LED Videoboard and Associated Systems: Section 27 41 00

PART 1 GENERAL

1.01 INTRODUCTION

.1 The Poirier Sports and Leisure Complex's Arena 1 has a seating capacity of 2,200. The spectator arena was extended and expanded in 2010. For this project, an LED videoboard will be added to the East end of the ice, hung from the truss system. The LED videoboard will be used for video replay and sponsorship opportunities, an integrated video production system will be added to provide a live feed to the videoboard, as well as livestreaming to remote viewers; this system will be installed and operated out of the Press Room - 2046.

.2 This Section includes requirements for the LED Displays & Associated Systems. It includes, but is not limited to the following:

.1 Single-sided LED Videoboard

.2 Integrated Video Production System

.3 Electrical Systems

.4 Structural Supports

.3 The Poirier Sport and Leisure Complex construction site will be open as determined by the Owner. The Contractor will co-ordinate access at all times.

1.02 DEFINITIONS

.1 "Contractor": the proponent awarded the contract to supply and install the LEDSYS, including their authorized representatives and sub-contractors, referred to throughout as if singular in number. The Contractor will provide all general contracting and sub-contract services as required.

.2 "Consultant": VWMason Technology Consultants Ltd and their authorized representatives, referred to throughout as if singular in number.

.3 "Owner": The City of Coquitlam, and its authorized representatives including the project manager, staff, Consultant, and other project consultants, referred to throughout as if singular in number.

.4 "LED Displays & Associated Systems": Systems and equipment to be supplied and installed by the Contractor. Referred to as the "LEDSYS" throughout the Specification document.

1.03 RELATED REQUIREMENTS

.1 The Contractor is responsible for all required scopes of work including the following related sections:

.1 Section 26 05 00: Electrical General Requirements

1.04 REFERENCE STANDARDS

.1 Published specifications and standards by trade, industry, and governmental organizations apply the design, construction, and installation of the LEDSYS. The Contractor and its sub-contractors and suppliers will have knowledge of these standards where they apply to the work required within this Specification and comply with their requirements as it applies to the project work. These specifications and standards include but are not limited to:

.1 ANSI/EIA/TIA-526: Standard Test Procedures for Fibre Optic Systems

.2 ANSI/EIA/TIA-568-C.0: Generic Communications Cabling for Customer Premises

.3 ANSI/EIA/TIA-568-C.1: Commercial Building Communications Cabling Standards, Part 1: General Requirements

.4 ANSI/EIA/TIA-568-C.2: Balanced Twisted-Pair Communications Cabling and Components Standard

.5 ANSI/EIA/TIA-568-C.3: Optical Fibre Cabling Components Standard

.6 ANSI/EIA/TIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces

.7 ANSI/INFOCOMM 10:2013 Audiovisual Systems Performance Verification

.8 ANSI/INFOCOMM 2M-2010 Standard Guide for Audiovisual Design and Coordination Processes

.9 AVIXA F501.01:2015 (Formerly INFOCOMM F501.01:2015), Cable Labeling for Audiovisual Systems

.10 AVIXA V202.01:2016 (Formerly ANSI/INFOCOMM V202.01:2016), Display Image Size for 2D Content in Audiovisual Systems

.11 BC Building Code 2018 (BCBC)

.12 CAN/CSA Standards of Canadian Standards Association

.13 Canadian Electrical Code C22.1- 2018 Edition (CEC)

.14 Canadian Electrical Manufacturers Representatives Association (CEMRA)

.15 Canadian Radio-television and Telecommunications Commission (CRTC) rules and regulations

.16 Middle Atlantic Products “Integrating Electronic Equipment and Power into Rack Enclosures” Rev. 4b

.17 Regulations of local inspection authorities having jurisdiction

.18 Society of Cable Television Engineers (SCTE)

.19 Society of Motion Picture and Television Engineers (SMPTE)

.20 Underwriters' Laboratories of Canada (ULC)

.21 Other applicable codes, standards, and installation procedures consistent with recognized industry trends and generally accepted procedures.

1.05 SCOPE OF WORK OVERVIEW

.1 Provide the design, engineering, labour, supplies, materials, tools, test equipment, transportation, offloading, supervision, and coordination required to complete the supply, installation, training, and commissioning of the LEDSYS as described in this Specification, schedules, attachments, and related drawings. The Contractor is responsible for providing a complete and operational LEDSYS.

.2 The Contractor is responsible for design, engineering, supplying and installing all electrical systems required to support the LEDSYS.

.3 The Contractor is responsible for design, engineering, supplying and installing all structural supports required to mount the LEDSYS.

.4 The Contractor must be thoroughly knowledgeable and acquainted with the complete contents and requirements of this section.

.5 The LEDSYS must be completed according to the contract documents, as well as all applicable civic, provincial, and national codes and regulations, and manufacturer requirements and specifications.

1.06 SYSTEM DESCRIPTIONS

.1 Single-Sided LED Videoboard

.1 The LED Videoboard will include a single-sided LED display.

.2 All content for the LED videoboard is virtual. Game in progress/replays, sponsorship, and game presentation elements (crowd pumpers) can be displayed on the videoboard in various configurations.

.3 Contractor supplied structure will be used to hang or mount the LED Videoboard.

.4 New electrical circuits are required to be installed for the LED videoboard. Refer to the attached drawings for details. New fibre cable for signal and control must be installed from the Team/Event Room to the scoreboard.

.5 The trim height from the bottom of the Videoboard to the concourse surface will be 3.6m AFF.

.6 An scaling video processor capable of receiving an HDSDI video signal and sending video to the LED display is required. Any additionally required active and/or passive signal distribution is to be included.

.2 Integrated Video Production System

.1 An integrated video production system will be provided by the Contractor. It will include video switching, support for multiple resolutions and frame rates, multiple M/E's, clip/graphics storage and playback, video replay, audio mixing, customized workspace, macros, customized UX, live streaming, virtual scoring, and customized program output.

.2 The LED display control system and the integrated video production system will be installed in an existing, owner-supplied rack in the Press Room - 2046.

1.07 RESPONSIBILITY AND RELATED WORK

.1 The Contractor will act as the prime/general contractor and is responsible for all permits and work including electrical and structural.

.2 LED drawings are provided to support this Specification. The purpose of these drawings is to illustrate general design intent; they are not construction drawings. The Contractor is responsible for completing all design and engineering for all systems. All engineered drawings, shop drawings, one lines, schematic diagrams, and connection diagrams will be reviewed by the Consultant prior to beginning work.

.3 The Contractors' electrical and structural engineer will be licenced to operate in the Province of British Columbia.

.4 The Contractor must verify all dimensions and site conditions to ensure the proper placement of all equipment, systems, and electrical services prior to submitting engineered drawings and shop drawings for approval and prior to commencing work.

.5 To maintain quality assurance, the Contractor will regularly review all project documentation and site conditions to ensure that the work of others as it pertains to the LEDSYS is developing as expected. The Contractor will promptly report any deficiencies, errors, omissions, discrepancies, or matters requiring clarification to the General Contractor in writing.

.6 The Contractor will maintain an experienced superintendent and necessary assistants, one or more of who must always attend the Poirier Sports and Leisure Complex during the installation of the LEDSYS. The superintendent will act as the Contractor's authorized representative at the site and be approved by the Consultant. The Contractor's authorized on-site representatives must hold a valid CTS-I certification.

.7 The design intent of the LEDSYS is to inter-connect the equipment to utilize its capabilities and features fully. Where applicable, all devices must be connected to allow for: signal transport, communication, control, and updates.

.8 The Contractor is responsible for assembly, modifications as required, and mounting of all components.

.9 The Contractor is responsible to supply and install all required conduit and tray pathways for electrical and low voltage wire.

.10 The Contractor will be responsible for supplying and terminating all copper wire and fiber in the proper rack, junction box, cabinet, wall plate, or panel as required, as well as mounting all required termination accessories and related equipment. Where fiber cable is being installed, the Contractor must supply a Certified Fiber Optic Technician to perform these terminations.

.11 The Contractor is responsible for all electrical services, load centers, branch circuits, connections, terminations, outlets, materials, and all other parts and labour required to power the LEDSYS based on the requirements of this specification, electrical code, and product requirements.

.12 The Owner will provide technology infrastructure to support the LEDSYS. This infrastructure will include network ports within 90 m of the video production system equipment rack. The

Contractor is required to supply and install all parts, cable, and labour required to patch audio-visual devices to these ports.

.13 The Contractor will operate all required equipment to test and commission the system and its components thoroughly.

1.08 SUBMITAL GENERAL RESPONSIBILITIES

.1 All Submittals listed below are required to be provided by the Contractor. Failure to provide submittals in a timely manner could result in a breach of contract by the Contractor.

.2 Review of the submittals by the Consultant is for purposes of tracking the work and contract administration and does not relieve the Contractor of responsibility for any deviation from the contract documents, or from providing equipment and/or services required by the contract documents which were omitted from the submittals.

.3 No portion of the project will commence until all preconstruction submittals have been reviewed by the Consultant and approved in writing by the Owner.

.4 All submittals will be accompanied by a letter of transmittal identifying the name of the project, Contractor's name, date submitted for review, and a list of items transmitted. Provide submittals in as few PDF files as possible.

1.09 PRECONSTRUCTION SUBMITTALS

.1 Preconstruction Information Submittal:

.1 Within 10 calendar days of issuance of contract award, and before ordering equipment or beginning work, the Contractor will supply the following for approval:

.2 Project Team:

.1 The Contractor will clearly identify project team members and that statement will include name, years with firm and a brief resume of the employees past projects and education. Pertinent team members that are to be identified will be Project Manager, Designer, Site Supervisor, Programmer(s), Health & Safety Officer (first-aid).

.2 Project Manager: On projects utilizing systems from manufacturers with a recommended training, testing, and credentialing program, the project manager will be certified to the highest relevant level offered by that manufacturer.

.3 On-Site Superintendent: Will be CTS-I certified. The superintendent will act as the Contractor's authorized representative at the site. On projects utilizing systems from manufacturers' with a recommended training, testing, and credentialing program, the engineer will be certified to the highest relevant level offered by that manufacturer.

.4 The Contractor will provide complete proof of current certifications as part of the Preconstruction Information Submittal

.3 Proposed Project Schedule:

.1 A Gantt chart showing the timetable for the work. As the construction schedule advances, revise, and resubmit the chart to show rescheduled work and milestones achieved.

.2 Gantt chart will include the following dates at minimum:

- Delivery dates for all future submittals
- Ordering of equipment
- Delivery of equipment to Contractor's facility
- Installation prep services to be completed at the Contractors facility
- Off-site programming
- On-site installation (include phasing details if applicable)
- Testing & Commissioning
- Training
- Closeout submittals and documentation

.4 Product Matrix:

.1 Provide a product information matrix.

- Indicating compliance or deviation for each product listed in the specification
- Include projected delivery date for all products
- Include unit pricing for all products
- Highlight products that will compromise adherence to the proposed installation and completion dates
- Include all manufacturer product warranty length
- Include a URL to the manufacturer website product page

.2 Provide product matrix in a spreadsheet/table format as a single PDF file.

.3 In the event that product substitutions are required, the Contractor will update and re-submit the product matrix as part of the preconstruction shop drawing submittal

.2 <u>Preconstruction Shop Drawing Submittal:</u>

.1 Within 45 calendar days of issuance of contract award, and before ordering equipment or beginning work, the Contractor will supply detailed shop drawings for review and approval. Shop Drawings will include at a minimum:

.2 Schematics:

.1 Include comprehensive functional schematic one-line drawing for all systems within the scope of work.

.2 Provide names, model numbers, and descriptions of all components.

.3 Detail all connection points, interconnecting wires, and location:

.4 Call out wire types and color-codes where appropriate

.5 Cross reference and label all wiring on the written lists and line drawings.

.6 A/V or Electrical Box Rack Schedule that includes the type of box or rack, size, mounting type, and location.

.3 Elevations:

.1 Include all equipment rack front and rear elevations, clearly showing the location of all equipment housed in racks.

.2 Include all panels, plates, and labelling strips.

.4 Installation Drawings.

.1 Provide drawings showing unique details of the manufacturers' installation methods specific to each product if, not contained in the manufacturers' datasheets.

.2 Include details and dimensioned drawings for all custom manufactured components. Include plan views and elevations.

.3 Schedule all required laminated labels, their sizes, and to which equipment they will be attached.

.4 Other relevant details pertaining to the work.

.5 Heat and Power Load Schedule:

.1 Provide a schedule showing the the total heat and power load of the new and existing equipment on a per room and per equipment rack basis.

.6 Submittal drawings will detail all proposed materials, finishes, and colors for all exposed surfaces and custom items.

.7 Create the drawings listed above with Revit or AutoCAD using AVIXA standard schematic icons and graphics and provide to Consultant.

.8 All drawings must be produced at an appropriate scale with a sheet size no smaller than 11x17 inches.

.3 <u>Commission and Training Plan Submittal:</u>

.1 Within 60 calendar days of issuance of contract award and prior to beginning work on site the Contractor will supply the following for approval:

.1 Provide detailed commissioning plan including schedule and proposed dates.

.2 Provide training plan including detailed syllabus and proposed dates. Indicate who is to attend training.

1.10 POST INSTALLATION SUBMITTALS

.1 Contract Closeout Submittals

.2 The Contractor will provide an organized compilation of site conditions, testing, measurement data, as-built drawings, and operation and maintenance manuals to the Consultant following substantial completion of the LEDSYS.Submittals will be provided by

the Contractor prior to instruction of owner personal. Final acceptance will not be issued until all submittals and been submitted and reviewed by the Consultant.

.3 Testing & Measurement Submittal:

.1 Provide the following Contract Closeout information in PDF format as a single file:

.1 A cover page and table of contents.

.2 Relevant certificates issued by authorities having jurisdiction (if applicable)

.3 Field changes of dimension and detail.

.4 Changes made by change orders.

.5 Details not on original Contract Drawings.

.6 Cable testing reports.

.7 Grounding measurements.

.8 Video system calibrations and verifications.

.9 Other Documents include but are not limited to manufacturer's certifications, inspection certifications, field test records required by individual specifications sections.

.4 As-Built Drawings Submittal:

.1 The Contractor will provide an organized compilation of as-built drawings, documents and records describing the installation of individual products or systems described in this Specification.

.2 All drawings must be produced at an appropriate scale with a sheet size no smaller than 11x17 inches.

.3 As-built drawings should include but are not limited to:

.1 Plan view, schematic, and other drawings.

.2 Rack and furniture layouts.

.3 Detailed list of equipment with serial numbers, IP and MAC addresses, passwords, etc., indexed by manufacturer, model, and part number. Update this list following Acceptance Testing if any equipment changes.

.4 Supplement product data with drawings to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.4 Submit as-built drawings as a single PDF document.

.5 Operation & Maintenance Manuals Submittal:

.1 The Contractor will provide an organized compilation of operation and maintenance information for individual products or systems described in this Specification.

.2 The operation and maintenance manual must be provided prior to the training of owner personnel.

.3 Operation and maintenance manual should include but are not limited to:

.1 Downloadable drive of equipment operation manuals, indexed by manufacturer, model, and part number. Provide link to access files online.

.2 Custom systems operation manuals are to be created by the Contractor.

.3 Equipment manufacturers maintenance procedures. Include demonstration videos, photos, and/or diagrams.

.4 Suggested maintenance schedule. Weekly, monthly, and/or annually.

.5 Spare parts lists:

- Source of spare parts for materials that are not kept at the site.
- List of spare parts that are required to be kept at the site.

.6 Suppliers for service, warranty, and replacement – name, address, and telephone number.

.7 Certification, guarantee, and warranty details for all parts and labor, including manufacturer warranty for all equipment. Highlight or summarize the duration of warranties.

.8 Recommended lifecycle replacement details for all new and owner supplied equipment.

.6 Submit operation and maintenance manual as a single PDF document if possible, or organized collection of PDF documents with master table of contents.

1.11 SUBMITTAL REVIEW:

.1 Submit PDF copies of all submittals described in this Specification to the Consultant for review and distribution to the Consultant for approval.

.2 Submission of individual or partial data will not be accepted; only complete documents will be reviewed.

.3 Allow a minimum of seven (7) business days for review of all submittals.

.4 Resubmission Requirements:

.1 Make any requested corrections or changes in submittals.

.2 Resubmit for review until no exceptions are taken.

.3 Indicate any changes that have been made other than those requested.

1.12 WARRANTY AND SERVICE

.1 The Contractor will provide a minimum one (1) year parts and one (1) year labor comprehensive installation warranty on all portions of the LEDSYS. Warranty requirements include:

.1 The Contractor must repair or replace all defects in parts, labour, or materials during the one (1) year warranty period. All repaired or replacement parts must be returned to the Owner within one (1) business day of receiving the part back from repair.

.2 The comprehensive installation warranty applies to defects in installation parts and labour only of Owner supplied equipment. Replacement of defective Owner supplied equipment is not included in the comprehensive installation warranty.

.3 During the one (1) year warranty period, the Contractor will ensure that an on-site service agent arrives at Poirier Sports and Leisure Complex not more than one (1) business day from the time their presence was requested by the Owner.

.4 During the one (1) year warranty period, the Contractor is responsible for all costs associated with covering floors and rental and delivery of lifts required to complete warranty servicing.

.5 The Contractor will provide same day telephone technical assistance with a maximum two (2) hour response time and remote access support from 8am to 5pm Pacific time, Monday to Friday, excluding statutory holidays.

.6 All requests for information and/or on-site service must have a maximum response time of two (2) hours and be processed within one (1) business day during the full term of the minimum one (1) year warranty period.

.7 This comprehensive warranty will commence upon certificate of final acceptance as determined by the Consultant or first event system use whichever is earlier.

.8 The (1) year comprehensive installation warranty does not reduce the longer-term manufacturer warranty offered by each manufacturer on its product.

.2 The Contractor will ensure all new equipment that is supplied as part of the LEDSYS includes a minimum (1) year manufacturer warranty.

.1 The Contractor is responsible for registering all manufacturer warranties as required. The manufacturer warranty will commence upon confirmation of substantial completion as determined by the Consultant and Owner or first event system use whichever is later.

.2 The Contractor will provide a comprehensive list detailing the manufacturer's warranty for each piece of equipment.

.3 There is no requirement for the Contractor to provide manufacturer warranty on Owner supplied equipment.

.3 The Contractor shall present an optional advanced Service Level Agreement, that supplements the (1) year comprehensive warranty, to provide an advanced support and service plan.

PART 2 PRODUCTS

2.01 GENERAL

.1 All equipment and materials, except Owner furnished, are new and the most recent version available and will must conform to applicable UL, ULC, CSA or ANSI provisions. Re-manufactured or "B" stock equipment is not acceptable.

.2 Refer to the attached drawings and schedules to determine design intent, locations, product quantities, and other LEDSYS information. If a discrepancy is found during the project tender or RFP phase the Proponent must ask for clarification or bid the more costly option. If a discrepancy if found following project award, the Contractor must obtain written instruction from the Consultant prior ordering or installing equipment. If instruction is not obtained it will be assumed that the more expensive options will be required.

.3 Provide all wire and cable, hardware, wall/ceiling brackets, installation/mud rings, accessories, and other parts necessary to install all products according to manufacturer specifications and in accordance with Article 1.04 - REFERENCE STANDARDS.

2.02 MANUFACTURERS

.1 Basis-of-design: all equipment listed in this Specification is part of an integrated design. Products named here form the basis-of-design for the project.

.2 Substitutions: Consultant may consider additional manufacturers having similar products to manufacturers listed as the basis-of-design during the construction period only. Alternates will only be considered if there is a clear price, delivery schedule, feature, or quality advantage.

.3 Do not use substitute products to establish bid price.

.4 Alternates and substitutions will not be accepted without the written consent of the Owner through consultation with the Consultant.

.5 Substitutions that appear as a part of the project without review and acceptance by the Owner will be rejected and replaced with one of the specified materials.

2.03 LED DISPLAY

.1 Main Video Display – Quantity (1) One SMD LED Videoboard

.1 Ideal pixel pitch: 3.7mm (3.7mm to 5.9mm pixel pitch SMD LED technology is acceptable).

.2 Minimum brightness level: 1400 nits.

.3 Ideal active area of display: 5.76 m wide x 3.24 m high

.4 Ideal resolution: 1536 pixels wide and 864 pixels high

.5 Total power load not to exceed 9,000 watts

.6 Total weight to not exceed 360 Kg

.7 Structure as required to mount display to main roof truss. Structure to have a finished integrated appearance.

.2 Custom Side and Rear Panel – Quantity (1) One (Provisional Item)

.1 Painted metal flashing trim kit on sides of display

.2 Perforated black vinyl screen fully covering the rear of the display. Logo to be printed on vinyl as supplied by owner

.3 All edges, gaps, and spaces to be fully flashed, concealing rear of display cabinets/panels

.3 No visible manufacturers logos, names, or identification shall appear on the structure, components, or displays.

.4 All LED displays in the LEDSYS will adhere to the following specifications:

.1 Only Nichia, Cree, Multicolor, Nationstar, or other industry-recognized black body SMD diodes will be accepted for the LED displays. Exact diode make and model must be specified in the response to this RFP. Provide verification from the above suppliers stating that the actual parts were individually verified in the manufacturer's factory and were observed being utilized for this specific project. This verification is one of the documents required as a basis for payment under contract obligations.

.2 The diodes for each display component must come from the same colour bin and brightness bin. The collective quantity of diodes must be procured at one time for the project with no mixing of bins or use of mixed shelf stock.

.3 Specified minimum brightness level is required at start up (100% white with automatic colour-correction "on"). LED display must maintain the minimum brightness level throughout the first 20,000 hours of use, or 48 months from the time of acceptance, whichever is longer.

.4 Individual pixels shall be calibrated for both intensity and chromaticity. System shall have the ability to adjust the intensity and colour value of individual blocks in the event of a replacement.

.5 All data transferring between display cards or modules must have bi-directional pathways or redundant data. Pathways and features must be passive and remain available even without supplied power. This eliminates data loss at the point of hardware failure. System architecture must notify the facility when redundancy has been triggered.

.6 Display's intensity is adjustable to a minimum of 256 levels including 0, 25, 75, 100%.

.7 Minimum 16,384 levels of intensity for each colour (red, blue, pure green) 14-bit processing.

.8 2,800° – 10,000° Kelvin colour temperature. Colour temperature will remain constant across specified horizontal and vertical viewing angles. Calibrate all screens to 6,500 Kelvin.

.9 Refresh rate is greater than 3,840 Hz.

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

.11 Minimum contrast ratio of 4 ,000:1.

.12 Service accessibility for all components of the display shall be from the front.

.13 Allowable Variation Pixel to Pixel:

.1 95% or more of pixels within each block must have a luminance within +/- 3% of the mean luminance for the block.

.2 The average luminance of a column or row of pixels at the edge of a block or panel must be within +/- 2% of the average luminance of the block or panel.

.3 95% or more of the pixels within each block must have a chromaticity value, within +/- 0.008 of the mean chromaticity value for the block.

.14 Allowable Variation Block to Block:

.1 100% of the blocks in a screen must have a luminance within +/- 3% of the mean luminance for the screen.

.2 100% of the adjacent blocks (i.e., blocks sharing a border) in a screen must have a luminance within +/- 2% of each other.

.3 100% of the blocks in a screen must have a chromaticity value within +/- 0.008 of the mean chromaticity value for the screen.

.4 100% of the adjacent blocks in a screen must have a chromaticity value within +/- 0.006 of each other.

.15 Installation and alignment of cabinets and modules must be uniform and tight with no visible seems. Uniformity applies to the X, Y, and Z axis. Cabinets must include alignment mechanisms that ensure precise alignment on all axis.

.16 All uniformity specifications above apply across all specified minimum horizontal and vertical viewing angles.

.17 All listed specifications must be maintained throughout the first 20,000 hours of use or 48 months from the time of acceptance, whichever is longer.

.18 Minimum of 160° horizontal viewing angle. Defined at 50% of full intensity, with automatic colour-correction “on,” at stated angle maximum.

.19 Minimum of a 140° vertical viewing angle. Defined at 50% of full intensity, with automatic colour-correction “on,” at stated angle maximum.

.5 LED DISPLAY SPARE PARTS

.1 The Contractor will include a spare parts inventory as part of the LEDSYS. This inventory must contain 3% spare lighting units, 3% spare power supplies, and a minimum of one (1) of every other critical component. All parts that, when not operating to the manufactures’ specification that prohibits the use and effectiveness of the LED screen, should be considered critical components.

.2 The quantity of spare parts is to be based on the fully delivered and installed LED screen.

.3 Provide an itemized list of all spare parts and the quantities being supplied.

.6 LED DISPLAY VIDEO PROCESSOR AND SIGNAL DISTRIBUTION

.1 The LED Display Video Processor and Signal Distribution includes all software, hardware, parts, and cable required to process and distribute video signals from the integrated video production system to the LED displays and control all LED display functionality. This includes but is not limited to scaling video processors, signal extenders, receiver cards, switcher, matrixes, distribution amplifiers, fibre cable, interconnects, patch bays, fibre cassettes, and other connectors, parts and cables as required.

.2 Video processor and sign distribution will adhere to the following specifications:

.1 Provide a minimum of one (1) main and one (1) backup unit of all critical hardware.

.2 A fully redundant backup system will be networked to the primary system. This redundant system shall be capable of immediately taking over control of the video displays in the event of the primary system failing.

.3 Video input: 3G-SDI 1080p

.4 Frame Rate: 59.94 fps

.5 Control and communication: One (1) network interface (RJ45)

.6 Output formats to LED display: Fibre optic

.7 Pass-through monitor outputs: One (1) 3G-SDI, one (1) DisplayPort, one (1) DVI

.8 Colour space conversion: 3x3 full-matrix, broadcast colour correction

.9 Input specific picture control: Gamma, brightness, contrast, saturation, hue, blending.

.10 Diagnostics data shall be available down to the level of an individual tile, rather than the receiver card level.

.11 The processor shall have the expandable capacity to support a maximum of 24 million pixels.

.12 Data transmission shall be through fibre optic cable, without the need for ethernet to fibre conversion, with 4 GB per output minimum (2M+pixels)

.13 Image processing: 22-bit minimum

.14 Colour depth at the block: 16-bit minimum

.15 The processor will be capable of performing electronic colour and intensity calibration at a block-to-block and pixel-to-pixel level.

.16 It is preferable that the display controller, receiver cards, and LED display be manufactured by the same company.

.17 The system will include bi-directional communication and provide status information on the LED displays and related components.

.3 A software-based LED graphics control system is not required for this project. Graphics, CG, and sports scoring data for the LED Display will be integrated into the video production system.

2.04 INTEGRATED VIDEO PRODUCTION SYSTEM

.1 The primary focus of the integrated video production system is to deliver a high-quality live feed to the LED Display, while simultaneously providing a high-quality livestream broadcast. It will be a native HD 1080p60 production system. All components will be High Dynamic Range (HDR) and Wide Colour Gamut capable. It will be a hybrid system that utilizes both baseband SDI and NDI based IP components.

.2 User interfaces for these systems can be accessed in the Team/Event Room, elsewhere within the facility, or remotely. Data from the sports scoring and timing system is automatically integrated with the production system.

.3 Integrated Video Production System hardware – Quantity (1) One:

.1 NewTek TriCaster TC410 Plus Integrated Video Production System

.1 3G-SDI 1080p60 production switcher with 4 SDI inputs and NDI support; four (4) ME's used to output content to the LED Display

.2 The system will support a simplified app-based interface and include a full-featured 1-strip control surface for advanced operation

.3 Production switcher will provide playback of video, key, and audio content

.4 Replay Functions to include slow motion and on-the-fly editing actions

.5 The system can be automated for events with fewer operators or simplified as required

.6 Control and content delivery of the LED Display will be integrated into the video production system

.7 The sports scoring and timing system will be integrated with the production system

.8 Simple activation of LED scoreboard graphics and scoring is available for events without video production

.2 NewTek RR2RU3RU rack rails

.3 23" Monitor, Keyboard, and mouse for TriCaster

.4 Apple iPad Pro (current generation) with articulating tablet stand

.5 NewTek LivePanel License for iPad

.6 Newtek ProTek Ultra (1 year subscription)

2.05 AV NETWORK SWITCH

.1 The primary focus of the AV Network Switch is to provide NDI (Network Device Interface) signal flows to the integrated video production system over Ethernet. NDI allows the connected

systems and devices to identify and communicate with each other, and to encode, transmit, and receive high quality, low latency, frame-accurate video and audio over IP in real time.

.2 AV network switch hardware – Quantity (1) One:

.1 Cisco C9300LM-48UXG-4Y Switch

2.06 MAIN CAMERA POSITION JBT AND CABING (PROVISIONAL ITEM)

.1 Qty (2) SDI cables and qty (2) CAT6A cables, with surface mount box at the main camera position (refer to drawings for location).

2.07 CABLE, CONNECTORS, AND SUPPLIES

.1 All cables specified are plenum rated, unless noted otherwise.

.2 Cable types listed here set a benchmark standard. Listed alternates are qualified.

.1 Video Cable

.1 RG 59

.1 Belden 1505A

.2 Mini RG-59, #23 AWG

.1 Belden 1855P

.3 HDMI Cables

.1 Kramer C-HM/HM- (length as required)

.2 Category 6A F/UTP

.1 LAN Data Network Cabling

.1 500 MHz, 23-gauge solid bare copper, aluminum foil tape, color orange.

.2 Siemon CAT 6A F/UTP 4-pair Cable Plenum

.3 Part number: #9A6P4-A5-09-R1A

.3 Cable and connector quantities are determined through design.

.4 BNC Connectors

.1 Only true 75 Ω / 3 GHz crimp type connectors with gold plated centre pin are acceptable.

.1 ADC BNC 27 (for RG 7)

.2 ADC BNC 8 (for RG 6)

.3 ADC BNC 1 (for RG 59)

.4 ADC BNC 13 (for mini-RG 59)

.2 XLR Connectors

.1 Three-pin, silver plated, male and female cable end connectors.

- Neutrik NC3FXX
- Neutrik NC3MXX

.2 Three-pin, silver plated, male and female panel mount connectors

- Neutrik NC3FD-LX-BAG
- Neutrik NC3MD-LX-BAG

.3 RJ45 Connectors Cat 6A

.1 Siemon ZPLUG #ZP1-6AS-01

.5 Various Length Permanent and Releasable Cable Ties

.1 Hellermann Tyton Product

.6 Cable Sleeves

.1 Hellermann Tyton Product 2.0 mm grey

.1 PH20X20GY

.7 Self-Adhesive, Wrap-Around Ink Printer or Laser Printer Cable Labels

.8 Hellermann Tyton TAG Series Label Markers

PART 3 EXECUTION

3.01 GENERAL

.1 The Poirier Sports and Leisure Complex construction site will be open as determined by the Owner. The Contractor will require flexibility in their installation times to accommodate the building schedule and ensure a timely installation.

.2 The Contractor must coordinate with the Owner and Consultant regarding the location of all equipment and junction box locations for equipment, control, and power cables/conduits from terminals, wall plates, and stub-ups to system equipment racks.

.3 The Contractor must obtain all required permits and licenses.

.4 All design and engineering must be reviewed by the Consultant prior to any work being undertaken by the Contractor.

.5 Installation will include the delivery, unloading, mounting to ceiling/support beams, or other structures where required, interconnecting LEDSYS wiring and components, equipment placement and adjustment, and all other work regardless of whether it is expressly detailed which is necessary to provide complete and operational systems.

.6 The Contractor must inspect all equipment for damage and accuracy prior to installation at the project site.

.7 For the purposes of coordination with Owner specified or existing furniture, the Contractor will ensure that all equipment and mounting hardware is compatible with the furniture. It will be the Contractor's responsibility to ensure they coordinate with the Consultant to ensure that sizes and supports are adequate for the LEDSYS equipment installation.

.8 During the installation, and up to the date of issuance of final acceptance, the Contractor will be under obligation to protect their finished and unfinished work against damage and loss. In the event of such damage or loss, they will replace or repair such work at no cost to the Owner.

3.02 QUALITY ASSURANCE:

.1 All work is to be performed in accordance with Article 1.04 - REFERENCE STANDARDS.

3.03 SITE CONDITIONS

.1 The Contractor must be aware of the existing site conditions and accept them as is.

.2 The Contractor must deliver all equipment to the site and convey to appropriate locations within the site as directed by the General Contractor.

3.04 DELIVERY, STORAGE, AND HANDLING

.1 Coordinate shipping and receiving with the Owner.

.2 Manpower and equipment (forklifts, etc.) must be pre-arranged to accept the product shipments at the Contractor’s expense.

.3 Limited storage is available.

.1 The Contractor may be responsible for obtaining off-site storage. Cost of off-site storage and transportation to and from the site is the responsibility of the Contractor.

.2 The Contractor must ensure all equipment is always secured and protected from ambient conditions.

.3 Equipment must only be delivered to the site when it is ready to be installed.

.4 Provide details to the receiver of any special handling requirements or if the shipment might be hazardous.

.5 The Contractor will not deliver equipment in original packaging to the site for installation. All such equipment will be unpacked and checked thoroughly in Contractor's premises. The Contractor will test such equipment as it is received to ensure that it conforms to the manufacturer’s specifications. On no account will the Owner be liable for any delays of completion of the installed system due to defective equipment being received by the Contractor.

.6 When possible, repackage and ship products to the site in their original container to prevent damage or contamination.

.7 Ship and handle packages in accordance with manufacturers’ recommendations.

.8 Provide protective coverings during construction, to prevent damage or contamination.

.9 If a product is damaged during shipping, handling, while in storage, or during construction, it is replaced at no cost to the Owner.

3.05 CLEAN UP AND REPAIR

.1 During the installation, the Contractor will be expected to maintain a clean and safe working environment.

.2 Each day upon completion of the work the Contractor will remove all their garbage, debris, and recyclables from and about the premises, and will leave the relevant areas and equipment clean and in an operational state.

.3 The Contractor will be responsible for repairing any damage caused to the premises by the Contractor's installation activities, at no cost to the Owner.

3.06 SECURITY

.1 Provide a project security program to:

.1 Protect Work, stored products, and construction equipment from theft and vandalism.

.2 Protect Owner's operations at site from theft, vandalism or damage from Contractor's work or employees

.3 Maintain security program throughout construction period, until Owner occupancy or Owner acceptance precludes the need for Contractor security.

3.07 PHYSICAL INSTALLATION

.1 All equipment shall be firmly secured in place unless the equipment has been documented to be portable in nature, either within this specification or as shown in the Construction Documents.

.2 All fastenings and supports shall be adequate to support their loads with a safety factor of five (5) times the load weight or as required by Code, whichever is greater.

.3 All boxes, equipment, and wall plates shall be secured plumb and square.

.4 In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors. If the Contractor discovers an issue with visual aesthetics, they shall inform the Consultant immediately so that all parties can coordinate and provide an adequate solution in a timely manner.

.5 To insure a proper finished appearance, the Contractor shall furnish and install trim/escutcheon components at all conditions where AV components pass through the finished walls, floors, and ceilings.

.6 The visible component of any trim shall be as small as possible preferably no wider than 13 mm. All trim components at the ceiling plane shall be finished to match the approved ACT ceiling grid system components. All trim components shall be submitted to the Consultant for review and approval prior to fabrication.

3.08 CABLE INSTALLATION

.1 Cable must be installed according to “Standard Integration Practices”, adhering to the standards set out in Article 1.4 REFERENCES, and in a manner to adhere to manufacturer’s specifications for maximum cable pulling tension, minimum bend radius, and rigging calculations and restrictions.

.2 Installing and terminating data cabling requires a high level of craftsmanship. Pulling, routing, cutting, dressing, bundling, terminating, and labeling the cable should only be done by qualified individuals.

.3 The Contractor will directly supervise any sub-contractors responsible for pulling cable through tray or conduit. Once the cable is pulled to its final location, only qualified Wiremen will be allowed to handle it.

.4 If there is a requirement for single-mode fiber cable, the fiber cable should be handled and terminated by certified (CFOT) fiber technicians only, working under the jurisdiction of the Wiremen.

.5 At no point, should the cable be stepped upon or driven over.

.6 Provide appropriate support at all horizontal-to-vertical transitions to keep the weight of the cable from degrading at the point of transition.

.7 All cables located in the ceiling areas, excluding corridors, are to be J-hooked and kept separate from data cables with crossovers at ninety (90) degrees. Protection, such as electrical conduit, is required if the cabling is within inaccessible areas or hard lid ceilings.

.8 Provide splice free wiring and cabling from origination to destination, free from joints, connections, or splices.

.9 Any cables, conductors, wires, or their respective insulating jackets that have been nicked or cut, pinched, or otherwise damaged will be rejected and replaced by the Contractor without cost to the Owner.

.10 Make joints and connections with rosin-core solder or with mechanical connectors approved by the Consultant, where spade lugs are used, crimp properly with ratchet type tool.

.11 Take precautions to prevent and guard against electromagnetic and electrostatic hum.

.12 Isolate cables and wires of different signals or different levels; and separate, organize, and route to restrict channel crosstalk or feedback oscillation in compliance with Article 1.4 REFERENCES. At a minimum, separate groups shall be formed for the following cables:

.1 Power cables

.2 Low voltage system cables

.3 Video cables

.13 Cable color coding is not required. However, if a color is chosen for a particular system (e.g., digital video, reference, etc.), it must be unique to that system and remain constant and cannot be changed to another cable color.

.14 All digital multimedia transport (HD Based T / HDBT) cabling shall be CAT6A (or better) shielded cables and terminations. Criteria required:

.1 Plenum CAT6A

.2 24.0 AWG or greater

.3 Solid center conductor

.4 Outer shielding

.5 SF/UTP or F/UTP type

.6 Terminations: shielded

.15 The Contractor must verify cable lengths and confirm the suitability of the cables listed above. Where signal loss is beyond anticipated norms, the Contractor shall coordinate with manufacturers and the Engineer to select a cable that will meet or exceed the requirements. No exceptions.

.16 Unless otherwise noted, all HDBT applications shall utilize shielded CAT6A cable and shielded connectors for 1080p. For 2k and 4k resolution applications, category cable that can verifiably pass a 100-meter HDBT test is required. If the Contractor is unsure as to the specific meaning or intent of this requirement, they should contact the consultant using the pre-bid RFI process. Cable and connectors that are not approved and installed shall be replaced at no charge to the Owner. All patch cords must be at the identical specification (or better) of the cable and connectors used for the HDBT homeruns. No exceptions!

.17 Unless otherwise noted, all analog video and computer video cables are to be terminated using seventy-five ohm (75.0 Ω) connector.

.18 Cables running in plenum areas without conduit shall be plenum rated cable; match the specified cable above. It is the responsibility of the bidder to inspect the electrical drawings and verify in what spaces plenum cable shall be used. No claims for additional monies, based on the use of plenum cable, will be allowed.

.19 All cables (except video and pulse cables which must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes without prior permission of the Consultant. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length based on the bend radius of the cable.

.20 Cover edges of cable and wire pass-through holes in chassis, housings, boxes, etc., with rubber grommets or Brady GRNY nylon grommetting.

.21 Cable management in equipment racks and junction boxes

.1 Install cable so that a radius bend of no less than ten times the cables OD is maintained.

.2 Provide 25 mm to 150 mm minimum service loop within junction boxes to enable plates to be removed from the junction box and serviced.

.3 Cable entering the top of a rack should be pulled to the base of the rack, a service loop of at least one meter added, and then rise to the termination point.

.4 When cable enters the bottom of the rack from access flooring, ensure a service loop of at least three meters is maintained under the floor.

.5 Vertical bundles of cable should be laced, tie-wrapped, or Velcroed to a vertical tie bar. Tie bars should be spaced to allow service on any individual vertical bundle. All bundles must be neatly dressed with as few crossing conductors as possible. Vertical tie bundles must not interfere with AC power strips or AC power cords.

.6 Install cable and wire neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack but still allow for service and testing. Provide horizontal support bars if cable bundles sag.

.7 Neatly bundle excess AC power cable from housing mounted equipment with plastic cable ties.

.8 Provide plastic cable ties or lacing twine to bundle cabling and wiring. Electrical tape and adhesive backed cable tie anchors are not acceptable.

.9 Install with connections completely visible and labeled.

.10 Provide termination resistors of 5% tolerance; fully visible and not concealed.

.11 Cable must be bundled using appropriate fasteners such as plastic cable ties or Velcro straps. Velcro must be used on all fiber cables and Cat 6 product. Electrical tape cannot be used to bundle cables.

.12 Use releasable cable ties during the installation process so cables can be secured, repositioned, and secured again. Replace all releasable cable ties with permanent once the cables are in final position.

.13 Cable ties will not be over tensioned. The tails of the ties are cut flush with the head enough to prevent abrasions when working in the rack. Cable ties must not be tightened to the point of damaging the cable.

.14 Cables must be installed with appropriate strain relief when making horizontal or vertical transitions. Use cable horizontal and vertical lacing bars as required. Cable tie saddles can be used only if screwed to an appropriate surface.

.15 Cable jackets must be covered with Hellerman Sleeves when appropriate.

.16 Shield / drain wires must be covered with Teflon tubing when appropriate.

.17 All crimp connections must be performed using the exact crimp die and tool specifications recommended by the manufacturer for the connector.

.18 Adhere to all manufacturer guidelines relating to the measurements of the jacket, braid, and centre conductor when stripping cable and attaching connectors.

.19 Solder connections require lead-based rosin-core solder. Use solder flux when appropriate to facilitate the weld.

.22 Any equipment mounted with, or on rack slides, sliding shelves or trays, should be cabled to allow for the equipment to be pulled forward to the end point of the sliding mechanism.

.23 Cables must be clearly and consistently labeled. Use the following guidelines for applying labels:

.1 Use self-adhesive, wrap around, no smudge, labels.

.2 Labels must be applied to the cables, so the text reads the same way consistently. Usually, the text reads into the connector.

.3 Ensure the cable is clean, dust and oil free before applying the label.

.4 Ensure hands are clean to prevent dirt transfer onto the label surface.

.5 Apply clear heat-shrink around labels that can be potentially damaged through handling and use.

.6 Handwritten labels are not acceptable.

.7 Labels must be clearly visible when the cables fan out to the equipment.

.8 Labels must be applied a consistent distance back from the end of the connector.

.9 Labels should have text that is at 2 mm high and 1.5 mm wide.

.10 Labeling schemes must be logical, consistent, and meaningful.

.11 Four copies of individual labels are printed. A label will be attached to each end of the cable after the cable is initially cut – these are the working labels. Working labels will be replaced with the remaining two after the cable is dressed – these are the finish labels.

3.09 CONNECTION PLATE RECEPTACLES

.1 Unless otherwise detailed herein, the following types of panel receptacles shall be used on all connection boxes, panels, plates, and wire ways:

.1 Audio (microphone or line level - Input only) - XLR type

.2 Audio (loudspeaker level) - Polarized locking connector. (Neutrik Speakon)

.3 Data, Serial (RS-232, 422, 485) - DB-9 or as noted on the drawings

.4 Data, LAN RJ-45

.5 Line Level Audio – RCA, ¼ inch Tip Ring Sleeve (TRS)

.6 Composite and 3G-SDI Video – BNC

.7 Coaxial & Triax: BNC

.8 CATV – RF

.9 VGA – HD15

.10 DVI-D – DVI-D or DVI-I

.11 HDMI – HDMI

.12 DisplayPort – DisplayPort, dual-mode

.13 CAT6A – RJ-45 Shielded

.14 Fiber Optics: as shown in the drawings or required by active components.

3.10 PANEL, CONNECTOR, AND EQUIPMENT INSTALLATION

.1 Install all rack-mounted equipment with Middle Atlantic Products 10-32 rack screws (Robertson drive). Screw length should be appropriate to ensure that nothing behind the rack rail is pierced.

.2 Any rear-mounted rack equipment is placed, so the equipment does not block access to the back of front-mounted equipment.

.3 Provide rack doors, security covers, and locks as required to prevent tampering with rack-mounted equipment.

.4 Blank panels should be flanged 3 mm steel finished in powder coat black, and no larger than three RU unless otherwise noted.

.5 Custom connector panels should be flanged 3 mm brushed aluminum (color black) and engraved unless otherwise noted.

.6 Power cables should be neatly wrapped using a consistent jig; cable-tied and inserted in the nearest available power outlet.

.7 Install panel-mounted connectors rigidly attached to panels, plumb and level.

.8 Install XLR type connectors in accordance with IEC-268 standard, with a wiring scheme of pin 2 hot (high), pin 3 (low), and pin 1 screen (shield).

.9 All patch panels will be wired so that signal “sources” (output from devices) appear on the upper row of a row pair, and all “loads” (inputs to devices) appear on the lower row of a row pair.

3.11 GROUNDING

.1 In order to minimize problems resulting from improper grounding, and to achieve the maximum signal-to-noise ratio, the following grounding procedures shall be adhered to:

.2 A single primary "system ground" shall be established for the systems in each particular area. All grounding conductors in that area shall connect to this primary system ground. The system ground shall be provided in the equipment rack for the area and shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors.

.3 Under no conditions shall the AC neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground.

.4 All audio cable shields shall be grounded at both ends. If a ground loop cannot be eliminated then an isolating transformer shall be utilized. For inter and intra-rack wiring this requires that the shield be connected at both ends. Chassis to rack ground shall be utilized if a ground loop can be detected either audibly or with an oscilloscope.

.5 Because of the great number of possible variations in grounding systems, it shall be the responsibility of the Contractor to follow good engineering practice, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.

.6 All connectors/terminations shall be isolated from wall plates, rack plates.

3.12 EQUIPMENT RACKS

.1 The Contractor is responsible for securing the equipment racks so they are prepared for safe operation. The equipment racks will allow for ergonomic operation, cable management, and accommodate the specified equipment.

.2 The Contractor will verify all rack layouts and dimensions with the manufacturer. It is the responsibility of the Contractor to ensure there is adequate space for all required components.

.3 Confirm all existing racks to be level and plumb.

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

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

3.13 STRUCTURAL NOTES

.1 Site-specific considerations, local best practices, British Columbia Building Code, environmental factors, and all authorities listed in Article 1.05 REFERENCES should be observed for all structural, mounting, and hanging considerations.

.2 The Contractor is responsible for confirming all base building information, and site conditions obtained by the Contractor or provided by the Owner.

.3 The Contractor will observe industry best practices and provide separation when connecting dissimilar metals.

3.14 ELECTRICAL NOTES

.1 Site-specific considerations, local best practices, environmental factors, and all authorities listed in Article 1.04 REFERENCE STANDARDS should be observed for all electrical engineering.

.2 Any additional pathways not shown on the attached drawings (conduit, cable tray, J hooks), required to provide a complete system for both power and signal/data are furnished and installed by the Contractor. Any additional raceway required will have the routing of the raceway approved by the Owner prior to installation.

.3 The Contractor is responsible for the final connection of power to all components. All secondary electrical panels, disconnects, junction boxes, and outlets must be clearly labeled. Ensure all branch power circuits are labeled at the component/receptacle and at the corresponding service panel.

.4 If any HVAC modifications are required (e.g., ductwork modifications, installation of split air conditioning systems, etc.) they must be coordinated with the Owner prior to LEDSYS installation and fall within the determined timelines for the project.

3.15 DATA NOTES

.1 The Contractor is responsible for terminating and performing the final connection of all cables.

.2 The Contractor is required to seek approvals from the Owner to connect any IT component to the Owner's networks. Approvals may not be granted, depending on the hardware and/or software specifications.

.3 The Contractor will provide licenses and site files for all software and control systems required to make the LEDSYS fully operational. Copies of all proprietary programming and software licenses will be included in the contract closeout submittals.

3.16 AESTHETIC NOTES

.1 Thoroughly label the EDSYS, including all wire, components, and parts. Also, label all storage areas and/or cabinets used for spare parts and the system manuals. All equipment and panel labels will be 1/8" engraved, block lettering on self-adhesive labels unless otherwise directed by the Owner. Printed labels on equipment will not be accepted. Ensure that all labels match the contract closeout documents.

.2 All flashing, trims, covers, panels, etc. are the responsibility of the Contractor to design, supply and install. No bolts, unfinished edges, equipment sides, and rear, or any other raw element is permitted to be within public view for any part of the LEDSYS.

.3 All metal materials must be finished (primed and coated or other approved finish). This includes but is not limited to pipes, brackets, and structural steel.

.4 The Contractor, its sub-contractors, suppliers, and vendors must not display trademarks, logos, or branding on any part of the LEDSYS that is within public view without written permission from the Owner.

3.17 INSTALLER TESTS AND ADJUSTMENTS

.1 During and immediately following the installation of all wiring and equipment installing testing must be completed.

.2 Prior to completing any testing the following must be verified:

.1 AC powered devices are properly grounded using a technical grounding scheme.

.1 Demonstrate a low-resistance path between the ground connection of the equipment racks and the main technical ground point. The DC resistance is less than 0.1 Ω.

.2 Demonstrate a high impedance path between the technical ground point and the main building ground. These systems should be in no way coupled. The DC resistance is more than 1 M Ω, or open.

.2 AC powered devices are connected to their assigned circuits, and the hot, neutral, and ground conductors are connected correctly.

.3 Heat shrink or neoprene cable (Hellermann) sleeves are installed on all sheathing breakouts.

.4 All exposed bare wire is covered with insulating tubing.

.5 Correct and consistent polarity is observed in all terminations.

.6 Cable is dressed, routed, and labeled in a neat and consistent manner.

.7 Adequate service loops are left on all cables where appropriate.

.8 Solder joints and their surroundings are cleaned and free of flux and dust.

.9 All wire fragments, cable remnants, dust, and debris are removed from the site and properly disposed of.

.3 Temperature Testing

.1 Test each rack interior for nominal operating temperature and ventilation. The temperature in each rack must be maintained below 30 °C. If the air temperature inside the racks cannot be maintained below 30 °C, install a temperature actuated quiet fan such as those available from Middle Atlantic.

.4 Certification of Cabling and Equipment after Termination

.1 After installation, and before termination, all wiring and cabling shall be checked and tested with a megohmmeter (megger) to insure there are no grounds, opens, or shorts on any conductors or shields.

.2 Sweep all video cable using a spectrum analyzer with an internal generator. Sweep all cables up to a minimum of 2.25 GHz. Provide two (2) hard copies of test results.

.3 Test UTP cable at in accordance with the referenced “Standards”. Provide test results as detailed in this Specification.

.4 Ensure all fiber optic cabling meets appropriate ANSI/TIA/EIA568-B.3 standards with an optical loss test set.

.5 Record the test results of each fiber strand and present this information using Fluke LinkWare software or similar.

.6 Ensure all fiber optic strands are within their respective optical loss budget.

.7 Using an OTDR, determine the source of any light losses that exceed the calculated loss budget for the fiber under test. Replace or repair the faulty item.

.8 Calibrate, optimize, and align all devices for proper operation. Use test patterns and test tones to align audio DAs, mixer gain stages, device inputs, and outputs.

.5 Test Equipment

.1 Thirty days prior to start of testing, provide a list to the Consultant of test equipment make, model numbers and calibration dates that will be used.

.2 Furnish the following or equivalent equipment. Equipment listed by manufacturer and model number establishes a standard of quality. Other approved equal equipment will be acceptable.

.1 Fluke DSX-5000 Cable Analyzer

.2 Fluke CertiFiber Pro Optical Loss Test Set

.3 Fluke 179 True RMS DMM with 80BK Temperature Probe

.4 Sadelco DisplayMax 5000 RF Meter

.6 Any planned on-site Manufacturer testing must be completed with the assistance of the Contractor. Members of the Contractor's workforce must be available for the date and duration of this process.

.7 The Contractor will document all testing, calibration, corrections, and repairs. Documentation will include but is not limited to:

.1 Performance date of the given procedure.

.2 Condition of the performance of the procedure.

.3 Type of procedure and description.

.4 Parameters measured and their values.

.5 Values before and after calibration and repairs as required.

.6 The names of personnel conducting the procedure.

.7 The equipment used to conduct the procedure.

.8 Upon completion of initial testing and all subsequent testing, the Contractor will provide written reports of all tests, and all other documents and drawings as required by this Specification.

3.18 SUBSTANTIAL COMPLETION

.1 After the results of the testing have been verified by the Consultant, and all deficiencies have been documented and rectified by the Contractor, the Contractor will schedule a substantial completion inspection with the Consultant.

.2 During the inspection the contractor will demonstrate the operation of the LEDSYS in full and verify that all parts of the LEDSYS meet the requirements of this Specification.

.3 During the inspection the contractor will be prepared to display test signals on the LED Videoboards including but not limited to full screen white, red, blue, and green test content.

.4 During the inspection the Contractor will give evidence that all parts of the LEDSYS meet this Specification in its entirety.

.5 Confirmation of operation will include by is not limited to proof of operation of each individual system including backups, integration, power cycles, diagnostic capabilities, and brightness, color temperature/uniformity and viewing angle of the displays.

.6 Following the inspection, the Consultant will provide a report detailing any deficiencies that must be repaired.

.7 The Owner is not responsible for any costs associated with any unsuccessful acceptance tests.

.8 The Contractor is responsible for making any necessary modifications or repairs to ensure that the LEDSYS meets this Specification.

.9 A confirmation of substantial completion will be provided by the Owner as recommended by the Consultant.

.10 Following confirmation of substantial completion and repair of all deficiencies the Contractor will provide the spare parts inventory as required in Section 2. Spare parts will be stored and secured by the Contractor as directed by the Owner.

.11 Prior to issuance of final acceptance, the LEDSYS must operate without fault for a minimum of seven consecutive days.

.12 The LEDSYS will not be considered accepted until all testing and demonstrations are complete, manuals, spare parts, and portable equipment stored and secured, and the required reports and close out documentation has been received and signed off by the Owner.

.13 The minimum one (1) year parts and one (1) year labor comprehensive installation warranty and all manufacturer warranties will commence upon confirmation of substantial completion as determined by the Consultant and Owner or first event system use whichever is later.

3.19 INSTRUCTION OF OWNER PERSONNEL

.1 Following confirmation of substantial completion and a minimum of 3 days prior to any facility events, the Contractor, at its own expense, must have completed end-user training. The training must cover the operation, maintenance, troubleshooting, and care of the system in full and according to the manufacturers' recommendations. As part of this training, Standard Operating Procedures (SOPs) will be developed and provided to the Owner.

.2 Training manuals and draft as-built documents will be provided to the Owner prior to training events.

.3 Operation training will include standard operations of all systems, including but not limited to:

.1 LED Video Display

.2 Integrated Video Production System

.3 General and preventative maintenance

.4 Start-up and shut-down procedures

.5 Use of all backup systems

.6 Shut down procedures during a power failure.

.4 These training events should be scheduled without conflict with any other training events.

.5 The Contractor will provide to the client's operation staff six (6) four-hour training sessions covering items to be determined by the Consultant prior to system completion. Training will consist of at least twenty-four (24) hours of instruction.

3.20 FINAL ACCEPTANCE

.1 Following completion of the training and delivery of all final closeout submittals a final inspection will be completed by the Consultant.

.2 The Contractor will provide any personnel, labour, materials, or other items as required to support the Consultants inspection. Personal will include at minimum the Contractors On-Site Superintendent.

.3 The contractor is responsible for ensuring all remaining deficiencies have been corrected and the LEDSYS is complete and function as required by this specification. If an additional inspection is required the Contractor will be responsible for all costs associated with the additional inspection.

.4 The LEDSYS will not be considered accepted until all testing and demonstrations are complete, manuals, spare parts, and portable equipment stored and secured, and the required reports and close out documentation has been received and signed off by the Owner.

.5 Prior to issuance of final acceptance, the AVSYS must operate without fault for a minimum of seven consecutive days.

.6 Reasonable efforts by the AV Contractor should be made to correct deficiencies identified by the AV Contractor prior to leaving the site.

.7 Following final acceptance any remaining deficiencies will be logged as warranty issues and will be corrected as per the terms in Article 1.14.

END OF SECTION 11 66 43