

AMERICAN FAMILY FIELD ADD24-1476  
Section 27 41 17 – Broadcast Cable Specifications

**PART 1 GENERAL**

1.1 SUMMARY

The disciplines included in this section are:

1. Broadcast Cabling

1.2 DESCRIPTION

1. The Contractor shall be responsible for providing all equipment as described to provide for a complete and turnkey Broadcast Cable System.
2. The Contractor shall be responsible for the provision and installation of all secondary mounting brackets for JBT and securing truck dock racks. This includes all labor, materials, equipment, tools, transportation, and project management required to complete a fully operational system(s) on the project.
3. Contractor shall grant a license to use all proprietary software provided with this RFP for the life of the system.
4. All equipment and materials shall be new (latest version at time of bid) and shall conform to applicable UL, CSA, or ANSI provisions. Re-manufactured or "B" stock equipment will not be accepted without prior written consent from the project. Evidence of unauthorized re-manufactured or "B" stock equipment on the project site will be deemed evidence of the Contractor's Failure to Perform the Work. Take care during installation to prevent scratches, dents, chips or disfiguration.

1.3 VENDOR QUALIFICATIONS

1. Vendor shall provide a list of a minimum of three (3) facilities (facility, contact name, title, address and current phone number) where the vendor has provided equipment and services of equivalent size and scope within the last five (5) years.
2. Vendor shall provide a minimum of one (1) facility (facility, contact name, title, address and current phone number) where the vendor has provided equipment and services of equivalent size and scope that is at least five (5) years old.
3. Vendor shall be required to provide a Letter of Surety from their bonding agent, stating their ability to provide a 100% payment and performance bond if they are the successful bidder.
4. Vendor shall have a direct service employee or certified contractor capable of providing maintenance response within 2 hours of a call for service via remote session and ability to be onsite in 48 hours when required.

1.4 SUBMITTAL REQUIREMENTS

1. Initial Submittals and Shop Drawings
  - a. Contractor shall be required to provide submittals and shop drawings within thirty (30) calendar days of date shown on award notice. Contractor shall be responsible to ensure that the dimensions and specifications of each component and all systems fit within the building allowances. Contractor shall advise of any discrepancy that could affect installation. If Contractor fails to notify any discrepancies, Contractor shall

assume responsibility for providing the required equipment or correcting such discrepancies at no additional cost. The following required submittals will be defined by the guidelines established and shall include but not be limited to:

- i. Digital sets of shop drawings, product data together in one cloud folder within thirty (30) calendar days of date shown on Award Notice to Contract and prior to ordering equipment.
- ii. Point-to-point wiring diagrams and typed wire lists identifying every connection. Include electronic devices such as switches, transformers and terminal blocks. Indicate locations of all components. Identify cables by types, colors and wire numbers. Complete, detailed wiring diagrams for the systems, based on the contract documents but including cable types, identification and color codes, and detailed wiring of connections, both at equipment and between equipment racks and wiring conduit, connector types, expansion loops and cable lengths. Drawings shall comply with ANSI and International Electrotechnical Commission recommendations and standards as appropriate. Provide drawing set cover sheet clearly dimensioning all cable preparation details for each cable type and connector utilized in the system.
- iii. Rack layouts indicating the proposed arrangement of mounted equipment including power junction box location and locations of conduit penetrations. Rack layouts shall include front and rear views. BTU loads for each piece of equipment should also be included on the rack layout drawing.
- iv. Detail drawings of all custom fabricated items and approved equipment modifications. Include complete parts lists, schematic diagrams, and all dimensions required for proper assembly.
- v. Proposed color selections and finishes for all exposed surfaces and custom fabricated items. Submit actual color/finish samples, wall plates, and custom labels. This includes the logo coordination and colors of the production consoles.
- vi. A list of all lower-tier subcontractors and suppliers. The list shall include lower tier subcontractor's qualifications indicating performance of similar work on past projects of this type and scope. Any subcontractor does not remove the responsibility of the engineering and project management from the prime contractor.
- vii. A project schedule in Gantt Chart format outlining equipment delivery dates and installation start and finish dates. Project schedule shall be broken down into sufficient detail (work task and duration).
- viii. Copies of all required business and contractor licenses.
- ix. Copies of proof of insurance.
- x. Approval of submitted items indicates only the acceptance of the manufacturer and quality. Specific requirements, arrangements, and quantities shall comply with the intent of the Contract Documents unless specifically approved in writing.
- xi. Submittals that are incomplete, deviate significantly from the requirements of the Contract Documents, or contain numerous errors

will be returned without review for rework and re-submittal, and may result in back charges to the Contractor.

2. Contract Closeout Submittal:

- a. When the installation is substantially complete, including the Testing Reports in Part 3 of this Section, Contractor shall submit a complete initial electronic set of contract closeout submittals for review. After review and approval of initial set, return markup to Contractor with comments for updating. Contractor shall provide final set of closeout submittals in electronic format. Closeout submittals shall include, but not be limited to:
  - i. Project Record Drawings (As-Built Drawings) including final secondary steel structural drawings, electrical drawings, and system block diagrams, rack layout drawings and wiring schedule. This shall be a digital copy as well as installed on the EIC computer.
  - ii. An Operation & Maintenance Manual. This shall be a digital copy as well as installed on the EIC computer.
  - iii. A list of all equipment provided and its location within the facility. List shall include manufacturer name, model identifier, serial number, and any other pertinent information needed to obtain service, maintenance, and/or replacement.
  - iv. A list of all Subcontractors who performed work for Contractor during installation. List shall include company name, physical company address, phone number, and contact person(s).
  - v. Copies of all software, settings and programs used in the control and operation of this system.
  - vi. Copies of all equipment registration documentation.
  - vii. Test reports from an independent testing & inspection agency certifying that bolted and/or welded connections for primary secondary structural steel meet the minimum requirements of the engineered structural drawings, the governing building code, or as required by the building official; whichever is more restrictive.
  - viii. All testing reports as specified in Section 3.8 – Testing and Acceptance.
  - ix. Test reports for all new fiber optic cables installed under this scope of work. Test reports shall indicate end to end signal loss does not exceed a maximum dB loss per Section 3.7.K and/or 3.7.L.

3. Operation & Maintenance Manual

- a. Upon substantial completion but prior to onsite training, Contractor shall provide digital copies of the Operation & Maintenance Manuals (O&M Manuals). O&M Manuals shall have folders and shall be logically organized to provide easy access to information without the need to research through the entire manual. All documents provided in the O&M Manual shall be written in English and shall provide sufficient detail as to be understood by an individual with no knowledge of audio components or the associated control equipment and/or operating systems. Contents of the O&M Manual shall include, but not be limited to:

- i. Table of Contents
- ii. Description / overview of system(s) including key features and operational procedures.
- iii. Full start up procedure for all control room rack equipment and any additional audio components written under the assumption that all equipment was in full powered off mode.
- iv. Full shutdown procedure for all control room rack equipment and any additional audio components written under the assumption that the facility is in an extended power failure situation.
- v. Owner's Manuals for all third party and/or "off the shelf" type equipment provided by Contractor; e.g., KVM's, fiber modems, network switches/routers, and UPS battery backups.
- vi. Single-line block diagrams showing all major components of the systems.
- vii. All third-party equipment and/or "off the shelf" equipment warranties and a notarized System Warranty.

## 1.5 EQUIPMENT GENERAL SPECIFICATIONS

1. All equipment and materials shall be new and the latest version at the time of bid and shall conform to applicable UL, ULC, CSA or ANSI provisions. Re-manufactured or "B" stock equipment will not be accepted without prior written consent. Evidence of unauthorized re-manufactured or "B" stock equipment on the project site will be deemed evidence of the contractor's failure to perform the work. Contractor shall take care during installation to prevent scratches, dents, chips or disfiguration of equipment and materials supplied. All damaged equipment and/or materials shall be repaired or replaced.
2. All cabling [minus equipment power] is to be labeled at each end of the cable with a description in English OR with a reference to a wire designation on a wiring diagram. These diagrams must be part of the Project documentation submitted at time of acceptance.
3. Each device shall meet all its published manufacturer's specifications. Verify performance as required.
4. Provide an uninterruptable power supply (UPS) at the bottom of each equipment rack supplied by Contractor, cable only racks are excluded from UPS requirement. UPS shall have the capability of providing power to all equipment within the rack for a period of 20 minutes in the event of a power failure at the facility.
5. Install all rack mounted equipment with Middle Atlantic Products HP Series truss head screws or approved equal.
6. Some rack-mounted equipment may require shaft locks, security covers, or removal of knobs; provide and install during Acceptance Testing.
7. Provide 2.0 mil gloss white polyester face stock; over-laminated with a 1.0 mil clear polyester film; 1.0 mil high-performance permanent pressure-sensitive adhesive. Mount labels on the equipment chassis and attach in a neat and permanent manner. Label equipment with schematic enumeration reference, and with descriptive information regarding its function or area it is serving.

8. All labels shall be 1/8" block lettering unless noted otherwise. On dark panels or pushbuttons, letters shall be white. Letters shall be black on stainless steel, brushed natural aluminum plates or light-colored pushbuttons.
9. Per IEC-268 standard, all XLR connectors not mounted on equipment shall be wired pin 2 hot (high), pin 3 low, and pin 1 screen (shield).
10. Mounting Hardware exposed to the weather shall be aluminum, brass epoxy painted galvanized steel or stainless steel. Apply corrosion inhibitor to all threaded fittings.
11. Equipment Racks shall be Middle Atlantic Products model MRK-44-36, or approved equal, with accessories as noted below (Bid form will supersede this requirement). Quantity of racks shall be as required to house all equipment supplied under this scope of work. Any unused rack mounting spaces shall have blank panels to fully enclose the rack assembly. Multiple racks shall be anchored together using appropriate ganging hardware. Standard solid rear door shall be replaced with Middle Atlantic Products model MW-LVRD-44 vented rear door.
  - a. Provide two (2) side panels per individual stand-alone rack or series of racks ganged together. The intent is to have an enclosed rack system. A single stand-alone rack would have two (2) side panels and a series of three (3) racks ganged together would also have two (2) side panels. Side panels shall be Middle Atlantic Products model SPN-44-36 or approved equal.
  - b. Provide Middle Atlantic Products model MW-4QFT-FC integrated fan top, or approved equal, for each rack. Fan shall be thermostatically controlled to ensure in-rack temperatures of less than 100 degrees Fahrenheit.
  - c. Provide two (2) Middle Atlantic Products model LT-GN-PL gooseneck work lights for each rack required for this scope of work.
  - d. Provide Middle Atlantic Products model PDT-1220C-NS, (12 Outlet Vertical Strip) or approved equal, in rack vertical power strip. Power strip shall have enough receptacles to accommodate all equipment housed in the associated rack with a minimum of two spare receptacles per rack. Power connector to be a L5-20 20A or L5-30 30A twist lock plug as required.
12. Any rear mounted rack equipment shall be placed so the equipment does not block access to the back of front mounted equipment.
13. Contractors shall exercise care when wiring racks to avoid damaging cables and equipment. Contractor shall install grommets around cut-outs and knockouts where conduit or chase nipples are not installed.
14. Power wiring and signal/data wiring shall be installed on opposite sides of the rack. Contractor may determine which side is used for power and which side for signal. Method shall be kept the same for entire installation, if multiple racks are required. Contractor shall exercise care when wiring racks to avoid damaging cables and equipment.

## 1.6 QUALITY ASSURANCE

1. All requirements of the latest published editions of the following standards shall apply, unless otherwise noted. In the event of conflict between cited or referenced standards, the more stringent shall govern.
  - a. National Electric Code (NEC)
  - b. National Electrical Manufacturers Association (NEMA)
  - c. American National Safety Institute (ANSI)
  - d. Occupational Safety and Health Administration (OSHA)
  - e. American Iron and Steel Institute (AISI)
  - f. Underwriters Laboratories (UL)
  - g. Federal Communications Commission (F.C.C.) Rules and Regulations, Part 76
  - h. Society of Cable Television Engineers (S.C.T.E.)
  - i. Society of Motion Picture and Television Engineers (S.M.P.T.E.)
  - j. American Society of Testing Materials (A.S.T.M.)
  - k. National Cable Television Association (N.C.T.A)
  - l. Electronic Industries Association (E.I.A.)
  - m. Telecommunications Industries Association (T.I.A.)
2. Review all architectural, civil, structural, mechanical, electrical, and other project documents related to this work.
3. Verify all dimensions, cable lengths and site conditions prior to starting work.
4. Coordinate the specified work with all other trades.
5. Maintain a competent supervisor and supporting technical personnel, acceptable to the Project during the entire installation. Change of supervisor during the project shall not be permitted without prior written approval from the Project.
6. Provide all items not indicated on the drawings or mentioned in the specifications that are necessary, required or appropriate for this work to realize a complete and fully operational system that performs in stable and safe manner.
7. Review project documentation and continuously make known any conflicts discovered and provide all items necessary to complete this work to the satisfaction of the Project without additional expense. In all cases where a device or item or equipment is referred to in singular number or without quantity, each such reference shall apply to as many such devices or items as are required to complete the work.
8. Provide additional support or positioning members as required for the proper installation and operation of equipment, materials and devices provided as part of this without additional cost.
9. Regularly examine all construction, and the work of others, which may affect Contractors work to ensure proper conditions exist at site for the equipment and devices before their manufacture, fabrication or installation.
10. Contractor shall be responsible for the proper fitting of the systems, equipment, materials, and devices provided as part of this work.

11. Promptly notify in writing of any difficulties that may prevent proper coordination or timely completion of this work. Failure to do so shall constitute acceptance of construction as suitable in all ways to receive this work, except for defects that may develop in the work of others after its execution.

12. After installation, submit photographs showing cable entries and terminations within equipment racks, enclosures and pedestals at the job site.

## 1.7 WARRANTY AND SERVICE

1. Contractor shall warrant labor and materials for twenty-four (24) months following the date of SUBSTANTIAL COMPLETION.

2. In the event that the contractor does not meet Substantial Completion before the first event, the contractor will be responsible for event support for all events that use the system until substantial completion is reached. The (3) required events will not start until after Substantial Completion is reached.

3. 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.

4. Contractor shall repair or replace defects that occur in labor or materials within the warranty period.

5. On-site labor shall be included during the warranty period for any work beyond simple component replacement. Simple component replacement shall be defined as all equipment that does not require tools to perform the equipment replacement.

6. 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.

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

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

9. Contractor shall supply at least one local service employee or local authorized service agent for service and repair of all equipment during the warranty period. Local service employee or local authorized service agent shall be located within 75 miles of facility.

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

11. Telephone service assistance and technical support from 8am to 11pm local time 7-days per week.

a. Answer all service calls and requests for information within one (1) hour during the warranty period.

b. The advance replacement should contain all the shipping information and packaging necessary to return the defective part or assembly back to Contractor at no cost.

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

13. 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 2-3 weeks prior to the start of the second seasons.

14. Check-up shall include all regular maintenance; including filter cleaning, a complete inspection of all systems, parts replacement where required and a complete written report of all findings.

END OF PART 1 GENERAL



**PART 2 PRODUCTS**

**2.1 BROADCAST CABLE**

See drawing for equipment, plates and cable requirements.

Base Bid is required to be bid; a vender alternate tab is provided in the bid form for use to recommend alternatives to the equipment. All vender alternates will meet the minimum specifications as the equipment in the main equipment list.

END OF PART 2 PRODUCTS

## PART 3 **EXECUTION**

### 3.1 BROADCAST CABLE

#### 1. Scope of Work

- a. The following outlines the turnkey delivery and installation responsibilities that define the project scope of work. 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:
  - i. Stadium JBT System
    - a. (27) JBT locations, this includes the removal of the old cable with the exception of the Triax, The Triax will be re-terminated with new connections of each side. Included in a new 12 RU JBT box, (12) strands of Single Mode Fiber, (3) SMPTE Fiber, (12) Pairs of audio terminated parallel Male/Female with the addition of a DT12 on the Truck Bay side and (7) New Racks for Interconnect Room.
  - ii. Truck Dock to TOC (Technical Operation Center)
    - a. (4) SMPTE Fiber, (48) Pairs of Audio
  - iii. Truck Dock to Front of House
    - a. (48) strands of Single Mode Fiber, (48) Pairs of Audio
  - iv. Provide and install all equipment listed in Part 2 – Products, including any and all equipment not specifically listed that is required to provide a completely functional system.
  - v. All equipment listed in Part 2 and bid form should be considered the base bid. All alternative equipment will be considered as long as it meets the same specs as the base system. Please provide cut sheets for any alternative equipment you are presenting.
  - vi. Decommissioning of an existing system/cables is deemed to be in this scope.
- b. Ensure that levels and impedances are properly matched between components.
- c. Provide all required permits and licenses.
- d. Provide on-site installation supervisor per Section 1.5.E.
- e. Coordinate work with other trades and coordinate scheduling with the construction supervisor to minimize delays.
- f. Deliver all Equipment to site and convey to appropriate locations within site as directed by the project.
- g. Store all Equipment in a safe and secure manner until installed, or as otherwise directed by the project.

2. Grounding and Shielding
  - a. Mount and enclose all electrical and electronic equipment in metal enclosures, pedestals or equipment racks.
  - b. Use EMT type conduit for all wiring outside of equipment racks except plenum rated wiring above a lay-in ceiling, and outdoor conduits and raceways, where separate insulated ground wiring shall be supplied.
  - c. Use flexible conduits and PVC fittings to provide insulated connections of the building's electrical raceways to equipment racks. Mount all equipment racks at the job site in a manner which provides electrical solution from the building structure and electrical raceways.
3. Wiring Practices
  - a. Where specific instructions are not given, perform all wiring in strict adherence to standard video engineering practices in accordance with the references listed in Section 1.5.
  - b. Group all wiring into the following classifications by power level or signal type:
    - i. Microphone Level
    - ii. Line Level Audio and DC Control Circuits
    - iii. Video Level
    - iv. Copper Data
    - v. Fiber Data
    - vi. AC Power Circuits
  - c. Separate wiring of differing classifications by at least six (6) inches, wherever possible. Wherever lines of differing classification must come closer together than six (6) inches, cross them perpendicular to each other.
  - d. Neatly harness wires together within racks by power level classification using horizontal and vertical wiring supports as required. Rigidly support all wires with fixed connection points. Leave service loops of sufficient lengths to allow rack hinges or slides to fully extend to facilitate access to rear panel connectors from the front of each rack. Do not use self-adhesive ty-wrap pads for support of cables unless fastened with screws.
  - e. Observe consistent polarity throughout the audio components as follows:
    - i. Use only balanced differential inputs throughout the audio system:
    - ii. Use approved transformers where directed to reduce objectionable system noise to acceptable levels.
  - f. Exercise care in wiring to avoid damaging the cables and equipment. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
  - g. Cut off unused wire ends approximately one-half inch (1/2 ") past the wire jacket. Fold them back over the jacket, and secure in place with heat-shrink tubing. In multi-conductor cables, preserve all unused conductors for future use. Failure to do so may result in replacement of cables at the Contractor's expense.

- h. Make video connections using approved mechanical connectors. All connectors shall be insulated from mounting plates or panels. Label each connection point with a unique number.
- i. Make audio connections using rosin-core solder or approved mechanical connectors. Connect microphone, control, and line level wiring through approved connectors. Mount all terminal devices on a non-conductive (electrically) rigid surface. Provide 10% spare terminals at each location. Label each terminal with a unique number.
- j. All fiber splicing shall utilize the fusion splice method. The maximum allowable loss per fusion splice shall be .05 dB.
- k. Pull mandrel one size smaller than the conduit, through entire length of all underground conduits.
- l. Cable pulling lubrication shall be utilized when pulling cable in conduits.
- m. A dynamometer shall be used to measure pulling tension during long or difficult runs. The dynamometer is to be placed between the cable puller and the pull line to monitor pulling tension. The manufacturer's pulling tension maximum range shall not be exceeded.
- n. Pulling grips suitable for use with fiber cables shall be applied to the ends of the cable. Consult cable manufacturer to determine appropriate pulling grip and method of attachment. Breakaway or fuse links shall be used at the pulling grip. Insure that the correct fuse pin is installed in the fuse link.
- o. The bend radius for all cables shall conform to manufacturer's specifications.
- p. All electrical conductors installed under this contract, except where otherwise specified, shall be soft drawn annealed stranded copper having a conductivity of not less than 98% of pure copper and shall be Anaconda, Triangle, General or approved equal for power, and Belden, Clark or Gepco for low voltage. Cable shall adhere to the following standards:
  - i. Analog Video – Black
  - ii. Digital Video – Blue
  - iii. RGB – Magenta
  - iv. Sync – Green
  - v. Data – Lite Blue
  - vi. Control – White
  - vii. Speaker – Grey
  - viii. Analog Audio – Red
  - ix. AES Audio – Red
  - x. Mic Level - Brown

#### 4. Labeling

- a. Label products in a logical, legible, and permanent manner corresponding to the Drawings. Wording, format, style, color and arrangement of text will be subject to the Contractor's approval. Submit samples and labeling schedule for approval. Labeling will be verified at final system commissioning.
- b. Label all wall plates for input, output, and control receptacles as well as connector mounting plates in all boxes using 1/8" engraved lettering filled with black or contrasting paint, as approved.
- c. Use 2.0 mil gloss white polyester face stock; over-laminated with a 1.0 mil clear polyester film; 1.0 mil high-performance permanent pressure-sensitive adhesive labels, squarely and permanently attached, to label the following:
  - i. Front of all rack mounted equipment including controls.
  - ii. Barrier strips, terminals, transformers, switches, relays and similar devices.
- d. Label pushbutton switches with lettering filled with contrasting color paint.
- e. Label all permanently installed wires on both ends with approved permanent sleeve type markers. Wrap-around adhesive labels will not be accepted unless completely covered with clear heat shrink tubing.
- f. Label all portable equipment using initials and/or words. Label all portable cables similarly with printed heat-shrinkable tags located 12 inches from the male connector end. Verify lettering through the Contractor prior to printing.

#### 5. Electrical and Data Wiring

- a. The electrical design and installation of all branch circuits by the Contractor shall comply with NEC, state and local codes.
- b. The Contractor shall provide separate single-line diagrams for each type of signal.
- c. Electrical design and engineering must be reviewed and prior to any electrical work by the Contractor.
- d. The Contractor will be responsible for power distribution from the demarcation points noted on the included electrical drawings. 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.
- e. Any additional raceway (conduit, cable tray, J hooks) required to provide a complete system for both power and signal/data shall be furnished and installed by Contractor. Any additional raceway required shall have routing of raceway approved prior to installation.
- f. The Contractor shall be responsible for termination and final connection of power to all elements. 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.

- g. Contractor shall not use wire nuts or electrical tape for any power or signal connection or any part of the work. 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.
  - h. 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.
  - i. 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 all video components 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 3.7.K and/or Section 3.7.L.
  - j. 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.
  - k. 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.
  - l. 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 video components per Contractor's diagram once diagram has been approved.
6. Aesthetic Considerations
- a. Contractor shall assume premium finishes on all elements not yet defined.
  - b. Post contract award, the Contractor must provide a comprehensive outline of intended finish details of all video equipment that is to be located in public viewing areas for approval. Failure to submit these details shall make Contractor responsible for all finishes as required at no additional cost.
  - c. The Contractor shall not visibly display its trademarks or insignia on any of the Equipment or structural elements within public view.
7. Final Adjustment and Commissioning
- a. Schedule a time to perform the Final Adjustment and Commissioning. Notify the Project at least seven (7) days in advance.
  - b. Furnish a technician who is familiar with the system to assist the Contractor during the Final Adjustment and Commissioning.
  - c. Record final settings on all equipment and submit with contract closeout documents.
8. Training
- a. The Contractor, at its own expense, will provide designated 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 provided to Owner prior to training.
  - c. The training shall cover the operation, routine maintenance and troubleshooting of the broadcast cable system.
  - d. Training shall consist of at least 8 hours of instruction.
  - e. Warranty period will commence at the Substantial Completion date.
9. Testing and Acceptance
- 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 and integration with existing systems.
  - c. Contractor must provide all necessary testing equipment for acceptance.
  - 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 official before it will deem the system "Accepted":
    - i. Three (3) consecutive problem free completed events with no equipment or system failures. The three events will be in three separate home stands as selected by the Owner.
    - ii. The Project will not be responsible for any added costs as a result of an unsuccessful acceptance test.
    - iii. Acceptance of the system includes, but not limited to, the completed installation of all physical components as well as proper system functionality. Tests of the system shall not occur until after the system has been installed, and all work completed.
  - f. Document all acceptance testing, calibration and correction procedures described herein. Include the following information:
    - i. Performance date of the given procedure.
    - ii. Condition of performance of procedure.
    - iii. Type of procedure, and description.
    - iv. Parameters measured and their values, including values measured prior to calibration or correction, as applicable.
    - v. The names of personnel conducting the procedure.
    - vi. The equipment used to conduct the procedure.
  - g. Upon completion of initial tests and adjustments, submit written report of tests to the Project along with all documents, diagrams, and recorded drawings required herein.
  - h. Final Procedures:

- i. Perform any and all "punch-list" work to correct inadequate performance or unacceptable conditions, as determined by the Project, at no additional expense.
- ii. Furnish all portable equipment to the Project along with complete inventory documentation. All portable equipment shall be presented in the original manufacturer's packing, complete with all included instructions, miscellaneous manuals, and additional documents.
- iii. Provide new acceptance testing in the same format as initial test reports.
- iv. Check, inspect, and if necessary, adjust all systems, equipment, devices and components specified, approximately thirty (30) days after the Projects acceptance.
- v. Upon completion of the Work, the Project may elect to verify test data as part of acceptance procedure. Provide personnel and equipment, at the convenience of the Project, to reasonably demonstrate system performance and to assist with such tests without additional cost.

END OF PART 3 EXECUTION