OREGON STATE UNIVERSITY
GILL COLISEUM

TECHNICAL SPECIFICATIONS
LED VIDEO UPGRADES

PROJECT NUMBER 191010:

10.20.2017

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall be responsible for providing all displays, hoist and control equipment as described.

B. The Contractor will provide a turn-key installation of the displays, including all electrical and signal cable/conduit that is required. Contractor is required to provide the design based on their product offering and provide an engineered stamped drawing set as part of their Offer per section 3.2

C. The Contractor shall be responsible for the provision and installation of any primary and secondary steel, mounting brackets/hardware, required This includes all labor, materials, equipment; tools, transportation, and project management required for a complete and fully operational system(s).

D. Owner will provide primary power in the main electrical room in the basement. Contractor shall be responsible for all power and electrical distribution from demarcation to new system(s). Contractor shall provide all secondary power connections/terminations required to power new system(s). Contractor is responsible for providing stamped electrical drawings by a licensed electrical engineer in the State of Oregon.

E. Upon approval by the Owner, Contractor may utilize conduits or raceways currently installed in the facility for low voltage, video signal, and/or data communication for new system(s). If existing conduits or raceways are utilized for new wire pulls, all fill ratios and code compliance is required, however the Contractor is required to remove the existing signal cable to the display that is being removed. All additional conduit and raceways required to complete a path to each display shall be furnished and installed by Contractor. Contractor shall be responsible to furnish, install, and terminate all required cabling needed to make new system(s) complete and fully operational.

F. A rendering package is provided as part of this RFP. The illustrations are to be construed as conceptual and not for construction purposes. Contractor shall be responsible for final engineering of structural and electrical components required for new system(s), including professional engineering stamp by a licensed/registered engineer in the State of Oregon. All structural and electrical engineering is subject to Owner review and approval. Any modifications required are the responsibility of the Contractor.

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

1.2 WARRANTY AND SERVICE

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

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

C. Contractor shall repair or replace defects that occur in labor or materials within the warranty period. If repair is affected using Owners spare parts allotment, Contractor shall replenish all parts used to keep Owner's inventory at the amount required by the contract.

D. On-site labor shall be included during the warranty period for any work beyond simple component replacement. Simple component replacement shall be defined as lighting unit or power supply replacement or the replacement of an internal display signal cable that does not require tools to perform the cable replacement.

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

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

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

H. Contractor shall supply at least one local service employee or local authorized service agent for servicing and repair of all equipment during the warranty period. Local service employee or local authorized service agent shall be located within seventy-five (75) miles of Owner's facility.

I. The local service employee or local authorized service agent shall be entity responsible for providing the following emergency response availability:

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

J. Warranty shall cover all equipment, including hoist, LED processors, controllers, operating systems, and software.

K. Warranty shall include two annual on-site system check-ups by a qualified technician who is a full-time employee of the Contractor. Visit to occur approximately two (2) to three (-3) weeks prior to the start of the second and third seasons or as determined by Owner. Check-up shall include all regular maintenance for all equipment provided in the RFP; including filter changes, a complete inspection of all systems, brightness level readings of LED displays, parts replacement where required and a complete written report of all findings.

1.3 SPARE PARTS

A. Contractor shall supply a spare parts inventory containing 2% spare lighting units, 2% spare power supplies, and a minimum of one (1) of every other critical component including fiber modems. Spare parts inventory shall be based on quantity of components used to manufacture the display(s). Contractor shall provide proposed spare parts inventory as part of the bid submission.

B. At the time of final sign-off, Contractor shall supply the specified spare parts inventory regardless of spare parts used during initial "shake out", "burn in" and/or testing of newly installed displays.

C. Manufacturer of the LED system components shall continue to make all parts necessary for the continued functioning of the system for a minimum of seven (7) years after Final Completion of this project. Furthermore, upon end of life of any component used in the LED displays, that is not replaced by a "backwards compatible" component, Manufacturer shall notify Owner of end of life status being given to components of this system, and shall give Owner an opportunity to buy spare parts from stock or a last production run, at then commercially viable prices.

END OF PART 1 GENERAL

PART 2 PRODUCTS

2.1 CENTER HUNG PRIMARY LED VIDEO DISPLAYS

A. Quantity: Four (4) Indoor Video Displays

B. Pixel Resolution: 6mm physical pixel resolution.

C. LED Supplier: Only Nichia or Cree Black Package LED's will be accepted.

D. Minimum Active Area of Displays: Two Sideline 14.1' tall by 25.2' wide. Two End Zone 9.5' tall by 16.7' wide

E. Minimum Resolution: Two Sideline 720 x 1280, Two End Zone 480 x 848 based on maximum pixel pitch of 6mm.

F. Minimum Brightness: 2000nits (100% white with automatic color-correction "on") at start-up.

G. System must maintain a minimum brightness level of 1500nits throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

H. Display's intensity shall be adjustable to a minimum of 32 levels.

I. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.

J. 6,500°-9,000° Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.

K. Refresh rate shall be greater than 960+Hz.

L. Video frame rate at or greater than 60 frames per second.

M. Service accessibility for all components of the displays shall be from the front and rear.

N. Pixel to Pixel Variation

1. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
2. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
3. 95% or more of the pixels within each module must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the module.

O. Module to Module Variation

1. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
2. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
3. 100% of the modules in a screen must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the screen.
4. 100% of the adjacent modules in a screen must have a chromaticity value, Δu'v', within +/- 0.003 of each other.

P. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all White, all Red, all Green, and all Blue screen display.

Q. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

R. Minimum of a 140° (±70°) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

S. Minimum of a 140° (±70°) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

2.2 CENTER HUNG PRIMARY VIDEO DISPLAYS – PROCESSING AND CONTROLS

A. Video screen control system must provide the ability to manage: brightness (multi-level), video input, image position: size and scale, adjustable gamma correction, remote power function (power on/off), color, color temperature, contrast and sharpness.

B. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

C. The processor shall support the following inputs: HD-SDI video in either 720p or 1080i, SD-SDI (480p) and SDI 16x9 anamorphic signal, and DVI video.

D. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

E. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

2.3 OPERATING SYSTEM

A. The operating system will be a shared system with Gill Coliseum. The system will reside in the press box of Reser, with KVM's for remote operation in Reser, Gill Coliseum and the central video replay control room. Sufficient fiber exists between the three facilities. Contractor is responsible to provide all necessary fiber gear, patch panels and terminations required to provide a fully functioning system.

B. The primary system is only required to operate one event at a time. The back-up system will be utilized in the event operation in both facilities is required at the same time.

C. The following displays will be controlled by this system:

1. All new displays included in this RFP. Base Bid only, do not include any alternates. Include any additional costs to control the alternate displays with the alternate displays.
2. Reser Stadium Video Display – pixel resolution 384 x 1056
3. Reser Stadium Ribbon Display - pixel resolution 48 x 2128

D. System must have the ability to trigger the existing Daktronics displays in Gill Coliseum.

E. Provide a fully functional operating system capable of CG, exposure time tracking, and game operation. Systems must be capable of playing back industry standard still and animation file formats. It is understood that different operating control systems have preferred file formats. File conversion is acceptable.

F. The system must have the ability to support DVE moves, enabling dynamic switching between full screen and vectored views with areas for sponsor ads, statistics, and game in progress data for the scoring system.

G. The system must be capable of accepting a serial feed from the Daktronics scoring controller for football, basketball and wrestling as well as well as the Beaver Creek System for gymnastics, and any and all 3rd party stats, sport ticker feeds, and closed captioning as required.

H. Image playback is to be stutter-free for both static and animated graphics.

I. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the LED display from a location outside of the display housing.

J. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

2.4 ADD ALTERNATE – ROSS SOLUTION

A. Provide alternate pricing for a Ross Operating system with all the capabilities required in section 2.3

2.4 CENTER HUNG SCOREBOARD SIGNAGE AND AESTHETICS

A. Provide and install the following (detailed specifications noted in rendering package).

1. Four (4) Center Hung "Gill Coliseum" ID Letters – as shown on AJP Renderings.
2. Underbelly University ID– as shown on AJP Renderings.
3. Structural Accent elements – as shown on AJP Renderings.

2.5 LED COURTSIDE DISPLAYS

A. Quantity: Two (2) Indoor Video Displays

B. Pixel Resolution: 10mm physical pixel resolution.

A. LED Supplier: Only Nichia or Cree LED's will be accepted.

B. Minimum Active Area of Displays: 2.1' tall by 9.6' wide.

C. Minimum Resolution: 64 pixels tall by 288 pixels wide based on maximum pixel pitch of 10mm.

D. Displays to include lexan cover to protect face of LED modules.

E. Minimum Brightness: 2000nits (100% white with automatic color-correction "on") at startup.

F. System must maintain a minimum brightness level of 1500nits throughout the first 10,000hrs. of use or 36months from the time of acceptance, whichever is longer.

G. Minimum Brightness: 2000nits (100% white with automatic color-correction "on") at startup.

H. System must maintain a minimum brightness level of 1500nits throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

I. Display's intensity shall be adjustable to a minimum of 32 levels.

J. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.

K. 6,500□-9,000□ Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.

L. Refresh rate shall be greater than 960+Hz.

M. Video frame rate at or greater than 60 frames per second.

N. Service accessibility for all components of the displays shall be from the front/top.

O. Pixel to Pixel Variation

1. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
2. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
3. 95% or more of the pixels within each module must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the module.

P. Module to Module Variation

1. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
2. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
3. 100% of the modules in a screen must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the screen.
4. 100% of the adjacent modules in a screen must have a chromaticity value, Δu'v', within +/- 0.003 of each other.

Q. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all White, all Red, all Green, and all Blue screen display.

R. All listed specifications must be maintained throughout the first 10,000hrs.of use or 36 months from the time of acceptance, whichever is longer.

S. Minimum of a 140° (±70°) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

T. Minimum of a 140° (±70°) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

2.6 COURTSIDE LED DISPLAY TABLE SPECIFICATIONS

A. Scorer's table to include the following:

B. Upholstery quality vinyl covered padding on ends and top in a color to be determined by Owner. Vinyl shall be "Naugahyde" product or equal as approved.

C. Table length to be approximately 10'.

D. Each table sections to be on locking casters and leveling feet.

E. Provide 34" maximum table height.

F. Provide 24" maximum counter depth.

G. Table top to include four (4) cup holders.

H. Provide maximum of 38" total depth – display to back edge of table

I. Specific sizes may vary depending on location.

J. Provide 4" x 4" cable trough under table top with access holes every 4' minimum

K. Provide AC power connections every 12" and data connections every 24" along entire length of table and interconnections for service to connect between table sections.

L. Provide trough for installation of Owner provided temporary cabling i.e. data, phone, distributed TV.

M. Protective Vinyl Covers for each table for use when tables are in storage

N. Plug strip Edison outlets on top of table should have 15a capacity per table.

O. Power to each table must have enough capacity to provide 15a 110v service to table top plug strip. Each table top plug strip should have a dedicated 15a breaker.

P. Owner will supply 3 phase 208v 5 wire power at the appropriate amperage. Table should have a Male inlet connector rated at the appropriate amperage for power input. Coordinate power needs and connector types with what owner has available to provide.

2.7 LED COURTSIDE DISPLAY - PROCESSING AND CONTROLS

A. System must provide the ability to manage: brightness (multi-level), image position: size, adjustable gamma correction, color and color temperature.

B. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

2.8 LED ANIMATION PACKAGE

A. Provide 20 custom animations with a minimum of 50% 3-D animations for each of the LED displays.

2.9 HOIST

A. Provide and install two (2) Self Climbing MD Omni Series Hoists – 30,000 lb. Total Lift Capacity/22,400 lb. Live Load.

B. Vortek Model # MD-SB-7512-2 (or an Owner approved equal) - 15,000 Lbs Total Load Capacity @6FPM/460VAC/60Hz/(4) 3/8" Dyform 6 Cables/Base Mounting /7.5 HP/70'-0 Maximum Travel.

C. S Series Controls

1. Control system with dual motor synchronized feature/dual digital height display read outs/hold to run up/down push bottoms/E-stop/keyswitch/ 4 preset capacity.

D. Provide and install following features:

1. Horn sounder.
2. Rotary beacon
3. Tilt sensor swtich

4. Hand help pendant, includes 50’ cable with Up/Down and E-stop
5. Remote Pendant plug-in station
6. Blocks – four (4) snatch blocks.

2.10 ALTERNATE 2 END ZONE DISPLAYS

A. Quantity: Two (2) Indoor Video Displays

B. Pixel Resolution: 10mm physical pixel resolution.

C. LED Supplier: Only Nichia or Cree diodes will be accepted.

D. Minimum Active Area of Displays: 11.5’ tall by 32.5’ wide

E. Minimum Resolution: 352 x 992 based on maximum pixel pitch of 10mm.

F. Minimum Brightness: 2000nits (100% white with automatic color-correction “on”) at start-up.

G. System must maintain a minimum brightness level of 1500nits throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

H. Display’s intensity shall be adjustable to a minimum of 32 levels.

I. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.

J. 6,500°-9,000° Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.

K. Refresh rate shall be greater than 960+Hz.

L. Video frame rate at or greater than 60 frames per second.

M. Service accessibility for all components of the displays shall be from the front and rear.

N. Pixel to Pixel Variation

1. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
2. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
3. 95% or more of the pixels within each module must have a chromaticity value, Δu’v’, within +/- 0.006 of the mean chromaticity value for the module.

O. Module to Module Variation

1. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
2. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
3. 100% of the modules in a screen must have a chromaticity value, Δu’v’, within +/- 0.006 of the mean chromaticity value for the screen.
4. 100% of the adjacent modules in a screen must have a chromaticity value, Δu’v’, within +/- 0.003 of each other.

P. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all White, all Red, all Green, and all Blue screen display.

Q. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of acceptance, whichever is longer.

R. Minimum of a 140° (±70°) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

S. Minimum of a 140° (±70°) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction “on”, at stated angle maximum.

2.11 ALTERNATE 2 END ZONE VIDEO DISPLAYS – PROCESSING AND CONTROLS

A. Video screen control system must provide the ability to manage: brightness (multi-level), video input, image position: size and scale, adjustable gamma correction, remote power function (power on/off), color, color temperature, contrast and sharpness.

B. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

C. The processor shall support the following inputs: HD-SDI video in either 720p or 1080i, SD-SDI (480p) and SDI 16x9 anamorphic signal, and DVI video.

D. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

E. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

2.10 END ZONE SIGNAGE AND AESTHETICS

A. Provide and install the following (detailed specifications noted in rendering package).

1. Two (2) Oregon State ID Letters – as shown on AJP Renderings.
2. Four (4) illuminated advertising panels.
3. Structural Accent elements – as shown on AJP Renderings.

END OF PART 2 PRODUCTS

PART 3 EXECUTION

3.1 SCOPE OF WORK

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

1. Provide and install all equipment and displays listed in Part 2 – Products, including any and all equipment not specifically listed that is required to provide a completely functional system.
2. Provide and install hoist and center hung display as shown in AJP renderings. All primary and secondary steel, rigging steel for hoist, mounting brackets/hardware and attachment method shall be engineered, supplied, and installed by Contractor. Contractor shall provide final structural drawings per Section 3.2.
3. Contractor may utilize existing pathways for low voltage, video signal, and/or data communication for new system(s). If existing conduits or raceways are utilized for new wire pulls, all fill ratios and code compliance is required. All additional conduit and raceways required to complete a path to each display shall be furnished and installed by Contractor. Contractor shall be responsible to furnish, install, and terminate all required cabling needed to make new system(s) complete and fully operational.
4. Owner will provide adequate primary power in the main electrical room located in the basement. Contractor shall be responsible for all electrical work from this point, including panels, breakers, conduit, wire connection, and any other electrical work required to accommodate all Contractor supplied equipment. Contractor shall provide final stamped electrical drawings per Section 3.2.
5. Owner will provide primary power as it currently exists for the alternate 2 End Zone Displays. Contractor shall be responsible for all electrical work from this point, including panels, breakers, conduit, wire connection, and any other electrical work required to accommodate all Contractor supplied equipment. Contractor shall provide final stamped electrical drawings per Section 3.2.
6. Provide required electrical and data cable: connect all equipment with power, signal and control wiring.
7. Coordinate with Owner regarding placement of new equipment rack(s) and electrical components.
8. Provide and install the new control system, including integration with existing scoring system and data feeds, including captioning if required.
9. Lift and level center hung, certify overall weight of hoist and center hung structure/displays.
10. Set safety limits of hoist.
11. Provide all required permits and licenses.
12. Provide on-site installation supervisor per Section 1.5.E.
13. Deliver all Equipment to site and convey to appropriate locations within site as directed by Owner.
14. Store all Equipment in a safe and secure manner until installed, or otherwise directed by Owner.

3.2 ENGINEERING

A. The Contractor must submit drawings and calculations stamped by a professional engineer who shall be licensed/registered in the state of Oregon.

B. Contractor is responsible for taking all seismic, wind and environmental considerations into account and making structural provisions for any such requirements.

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

D. Engineered drawings are to include both structural and electrical.

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

3.3 STRUCTURAL CONSIDERATIONS

A. Contractor is responsible to engineer, build, deliver, install, integrate and commission complete turnkey displays as specified with all required structure needed to support all display components.

B. Flashing and any other related equipment shall be the responsibility of the Contractor to furnish and install.

C. Contractor is responsible for design and erection of all materials related to the new equipment.

D. Sub-structure is to be fabricated using structural steel and/or aluminum (optional). Contractor shall provide necessary protective separation when connecting dissimilar metals to prevent galvanic corrosion.

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

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

G. All components to be painted and otherwise finished for exterior service conditions shall be warranted to be free of rust or other defects for a period of ten years.

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

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

3.4 ELECTRICAL AND DATA

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

B. Contractor shall provide remote power on/off for displays noted in Part 2 Products. Contractor shall provide sufficient number of switches to control all displays. Switches to be mounted into equipment racks along with other equipment provided by Contractor. Configuration of switches shall be submitted with shop drawings to be approved by Owner.

C. The Contractor shall provide electrical and data one-line diagrams.

D. Electrical design and engineering must be reviewed and approved by the Owner prior to any electrical work by the Contractor.

E. The Contractor will be responsible for power distribution from the demarcation points noted on the included electrical drawing. Any additional electrical components required for a complete and fully operational system but not shown on the electrical drawings shall be the responsibility of the Contractor.

F. Contractor to provide a 4” x 4” J-Box at top/bottom of each rack with power circuit cabling terminating in 24” pig tails. Label each outlet as to which AC circuit is feeding it and provide the same information in the circuit breaker panel. Owner will provide all AC power and conduit to the equipment racks and will terminate AC power circuits within the J-Boxes.

G. Contractor is responsible for all conduit and raceways as required for signal/control cable distribution. Contractor may utilize existing conduit subject to Owner approval.

H. The Contractor shall be responsible for termination and final connect of power to all displays. All secondary electrical panels must be clearly marked with names of the branch circuits controlled by each breaker to aid in troubleshooting or isolating problems. All electrical services, disconnects, and breaker panels are to be labeled with what they control and where they are fed from.

I. Contractor shall not use wire nuts or electrical tape for any power or signal connection or any part of the work including internal LED display power jumpers or power connections to signage elements. All connections shall use a proper terminal block and spade terminal or terminal block and direct connection as required. Covers shall be provided over all high power terminal blocks to prevent electrical shock.

J. Permanent power distribution from Owner provided primary power source shall use rigid metal conduit and wire or metal clad (MC) cable. The use of SO cord or rubber jacket type power cables typically used on transportable installations or used on the installation of pitch side displays shall not be permit for permanent installations. Strain relief on all connectors shall be per manufactures recommendations. Contractor shall submit manufacturers strain relief recommendations for all connectors during the submittal process.

K. The Contractor will be responsible for providing stamped electrical drawings. A licensed/registered engineer in the state where this project is located shall stamp all electrical drawings.

L. Any equipment not certified as required in Section 1.4.A. shall require on site certification by a listed testing agency. All cost associated with obtaining on site certification shall be the responsibility of the Contractor. Written proof of certification or equivalent will be required prior to any work being performed on site.

M. Contractor shall provide twelve (12) spare strands of fiber in addition to the total amount of fiber that is required to provide video signal and/or data communication to LED displays installed by Contractor. All fiber shall be terminated and landed in an appropriate fiber patch panel. All new fiber supplied by Contractor shall be tested and shall not exceed maximum allowable dB loss per Section 3.4.N and/or Section 3.4.O.

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

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

P. Contractor to provide all required fiber transmitters and receivers (including amplifiers where required). Contractor will be responsible to terminate and perform final connection of all cables. Cables will be routed from the specified control locations to the display components per Contractor's diagram once the Owner has approved diagram.

3.5 AESTHETIC CONSIDERATIONS

A. Prior to contract award, the Contractor must provide a comprehensive outline of all intended flashing and finish details for Owner approval. Failure to submit these details prior to contract award shall make Contractor responsible for all flashing and finishes as required by Owner at no additional cost to Owner.

B. No exposed bolts, inverted U channels, or unfinished edges on LED displays shall be permitted on any surface with public view. Any part of the secondary steel frame exposed to public view shall be covered with flashing to match the edge of the LED display.

C. Unless specified differently on the AJP Drawings, the following shall serve as a minimum standard for products and finishes. Contractor shall be responsible to ensure that the material thickness provided is sufficient to prevent warping or "oil canning" on the span or sections of material installed.

1. ***Metals***
    a. + .040" aluminum on internal baffling
    b. + .090" aluminum on flashing
    c. + .125" aluminum on any routed or primary surface
    d. + 12ga/2.6mm stainless steel (visible)
2. ***Plastics***
    a. + .117" thickness on thermoformed polycarbonates
    b. + .177" thickness on flat polycarbonates
    c. + .125" thickness on flat acrylics
3. ***Finishes***
    a. + Approved Automotive Grade Enamels
    b. + ASTM D3451-06 compliant Powder Coating
4. ***Vinyl Films***
    a. + 3M, Avery, Oracal or other as approved.
    b. + 9oz weight for any outdoor banner (UV coated)

D. The Contractor shall not visibly display its trademarks or insignia on any of the Equipment or structural elements.

3.6 TRAINING

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

B. Training will be performed at the site by a qualified technician and shall occur either during installation of the equipment or immediately thereafter. O&M Manuals per Section 1.3.B shall be provide to Owner prior to training.

C. The training shall cover the operation, routine maintenance and troubleshooting of the displays and control equipment.

D. Training shall consist of at least 24 hours (over the course of 3-5 days) of instruction.

E. Contractor will be required to have a control systems operator and LED technician on site for the first event and continue to be on site for three (3) consecutive problem free events. “Problem-free” constitutes an event where the video and scoring displays, control system, and any other components installed by the Contractor are without failure during an event. Each successful event will need to be signed off by the Owner until three (3) consecutive events are achieved.

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

3.7 TESTING AND FINAL COMPLETION

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

B. Confirmation will be required of, but not limited to the following functions: operation of each system component, including back-up systems, control functionality, integration with existing systems, diagnostic capabilities, screen brightness, color temperature and viewing angles.

C. Contractor must provide all necessary testing equipment for Final Completion.

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

E. The following items must be completed and signed off by an appropriate Owner official before the Owner will issue a Final Completion letter.

1. LED Screens - Brightness and color uniformity shall be demonstrated and must meet the specification described. If the demonstration exhibits the display in noncompliance with the specifications, it will be the responsibility of the Contractor to make the necessary adjustments or to adjust, repair or replace the components necessary to meet the specifications. The Owner will not be responsible for any added costs as a result of an unsuccessful acceptance test.

2. Certain LED video displays included in this RFP are required to maintain minimum parameters over a specified period of time. The Owner at its sole discretion may engage an independent testing agency to verify the display’s specifications, at any time during the specified period of time. Cost for this testing will borne by the Owner, if display is in compliance. If the testing exhibits the display in noncompliance with the specifications, the cost of the testing will be the responsibility of the Contractor. Contractor will also be responsible to make the necessary adjustments or repair or replace the components necessary to meet the specifications. The Owner will not be responsible for any added costs as a result of an unsuccessful test.

3. Functionality of each of the displays and their control systems, as specified, shall be demonstrated in its entirety.

4. Final Completion of the system includes, but not limited to, the completed installation of all physical components and the issuance of the Certificate of Approval for code compliance by the Code Authority having Jurisdiction. Tests of the system shall not occur until after the system has been installed, and all work completed on the display systems.

F. Document all Final Completion testing, calibration and correction procedures described herein. Include the following information:

1. Performance date of the given procedure.

2. Condition of performance of procedure.

3. Type of procedure, and description.

4. Parameters measured and their values, including values measured prior to calibration or correction, as applicable.

5. The names of personnel conducting the procedure.

6. The equipment used to conduct the procedure.

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

H. Final Procedures

1. Perform any and all “punch-list” work to correct inadequate performance or unacceptable conditions, as determined by the Owner, at no additional expense to the Owner.

2. Furnish all portable (includes spare parts) equipment to the Owner along with complete inventory documentation. All portable equipment shall be presented in the original manufacturers packing, complete with all included instructions, miscellaneous manuals, and additional documents.
3. Provide new Final Completion testing in the same format as initial test reports.
4. Check, inspect, and if necessary, adjust all systems, equipment, devices and components specified, at the Owner's convenience, approximately thirty (30) days after Final Completion.
5. Upon completion of the Work, the Owner may elect to verify test data as part of Final Completion procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner.

END OF PART 3 EXECUTION

OREGON STATE UNIVERSITY
RESER STADIUM

TECHNICAL SPECIFICATIONS
LED RIBBON BOARD UPGRADES

PROJECT NUMBER 191010:

10.20.2017

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall be responsible for providing all displays and control equipment as described.

B. The Contractor will provide a turn-key installation of the displays, including all electrical and signal cable/conduit that is required. Contractor is required to provide the design based on their product offering and provide an engineered stamped drawing set as part of their Offer per section 3.2

C. The Contractor shall be responsible for the provision and installation of any secondary steel, mounting brackets/hardware, required This includes all labor, materials, equipment; tools, transportation, and project management required for a complete and fully operational system(s).

D. Owner will provide primary power from the main electrical room on the east side of stadium. Contractor shall be responsible for all power and electrical distribution from demarcation point to new system(s). Contractor shall provide all secondary power connections/terminations required to power new system(s). Contractor is responsible for providing stamped electrical drawings by a licensed electrical engineer in the State of Oregon.

E. Upon approval by the Owner, Contractor may utilize conduits or raceways currently installed in the facility for low voltage, video signal, and/or data communication for new system(s). If existing conduits or raceways are utilized for new wire pulls, all fill ratios and code compliance is required, however the Contractor is required to remove the existing signal cable to the display that is being removed. All additional conduit and raceways required to complete a path to each display shall be furnished and installed by Contractor. Contractor shall be responsible to furnish, install, and terminate all required cabling needed to make new system(s) complete and fully operational.

F. A rendering package is provided as part of this RFP. The illustrations are to be construed as conceptual and not for construction purposes. Contractor shall be responsible for final engineering of structural and electrical components required for new system(s), including professional engineering stamp by a licensed/registered engineer in the State of Oregon. All structural and electrical engineering is subject to Owner review and approval. Any modifications required are the responsibility of the Contractor.

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

1.2 WARRANTY AND SERVICE

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

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

C. Contractor shall repair or replace defects that occur in labor or materials within the warranty period. If repair is affected using Owners spare parts allotment, Contractor shall replenish all parts used to keep Owner's inventory at the amount required by the contract.

D. On-site labor shall be included during the warranty period for any work beyond simple component replacement. Simple component replacement shall be defined as lighting unit or power supply replacement or the replacement of an internal display signal cable that does not require tools to perform the cable replacement.

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

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

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

H. Contractor shall supply at least one local service employee or local authorized service agent for servicing and repair of all equipment during the warranty period. Local service employee or local authorized service agent shall be located within seventy-five (75) miles of Owner's facility.

I. The local service employee or local authorized service agent shall be entity responsible for providing the following emergency response availability:

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

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

K. Warranty shall include two annual on-site system check-ups by a qualified technician who is a full-time employee of the Contractor. Visit to occur approximately two (2) to three (-3) weeks prior to the start of the second and third seasons or as determined by Owner. Check-up shall include all regular maintenance; including filter changes, a complete inspection of all systems, brightness level readings of LED displays, parts replacement where required and a complete written report of all findings.

1.3 SPARE PARTS

A. Contractor shall supply a spare parts inventory containing 2% spare lighting units, 2% spare power supplies, and a minimum of one (1) of every other critical component including fiber modems. Spare parts inventory shall be based on quantity of components used to manufacture the display(s). Contractor shall provide proposed spare parts inventory as part of the bid submission.

B. At the time of final sign-off, Contractor shall supply the specified spare parts inventory regardless of spare parts used during initial "shake out", "burn in" and/or testing of newly installed displays.

C. Manufacturer of the LED system components shall continue to make all parts necessary for the continued functioning of the system for a minimum of seven (7) years after Final Completion of this project. Furthermore, upon end of life of any component used in the LED displays, that is not replaced by a "backwards compatible" component, Manufacturer shall notify Owner of end of life status being given to components of this system, and shall give Owner an opportunity to buy spare parts from stock or a last production run, at then commercially viable prices.

END OF PART 1 GENERAL

PART 2 PRODUCTS

2.1 EAST GRANDSTAND FASCIA DISPLAY

A. Quantity: 1 Outdoor Video Display

B. Pixel Resolution: 16mm physical pixel resolution.

C. LED Supplier: Only Nichia or Cree LED's will be accepted.

D. Minimum Active Area of Displays:

1. East – 3' tall by 509' wide.
2. The intent is to fill all available space on the fascia. Bidder is responsible for verifying sizes and providing displays to fill the space.

E. Minimum Resolution of Displays:

1. East – 56 x 9712
2. North – 56 x 1424

F. Minimum Brightness: 6000nits (100% white with automatic color-correction "on") at startup.

G. System must maintain a minimum brightness level of 5000nits throughout the first 10,000 hours of use or 36 months from the time of Final Completion, whichever is longer.

H. Display's intensity shall be adjustable to a minimum of 32 levels.

I. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.

J. 6,500°-9,000° Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.

K. Refresh rate shall be greater than 960+Hz.

L. Video frame rate at or greater than 60 frames per second.

M. Service accessibility for all components of the displays shall be from the top.

N. Pixel to Pixel Variation

1. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
2. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
3. 95% or more of the pixels within each module must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the module.

O. Module to Module Variation

1. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
2. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
3. 100% of the modules in a screen must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the screen.
4. 100% of the adjacent modules in a screen must have a chromaticity value, Δu'v', within +/- 0.003 of each other.

P. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all White, all Red, all Green, and all Blue screen display.

Q. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of Final Completion, whichever is longer.

R. Minimum of a 120° (±60°) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

S. Minimum of a 90° (60/30°) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

2.2 FASCIA LED DISPLAYS – PROCESSING AND CONTROLS

A. System must provide the ability to manage: brightness (multi-level), image position: size, adjustable gamma correction, color and color temperature.

B. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

C. The processor shall support the following inputs: DVI

D. All processing is to be housed in the west side press box control room.

E. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

F. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

2.3 FASCIA LED DISPLAY – OPERATING SYSTEM

A. Refer to section 2.3 of the Gill Coliseum technical specifications.

2.4 ADD ALERNATE – NORTH ENDZONE FASCIA DISPLAY

A. Quantity: 2 Outdoor Video Displays

B. Pixel Resolution: 16mm physical pixel resolution.

C. LED Supplier: Only Nichia or Cree LED's will be accepted.

D. Minimum Active Area of Displays:

1. Two Displays - 3' tall by 75' wide.
2. The intent is to fill all available space on the fascia. Bidder is responsible for verifying sizes and providing displays to fill the space.

E. Minimum Resolution of Displays:

1. Each Display - 56 x 1424

F. Minimum Brightness: 6000nits (100% white with automatic color-correction "on") at startup.

G. System must maintain a minimum brightness level of 5000nits throughout the first 10,000 hours of use or 36 months from the time of Final Completion, whichever is longer.

H. Display's intensity shall be adjustable to a minimum of 32 levels.

I. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.

J. 6,500°-9,000° Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.

K. Refresh rate shall be greater than 960+Hz.

L. Video frame rate at or greater than 60 frames per second.

M. Service accessibility for all components of the displays shall be from the top.

N. Pixel to Pixel Variation

1. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
2. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.

3. 95% or more of the pixels within each module must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the module.

O. Module to Module Variation

1. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
2. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
3. 100% of the modules in a screen must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the screen.
4. 100% of the adjacent modules in a screen must have a chromaticity value, Δu'v', within +/- 0.003 of each other.

P. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all White, all Red, all Green, and all Blue screen display.

Q. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of Final Completion, whichever is longer.

R. Minimum of a 120° (±60°) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

S. Minimum of a 90° (60/30°) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

2.5 ADD ALTERNATE FASCIA LED DISPLAYS – PROCESSING AND CONTROLS

A. System must provide the ability to manage: brightness (multi-level), image position: size, adjustable gamma correction, color and color temperature.

B. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

C. The processor shall support the following inputs: DVI

D. All processing is to be housed in the west side press box control room.

E. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

F. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

2.6 ADD ALTERNATE FASCIA LED DISPLAY – OPERATING SYSTEM

A. Provide all required additional equipment to integrate the control of the north end zone displays with the east grandstand displays.

B. System must allow for independent control of the east side ribbon and north end zone displays.

C. System must have hot key functionality providing the ability for all new displays in this package to be triggered with a single button.

2.7 LED ANIMATION PACKAGE

A. Provide 20 custom animations with a minimum of 50% 3-D animations for each of the LED displays.

END OF PART 2 PRODUCTS

PART 3 EXECUTION

3.1 SCOPE OF WORK

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

1. Provide and install all equipment and displays listed in Part 2 – Products, including any and all equipment not specifically listed that is required to provide a completely functional system.
2. Provide and install fascia LED display sections as shown in AJP renderings. Mounting brackets/hardware and attachment method shall be engineered, supplied, and installed by Contractor. Contractor shall provide final structural drawings per Section 3.2.
3. Ribbon display cabinets must incorporate a drink cap, with final design to be approved by Owner.
4. Contractor may utilize existing pathways for low voltage, video signal, and/or data communication for new system(s). If existing conduits or raceways are utilized for new wire pulls, all fill ratios and code compliance is required. All additional conduit and raceways required to complete a path to each display shall be furnished and installed by Contractor. Contractor shall be responsible to furnish, install, and terminate all required cabling needed to make new system(s) complete and fully operational.
5. Owner will provide primary power located in east side main electrical room for the east grandstand displays. Contractor shall be responsible for all electrical work from this point, including panels, breakers, conduit, wire connection, and any other electrical work required to accommodate all Contractor supplied equipment. Contractor shall provide final stamped electrical drawings per Section 3.2.
6. Owner will provide primary power located in the north end main electrical room. Contractor shall be responsible for all electrical work from this point, including panels, breakers, conduit, wire connection, and any other electrical work required to accommodate all Contractor supplied equipment. Contractor shall provide final stamped electrical drawings per Section 3.2.
7. Provide required electrical and data cable: connect all equipment with power, signal and control wiring.
8. Coordinate with Owner regarding placement of new equipment rack(s) and electrical components.
9. Provide and install the new control system, including integration with existing scoring system and data feeds, including captioning if required.
10. Provide all required permits and licenses.
11. Provide on-site installation supervisor per Section 1.5.E.
12. Deliver all Equipment to site and convey to appropriate locations within site as directed by Owner.
13. Store all Equipment in a safe and secure manner until installed, or otherwise directed by Owner.

3.2 ENGINEERING

A. The Contractor must submit drawings and calculations stamped by a professional engineer who shall be licensed/registered in the state of Oregon.

B. Contractor is responsible for taking all seismic, wind and environmental considerations into account and making structural provisions for any such requirements.

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

D. Engineered drawings are to include both structural and electrical.

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

3.3 STRUCTURAL CONSIDERATIONS

A. Contractor is responsible to engineer, build, deliver, install, integrate and commission complete turnkey displays as specified with all required structure needed to support all display components.

B. Flashing and any other related equipment shall be the responsibility of the Contractor to furnish and install.

C. Contractor is responsible for design and erection of all materials related to the new equipment.

D. Sub-structure is to be fabricated using structural steel and/or aluminum (optional). Contractor shall provide necessary protective separation when connecting dissimilar metals to prevent galvanic corrosion.

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

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

G. All components to be painted and otherwise finished for exterior service conditions shall be warranted to be free of rust or other defects for a period of ten years.

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

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

3.4 ELECTRICAL AND DATA

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

B. Contractor shall provide remote power on/off for displays noted in Part 2 Products. Contractor shall provide sufficient number of switches to control all displays.. Switches to be mounted into equipment racks along with other equipment provided by Contractor. Configuration of switches shall be submitted with shop drawings to be approved by Owner.

C. The Contractor shall provide electrical and data one-line diagrams.

D. Electrical design and engineering must be reviewed and approved by the Owner prior to any electrical work by the Contractor.

E. The Contractor will be responsible for power distribution from the demarcation points noted on the included electrical drawing. Any additional electrical components required for a complete and fully operational system but not shown on the electrical drawings shall be the responsibility of the Contractor.

F. Contractor to provide a 4” x 4” J-Box at top/bottom of each rack with power circuit cabling terminating in 24” pig tails. Label each outlet as to which AC circuit is feeding it and provide the same information in the circuit breaker panel. Owner will provide all AC power and conduit to the equipment racks and will terminate AC power circuits within the J-Boxes.

G. Contractor is responsible for all conduit and raceways as required for signal/control cable distribution. Contractor may utilize existing conduit subject to Owner approval.

H. The Contractor shall be responsible for termination and final connect of power to all displays. All secondary electrical panels must be clearly marked with names of the branch circuits controlled by each breaker to aid in troubleshooting or isolating problems. All electrical services, disconnects, and breaker panels are to be labeled with what they control and where they are fed from.

I. Contractor shall not use wire nuts or electrical tape for any power or signal connection or any part of the work including internal LED display power jumpers or power connections to signage elements. All connections shall use a proper terminal block and spade terminal or terminal block and direct connection as required. Covers shall be provided over all high power terminal blocks to prevent electrical shock.

J. Permanent power distribution from Owner provided primary power source shall use rigid metal conduit and wire or metal clad (MC) cable. The use of SO cord or rubber jacket type power cables typically used on transportable installations or used on the installation of pitch side displays shall not be permit for permanent installations. Strain relief on all connectors shall be per manufactures recommendations. Contractor shall submit manufacturers strain relief recommendations for all connectors during the submittal process.

K. The Contractor will be responsible for providing stamped electrical drawings. A licensed/registered engineer in the state where this project is located shall stamp all electrical drawings.

L. Any equipment not certified as required in Section 1.4.A. shall require on site certification by a listed testing agency. All cost associated with obtaining on site certification shall be the responsibility of the Contractor. Written proof of certification or equivalent will be required prior to any work being performed on site.

M. Contractor shall provide six (6) spare strands of fiber in addition to the total amount of fiber that is required to provide video signal and/or data communication to LED displays installed by Contractor. All fiber shall be terminated and landed in an appropriate fiber patch panel. All new fiber supplied by Contractor shall be tested and shall not exceed maximum allowable dB loss per Section 3.4.N and/or Section 3.4.O.

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

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

P. Contractor to provide all required fiber transmitters and receivers (including amplifiers where required). Contractor will be responsible to terminate and perform final connection of all cables. Cables will be routed from the specified control locations to the display components per Contractor's diagram once the Owner has approved diagram.

3.5 AESTHETIC CONSIDERATIONS

A. Prior to contract award, the Contractor must provide a comprehensive outline of all intended flashing and finish details for Owner approval. Failure to submit these details prior to contract award shall make Contractor responsible for all flashing and finishes as required by Owner at no additional cost to Owner.

B. No exposed bolts, inverted U channels, or unfinished edges on LED displays shall be permitted on any surface with public view. Any part of the secondary steel frame exposed to public view shall be covered with flashing to match the edge of the LED display.

C. Unless specified differently on the AJP Drawings, the following shall serve as a minimum standard for products and finishes. Contractor shall be responsible to ensure that the material thickness provided is sufficient to prevent warping or "oil canning" on the span or sections of material installed.

1. ***Metals***
    a. + .040" aluminum on internal baffling
    b. + .090" aluminum on flashing
    c. + .125" aluminum on any routed or primary surface
    d. + 12ga/2.6mm stainless steel (visible)
2. ***Plastics***
    a. + .117" thickness on thermoformed polycarbonates
    b. + .177" thickness on flat polycarbonates
    c. + .125" thickness on flat acrylics
3. ***Finishes***
    a. + Approved Automotive Grade Enamels
    b. + ASTM D3451-06 compliant Powder Coating
4. ***Vinyl Films***
    a. + 3M, Avery, Oracal or other as approved.
    b. + 9oz weight for any outdoor banner (UV coated)

D. The Contractor shall not visibly display its trademarks or insignia on any of the Equipment or structural elements.

3.6 TRAINING

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

B. Training will be performed at the site by a qualified technician and shall occur either during installation of the equipment or immediately thereafter. O&M Manuals per Section 1.3.B shall be provide to Owner prior to training.

C. The training shall cover the operation, routine maintenance and troubleshooting of the displays and control equipment.

D. Training shall consist of at least 24 hours (over the course of 3-5 days) of instruction.

E. Contractor will be required to have a control systems operator and LED technician on site for the first event and continue to be on site for three (3) consecutive problem free events. "Problem-free" constitutes an event where the video and scoring displays, control system, and any other components installed by the Contractor are without

failure during an event. Each successful event will need to be signed off by the Owner until three (3) consecutive events are achieved.

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

3.7 TESTING AND FINAL COMPLETION

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

B. Confirmation will be required of, but not limited to the following functions: operation of each system component, including back-up systems, control functionality, integration with existing systems, diagnostic capabilities, screen brightness, color temperature and viewing angles.

C. Contractor must provide all necessary testing equipment for Final Completion.

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

E. The following items must be completed and signed off by an appropriate Owner official before the Owner will issue a Final Completion letter.

1. LED Screens - Brightness and color uniformity shall be demonstrated and must meet the specification described. If the demonstration exhibits the display in noncompliance with the specifications, it will be the responsibility of the Contractor to make the necessary adjustments or to adjust, repair or replace the components necessary to meet the specifications. The Owner will not be responsible for any added costs as a result of an unsuccessful acceptance test.

2. Certain LED video displays included in this RFP are required to maintain minimum parameters over a specified period of time. The Owner at its sole discretion may engage an independent testing agency to verify the display's specifications, at any time during the specified period of time. Cost for this testing will borne by the Owner, if display is in compliance. If the testing exhibits the display in noncompliance with the specifications, the cost of the testing will be the responsibility of the Contractor. Contractor will also be responsible to make the necessary adjustments or repair or replace the components necessary to meet the specifications. The Owner will not be responsible for any added costs as a result of an unsuccessful test.

3. Functionality of each of the displays and their control systems, as specified, shall be demonstrated in its entirety.

4. Final Completion of the system includes, but not limited to, the completed installation of all physical components and the issuance of the Certificate of Approval for code compliance by the Code Authority having Jurisdiction. Tests of the system shall not occur until after the system has been installed, and all work completed on the display systems.

F. Document all Final Completion testing, calibration and correction procedures described herein. Include the following information:

1. Performance date of the given procedure.

2. Condition of performance of procedure.

3. Type of procedure, and description.

4. Parameters measured and their values, including values measured prior to calibration or correction, as applicable.

5. The names of personnel conducting the procedure.

6. The equipment used to conduct the procedure.

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

H. Final Procedures

1. Perform any and all "punch-list" work to correct inadequate performance or unacceptable conditions, as determined by the Owner, at no additional expense to the Owner.

2. Furnish all portable (includes spare parts) equipment to the Owner along with complete inventory documentation. All portable equipment shall be presented in the original manufacturers packing, complete with all included instructions, miscellaneous manuals, and additional documents.
3. Provide new Final Completion testing in the same format as initial test reports.
4. Check, inspect, and if necessary, adjust all systems, equipment, devices and components specified, at the Owner's convenience, approximately thirty (30) days after Final Completion.
5. Upon completion of the Work, the Owner may elect to verify test data as part of Final Completion procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner.

END OF PART 3 EXECUTION

OREGON STATE UNIVERSITY
SOFTBALL COMPLEX

TECHNICAL SPECIFICATIONS
LED VIDEO AND SCOREBOARD UPGRADES

PROJECT NUMBER 191010:

10.20.2017

PART 1 GENERAL

1.1 DESCRIPTION

A. The Contractor shall be responsible for providing all displays and control equipment as described.

B. The Contractor will provide a turn-key installation of the displays, including all structural steel, foundations, electrical and signal cable/conduit that is required. Contractor is required to provide the design based on their product offering and provide an engineered stamped drawing set as part of their Offer per section 3.2

C. The Contractor shall be responsible for the provision and installation of any primary and secondary steel, mounting brackets/hardware, required This includes all labor, materials, equipment; tools, transportation, and project management required for a complete and fully operational system(s).

D. Owner will provide primary power as it currently exists at the scoreboard – 100amp/208v. Contractor shall be responsible for all power and electrical distribution from demarcation point (secondary power) to new system(s). Contractor shall provide all secondary power connections/terminations required to power new system(s). Contractor is responsible for providing stamped electrical drawings by a licensed electrical engineer in the State of Oregon.

E. Upon approval by the Owner, Contractor may utilize conduits or raceways currently installed in the facility for low voltage, video signal, and/or data communication for new system(s). If existing conduits or raceways are utilized for new wire pulls, all fill ratios and code compliance is required, however the Contractor is required to remove the existing signal cable to the display that is being removed. All additional conduit and raceways required to complete a path to each display shall be furnished and installed by Contractor. Contractor shall be responsible to furnish, install, and terminate all required cabling needed to make new system(s) complete and fully operational.

F. A rendering package is provided as part of this RFP. The illustrations are to be construed as conceptual and not for construction purposes. Contractor shall be responsible for final engineering of structural and electrical components required for new system(s), including professional engineering stamp by a licensed/registered engineer in the State of Oregon. All structural and electrical engineering is subject to Owner review and approval. Any modifications required are the responsibility of the Contractor.

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

1.2 WARRANTY AND SERVICE

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

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

C. Contractor shall repair or replace defects that occur in labor or materials within the warranty period. If repair is affected using Owners spare parts allotment, Contractor shall replenish all parts used to keep Owner's inventory at the amount required by the contract.

D. On-site labor shall be included during the warranty period for any work beyond simple component replacement. Simple component replacement shall be defined as lighting unit or power supply replacement or the replacement of an internal display signal cable that does not require tools to perform the cable replacement.

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

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

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

H. Contractor shall supply at least one local service employee or local authorized service agent for servicing and repair of all equipment during the warranty period. Local service employee or local authorized service agent shall be located within seventy-five (75) miles of Owner's facility.

I. The local service employee or local authorized service agent shall be entity responsible for providing the following emergency response availability:

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

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

K. Warranty shall include two annual on-site system check-ups by a qualified technician who is a full-time employee of the Contractor. Visit to occur approximately two (2) to three (-3) weeks prior to the start of the second and third seasons or as determined by Owner. Check-up shall include all regular maintenance; including filter changes, a complete inspection of all systems, brightness level readings of LED displays, parts replacement where required and a complete written report of all findings.

1.3 SPARE PARTS

A. Contractor shall supply a spare parts inventory containing 2% spare lighting units, 2% spare power supplies, and a minimum of one (1) of every other critical component including fiber modems. Spare parts inventory shall be based on quantity of components used to manufacture the display(s). Contractor shall provide proposed spare parts inventory as part of the bid submission.

B. At the time of final sign-off, Contractor shall supply the specified spare parts inventory regardless of spare parts used during initial "shake out", "burn in" and/or testing of newly installed displays.

C. Manufacturer of the LED system components shall continue to make all parts necessary for the continued functioning of the system for a minimum of seven (7) years after Final Completion of this project. Furthermore, upon end of life of any component used in the LED displays, that is not replaced by a "backwards compatible" component, Manufacturer shall notify Owner of end of life status being given to components of this system, and shall give Owner an opportunity to buy spare parts from stock or a last production run, at then commercially viable prices.

END OF PART 1 GENERAL

PART 2 PRODUCTS

2.1 ALTERNATE 3 PRIMARY VIDEO DISPLAY DISPLAY

A. Quantity: 1 Outdoor Video Display

B. Pixel Resolution: 16mm physical pixel resolution.

C. LED Supplier: Only Nichia or Cree LED's will be accepted.

D. Minimum Active Area of Displays: 16' tall by 28.5' wide.

E. Minimum Resolution of Displays: 304 x 544 based on minimum resolution of 16mm.

F. Minimum Brightness: 6000nits (100% white with automatic color-correction "on") at startup.

G. System must maintain a minimum brightness level of 5000nits throughout the first 10,000 hours of use or 36 months from the time of Final Completion, whichever is longer.

H. Display's intensity shall be adjustable to a minimum of 32 levels.

I. Minimum 4,096 levels of intensity for each color (red, blue, pure green) 14-bit processing.

J. 6,500°-9,000° Kelvin color temperature. Color temperature shall remain constant across specified horizontal and vertical viewing angles.

K. Refresh rate shall be greater than 960+Hz.

L. Video frame rate at or greater than 60 frames per second.

M. Service accessibility for all components of the displays shall be from the top.

N. Pixel to Pixel Variation

1. 95% or more of pixels within each module must have a luminance within +/- 4% of the mean luminance for the module.
2. The average luminance of a column or row of pixels at the edge of a module or panel must be within +/- 2% of the average luminance of the module or panel.
3. 95% or more of the pixels within each module must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the module.

O. Module to Module Variation

1. 100% of the modules in a screen must have a luminance within +/- 4% of the mean luminance for the screen.
2. 100% of the adjacent modules (i.e., modules sharing a border) in a screen must have a luminance within +/- 3% of each other.
3. 100% of the modules in a screen must have a chromaticity value, Δu'v', within +/- 0.006 of the mean chromaticity value for the screen.
4. 100% of the adjacent modules in a screen must have a chromaticity value, Δu'v', within +/- 0.003 of each other.

P. All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles and are to be met for an all White, all Red, all Green, and all Blue screen display.

Q. All listed specifications must be maintained throughout the first 10,000 hours of use or 36 months from the time of Final Completion, whichever is longer.

R. Minimum of a 120° (±60°) horizontal viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

S. Minimum of a 90° (60/30°) vertical viewing angle. Defined at 50% of full intensity, with automatic color-correction "on", at stated angle maximum.

2.2 ALTERNATE 3 PRIMARY VIDEO DISPLAY – PROCESSING AND CONTROLS

A. Video screen control system must provide the ability to manage: brightness (multi-level), video input, image position: size and scale, adjustable gamma correction, remote power function (power on/off), color, color temperature, contrast and sharpness.

B. Processing to allow for electronic color and brightness calibration - block to block and pixel to pixel.

C. The processor shall support the following inputs: HD-SDI video in either 720p or 1080i, SD-SDI (480p) and SDI 16x9 anamorphic signal, and DVI video.

D. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the video display from a location outside of the display housing.

E. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

2.3 ALTERNATE 3 PRIMARY VIDEO DISPLAY – OPERATING SYSTEM

A. Provide a fully functional operating system capable of CG, exposure time tracking, and game operation. Systems must be capable of playing back industry standard still and animation file formats. It is understood that different operating control systems have preferred file formats. File conversion is acceptable.

B. The system must be capable of accepting a serial feed from the Daktronics scoring controller and any and all 3rd party stats, sport ticker feeds, and closed captioning as required.

C. Image playback is to be stutter-free for both static and animated graphics.

D. Operating system is to be housed in Press Box

E. Contractor shall provide a remote user station, also located in the Press Box.

F. Contractor is responsible for providing all required components, racks and wiring necessary to manage and control the LED display from a location outside of the display housing.

G. System architecture must allow for 100% processing and control redundancy. Back up units shall be installed in the equipment racks and shall be hot swappable.

2.4 SCORING SYSTEM

A. Provide and install fixed digit, white LED softball scoreboard as depicted in AJP RFP rendering package

B. Provide and install the following equipment:

1. Two (2) Scoring Controllers (1 primary and 1 backup).
2. One (1) Data Distribution Panel.

2.5 ALTERNATE 3 LED ANIMATION PACKAGE

A. Provide 20 custom animations with a minimum of 50% 3-D animations for each of the LED displays.

END OF PART 2 PRODUCTS

PART 3 EXECUTION

3.1 SCOPE OF WORK

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

1. Provide and install all equipment and displays listed in Part 2 – Products, including any and all equipment not specifically listed that is required to provide a completely functional system.
2. Provide and install foundations, primary steel, secondary steel, catwalks and mounting brackets/hardware as required to support new displays. The existing structure may be re-used. Contractor shall provide final structural drawings per Section 3.2.
3. Contractor may utilize existing pathways for low voltage, video signal, and/or data communication for new system(s). If existing conduits or raceways are utilized for new wire pulls, all fill ratios and code compliance is required. All additional conduit and raceways required to complete a path to each display shall be furnished and installed by Contractor. Contractor shall be responsible to furnish, install, and terminate all required cabling needed to make new system(s) complete and fully operational.
4. Owner will provide primary power located at the scoreboard with 100 amps at 208V 3 phase available for the displays. Contractor shall be responsible for all electrical work from this point, including panels, breakers, conduit, wire connection, and any other electrical work required to accommodate all Contractor supplied equipment. Contractor shall provide final stamped electrical drawings per Section 3.2.
5. If primary power for each display is not sufficient for all products Contractor intends to provide under this package, then Contractor is responsible for bringing additional power to the displays from new demarcation points identified by Owner.
6. Provide required electrical and data cable: connect all equipment with power, signal and control wiring.
7. Coordinate with Owner regarding placement of new equipment rack(s) and electrical components.
8. Provide and install the new control system and scoring system, including integration with existing data feeds, including captioning if required.
9. Provide all required permits and licenses.
10. Provide on-site installation supervisor per Section 1.5.E.
11. Deliver all Equipment to site and convey to appropriate locations within site as directed by Owner.
12. Store all Equipment in a safe and secure manner until installed, or otherwise directed by Owner.

3.2 ENGINEERING

A. The Contractor must submit drawings and calculations stamped by a professional engineer who shall be licensed/registered in the state of Oregon.

B. Contractor is responsible for taking all seismic, wind and environmental considerations into account and making structural provisions for any such requirements.

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

D. Engineered drawings are to include both structural and electrical.

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

3.3 STRUCTURAL CONSIDERATIONS

A. Contractor is responsible to engineer, build, deliver, install, integrate and commission complete turnkey displays as specified with all required structure needed to support all display components.

B. Flashing and any other related equipment shall be the responsibility of the Contractor to furnish and install.

C. Contractor is responsible for design and erection of all materials related to the new equipment.

D. Sub-structure is to be fabricated using structural steel and/or aluminum (optional). Contractor shall provide necessary protective separation when connecting dissimilar metals to prevent galvanic corrosion.

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

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

G. All components to be painted and otherwise finished for exterior service conditions shall be warranted to be free of rust or other defects for a period of ten years.

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

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

3.4 ELECTRICAL AND DATA

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

B. Contractor shall provide remote power on/off for displays noted in Part 2 Products. Contractor shall provide sufficient number of switches to control all displays.. Switches to be mounted into equipment racks along with other equipment provided by Contractor. Configuration of switches shall be submitted with shop drawings to be approved by Owner.

C. The Contractor shall provide electrical and data one-line diagrams.

D. Electrical design and engineering must be reviewed and approved by the Owner prior to any electrical work by the Contractor.

E. The Contractor will be responsible for power distribution from the demarcation points noted on the included electrical drawing. Any additional electrical components required for a complete and fully operational system but not shown on the electrical drawings shall be the responsibility of the Contractor.

F. Contractor to provide a 4” x 4” J-Box at top/bottom of each rack with power circuit cabling terminating in 24” pig tails. Label each outlet as to which AC circuit is feeding it and provide the same information in the circuit breaker panel. Owner will provide all AC power and conduit to the equipment racks and will terminate AC power circuits within the J-Boxes.

G. Contractor is responsible for all conduit and raceways as required for signal/control cable distribution. Contractor may utilize existing conduit subject to Owner approval.

H. The Contractor shall be responsible for termination and final connect of power to all displays. All secondary electrical panels must be clearly marked with names of the branch circuits controlled by each breaker to aid in troubleshooting or isolating problems. All electrical services, disconnects, and breaker panels are to be labeled with what they control and where they are fed from.

I. Contractor shall not use wire nuts or electrical tape for any power or signal connection or any part of the work including internal LED display power jumpers or power connections to signage elements. All connections shall use a proper terminal block and spade terminal or terminal block and direct connection as required. Covers shall be provided over all high power terminal blocks to prevent electrical shock.

J. Permanent power distribution from Owner provided primary power source shall use rigid metal conduit and wire or metal clad (MC) cable. The use of SO cord or rubber jacket type power cables typically used on transportable installations or used on the installation of pitch side displays shall not be permit for permanent installations. Strain relief on all connectors shall be per manufactures recommendations. Contractor shall submit manufacturers strain relief recommendations for all connectors during the submittal process.

K. The Contractor will be responsible for providing stamped electrical drawings. A licensed/registered engineer in the state where this project is located shall stamp all electrical drawings.

L. Any equipment not certified as required in Section 1.4.A. shall require on site certification by a listed testing agency. All cost associated with obtaining on site certification shall be the responsibility of the Contractor. Written proof of certification or equivalent will be required prior to any work being performed on site.

M. Contractor shall provide six (6) spare strands of fiber in addition to the total amount of fiber that is required to provide video signal and/or data communication to LED displays installed by Contractor. All fiber shall be

terminated and landed in an appropriate fiber patch panel. All new fiber supplied by Contractor shall be tested and shall not exceed maximum allowable dB loss per Section 3.4.N and/or Section 3.4.O.

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

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

P. Contractor to provide all required fiber transmitters and receivers (including amplifiers where required). Contractor will be responsible to terminate and perform final connection of all cables. Cables will be routed from the specified control locations to the display components per Contractor's diagram once the Owner has approved diagram.

3.5 AESTHETIC CONSIDERATIONS

A. Prior to contract award, the Contractor must provide a comprehensive outline of all intended flashing and finish details for Owner approval. Failure to submit these details prior to contract award shall make Contractor responsible for all flashing and finishes as required by Owner at no additional cost to Owner.

B. No exposed bolts, inverted U channels, or unfinished edges on LED displays shall be permitted on any surface with public view. Any part of the secondary steel frame exposed to public view shall be covered with flashing to match the edge of the LED display.

C. Unless specified differently on the AJP Drawings, the following shall serve as a minimum standard for products and finishes. Contractor shall be responsible to ensure that the material thickness provided is sufficient to prevent warping or "oil canning" on the span or sections of material installed.

1. ***Metals***
    a. + .040" aluminum on internal baffling
    b. + .090" aluminum on flashing
    c. + .125" aluminum on any routed or primary surface
    d. + 12ga/2.6mm stainless steel (visible)
2. ***Plastics***
    a. + .117" thickness on thermoformed polycarbonates
    b. + .177" thickness on flat polycarbonates
    c. + .125" thickness on flat acrylics
3. ***Finishes***
    a. + Approved Automotive Grade Enamels
    b. + ASTM D3451-06 compliant Powder Coating
4. ***Vinyl Films***
    a. + 3M, Avery, Oracal or other as approved.
    b. + 9oz weight for any outdoor banner (UV coated)

D. The Contractor shall not visibly display its trademarks or insignia on any of the Equipment or structural elements.

3.6 TRAINING

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

B. Training will be performed at the site by a qualified technician and shall occur either during installation of the equipment or immediately thereafter. O&M Manuals per Section 1.3.B shall be provide to Owner prior to training.

C. The training shall cover the operation, routine maintenance and troubleshooting of the displays and control equipment.

D. Training shall consist of at least 24 hours (over the course of 3-5 days) of instruction.

E. Contractor will be required to have a control systems operator and LED technician on site for the first event and continue to be on site for three (3) consecutive problem free events. "Problem-free" constitutes an event where the video and scoring displays, control system, and any other components installed by the Contractor are without failure during an event. Each successful event will need to be signed off by the Owner until three (3) consecutive events are achieved.

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

3.7 TESTING AND FINAL COMPLETION

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

B. Confirmation will be required of, but not limited to the following functions: operation of each system component, including back-up systems, control functionality, integration with existing systems, diagnostic capabilities, screen brightness, color temperature and viewing angles.

C. Contractor must provide all necessary testing equipment for Final Completion.

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

E. The following items must be completed and signed off by an appropriate Owner official before the Owner will issue a Final Completion letter.

1. LED Screens - Brightness and color uniformity shall be demonstrated and must meet the specification described. If the demonstration exhibits the display in noncompliance with the specifications, it will be the responsibility of the Contractor to make the necessary adjustments or to adjust, repair or replace the components necessary to meet the specifications. The Owner will not be responsible for any added costs as a result of an unsuccessful acceptance test.

2. Certain LED video displays included in this RFP are required to maintain minimum parameters over a specified period of time. The Owner at its sole discretion may engage an independent testing agency to verify the display's specifications, at any time during the specified period of time. Cost for this testing will borne by the Owner, if display is in compliance. If the testing exhibits the display in noncompliance with the specifications, the cost of the testing will be the responsibility of the Contractor. Contractor will also be responsible to make the necessary adjustments or repair or replace the components necessary to meet the specifications. The Owner will not be responsible for any added costs as a result of an unsuccessful test.

3. Functionality of each of the displays and their control systems, as specified, shall be demonstrated in its entirety.

4. Final Completion of the system includes, but not limited to, the completed installation of all physical components and the issuance of the Certificate of Approval for code compliance by the Code Authority having Jurisdiction. Tests of the system shall not occur until after the system has been installed, and all work completed on the display systems.

F. Document all Final Completion testing, calibration and correction procedures described herein. Include the following information:

1. Performance date of the given procedure.

2. Condition of performance of procedure.

3. Type of procedure, and description.

4. Parameters measured and their values, including values measured prior to calibration or correction, as applicable.

5. The names of personnel conducting the procedure.

6. The equipment used to conduct the procedure.

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

H. Final Procedures

1. Perform any and all "punch-list" work to correct inadequate performance or unacceptable conditions, as determined by the Owner, at no additional expense to the Owner.

2. Furnish all portable (includes spare parts) equipment to the Owner along with complete inventory documentation. All portable equipment shall be presented in the original manufacturers packing, complete with all included instructions, miscellaneous manuals, and additional documents.

3. Provide new Final Completion testing in the same format as initial test reports.

4. Check, inspect, and if necessary, adjust all systems, equipment, devices and components specified, at the Owner's convenience, approximately thirty (30) days after Final Completion.
5. Upon completion of the Work, the Owner may elect to verify test data as part of Final Completion procedure. Provide personnel and equipment, at the convenience of the Owner, to reasonably demonstrate system performance and to assist with such tests without additional cost to the Owner.

END OF PART 3 EXECUTION