INVITATION FOR BIDS
CCK-2429=20, Project 2506.0
Improve Student Center Space 1 –
Harris Ballroom
ADDENDUM # 1
7/15/2019

ATTENTION: This is not an order. Read all instructions, terms and conditions carefully.

IMPORTANT: BID AND ADDENDUM MUST BE RECEIVED BY 07/25/2019 @ 3:00 P.M. LEXINGTON, KY TIME

Bidder must acknowledge receipt of this and any addendum as stated in the Invitation for Bids.

Please refer to and incorporate within the Offer the attached Addendum Number One from Omni Architects, pages 1 thru 65, Improve Student Center Space 1 - Harris Ballroom, pages 1 thru 65, Project #2505.0, and RFP #UK-1921-19 dated July 2019.

Also, included within the above Addendum are the Written Questions and Answers.

OFFICIAL APPROVAL
UNIVERSITY OF KENTUCKY

[Signature]

Contracting Officer / (859) 257-5409.

Typed or Printed Name
ADDENDUM NUMBER ONE

Bidders shall conform to the following changes, as same shall become binding to the Bid Documents for the purpose of bidding.

PRODUCT INFORMATION

For all of the product information listed below, Bidders are reminded that the listing of a manufacturer in this document is in no way an endorsement or approval of the manufacturer’s products, nor is it a waiver of any specified criteria. All bidders must comply with the criteria originally specified.

1. Refer to Specifications Section 096725 “Foodservice Fluid Applied Flooring”: See Part 2.1 “Manufacturers” shall read “Subject to compliance with requirements, provide products by, but not limited to the following.” Therefore, manufacturers that meet the performance requirements listed in the specification may be acceptable.

CORRECTIONS AND CLARIFICATIONS:

2. Refer to new Specifications “Special Conditions” Article 21 and Specifications 012000 “Allowances” Part 3, A: The allowance for the Simplex Grinnell fire alarm shall be $19,500.

3. Refer to Specifications Section 017419 “Construction Waste Management and Disposal”: Part 3.1, Paragraph C: Add the following: Construction waste carts used within the Student Center are to be covered during transport from the Ballroom to the dumpster locations at the loading dock in order to minimize dust and construction debris along the transportation path.

4. Refer to new Specifications Section 097713 “Stretched-Fabric Wall systems”: See attached new section 097713. This replaces section 097723 “Fabric-Wrapped Panels”.

5. General Network Cabling Clarification - ALL cabling that is routed into or out of UK ITS infrastructure (IDFs, Cable Tray, Conduits, etc.) shall be by the same, qualified installer.

6. Refer to the Electrical Specifications Section 225561 “Theatrical Lighting” - Replace section with revised version attached herein.

7. Refer to the Electrical Specifications Section 272423 “Audio Video Devices” - Replace section with revised version attached herein.

8. Refer to Drawing SD-1.3b and SD-3.0 – Fireproofing Patch/Repair at Existing Temporary Partition: See attached replacement drawings SD-1.3b and SD-3.0. Edited demo key note 7 to add requirements to patch/repair fireproofing on the roof deck where the temporary partition is removed. Refer to specification 078100 for Spray Applied Fireproofing requirements.

9. Refer to Drawing SD-1.3b and SD-3.0 – Fireproofing Key Note 30: See attached replacement drawings SD-1.3b and SD-3.0. Removed reference to fireproofing column and beam in the mechanical mezzanine. Demo key note 30 requires fireproofing the existing column as indicated on sheets SD-1.3b and SD-3.0. Existing condition photos 19, 20, and 21 were removed from sheet SD-3.0. The fireproofing for the column and beam in the mechanical mezzanine was provided under a previous project. Refer to specification 078100 for Spray Applied Fireproofing requirements.

10. Refer to Drawing A-1.1 - Elevator sizes and capacities: West elevator G: Capacity 4,500 lbs. Cab size: 5'-8” x 7'-10” East freight elevator B: Capacity: 15,000 lbs. Platform size: 10’ x 10’ (field verify actual cab size). See attached photographs of Elevator G. See attached reference photographs of elevator G, as requested in the pre-bid meeting.

11. Refer to the Drawing AV1.0 – “AV Legend and Equipment List” –
a. Revise equipment rack basis of design to Middle Atlantic WRK-44SA-27LRD
b. Revise speaker basis of design to Sound Tube HP1290I-BK
c. Revise screen basis of design to DaLite HD Progressive 1.1.

12. Refer to Drawing E-2.0: See the attached photographs of existing light fixture “EX” that are to be refurbished and installed under this contract.

13. Refer to the Electrical Drawing E4.0 “Electrical Systems Plan” -
   d. Add fire alarm speaker/strobe to plan west wall of Green Room A353.
   e. Add fire alarm speaker/strobe to plan west wall of TLT A354.
   f. Provide temporary heat detector coverage during the time construction of the project including all rough-ins (quantity 15) for the heat detectors. Coordinate work with Controls Contractor.

14. Refer to Drawing E-5.0: The following light fixture equals shall be added to the luminaire schedule:

<table>
<thead>
<tr>
<th>Type</th>
<th>MFG</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL1</td>
<td>ELITE LIGHTING</td>
<td>HH6-LED-1500L-DIM10-MVOLT-MD-40K-90 HH6-6501-CL-SCH</td>
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<tr>
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<td>DL3E</td>
<td>ELITE LIGHTING</td>
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<tr>
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<td>CORONET, INC</td>
<td>LSR6-LED-<strong>-40-LTGC-UNV-DB1%-W-</strong></td>
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<td>GT</td>
<td>Columbia</td>
<td>LJT22-40VLG-RAA12125-EDU</td>
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<tr>
<td>GTE</td>
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<td>LJT22-40VLG-RAA12125-EDU</td>
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<td>ESRN / ESR2401B</td>
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<tr>
<td>K1</td>
<td>Kenall</td>
<td>CSEDO-24-6740K-DCC-120-2F-2H-SYM-FN</td>
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<tr>
<td>K1E</td>
<td>Kenall</td>
<td>CSEDO-24-6740K-DCC-120-2F-2H-SYM-FN</td>
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<td>SK1</td>
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<td>ESRN / ESR2401B</td>
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<tr>
<td>T1</td>
<td>Times Square Lighting</td>
<td>AXI-98-30-XX-UNIV-20-TA2-BLU-XX</td>
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</tbody>
</table>

Addendum No. 1 - 2
Type | MFG | Part
--- | --- | ---
T1 | Times Square Lighting | TS-12-XX TEK11 XTSA41
TMH | Associated Controls & Design | SL LEDSPOT 300LED
TMH | Associated Controls & Design | FUZ495
TW | Associated Controls & Design | EAV259
THEATRICAL | Associated Controls & Design | RL100W-XX
THEATRICAL | Associated Controls & Design | VISION.NET.50
X1 | ELITE LIGHTING | ELX-606-R-XX-1-MIRROR
X2 | ELITE LIGHTING | ELX-606-R-XX-2-MIRROR

**Type EX** - The refurbishment of these (10) pendants will be performed by one of these three manufacturers per the specifications. Louisville Lamps, Crenshaw Lighting or Victor Illuminating, Inc.

15. **Refer to the attached plumbing drawings P2.0, P3.0 and P5.0**
   
   g. Revised grease waste design.
   h. Revised floor drains and floor sink locations.

End of Addendum #1 Refer to attachments.
<table>
<thead>
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<th>NO.</th>
<th>QUESTION</th>
<th>RESPONDER</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am writing for a clarification on just what you want for your acoustical panels/system. You have the basis of design as the Accutrack System 'Accusnap' material. This is a 'stretch fabric system' as opposed to a Fabric Wrapped Panel. I represent G&amp;S ACOUSTICS in Kentucky and would like very much to be part of your project. We offer our FABRIC WALL Stretch System, information attached, and of course our fabric wrapped panels in many configurations. Can you please clarify which acoustical product you wish to use for your project?</td>
<td>Omni</td>
<td>We will issue a clarification (revision) to the specification. As you noted, the acoustic wall system would be better suited in the “Stretched Fabric Panel” section. We will also consider opening the specification to other frame manufacturers, granted the proposed product meets the spec performance requirements. We will issue this via addendum. However, the custom Carnegie Xorel facing product will remain proprietary.</td>
</tr>
<tr>
<td>2</td>
<td>Can you provide a specification for the carpet scheduled to be replaced at end of project in A300A, A351C, etc?</td>
<td>Omni</td>
<td>Refer to finish plan sheet A-10.3b for CPT types that are referenced in specification 096813 (Tile Carpeting).</td>
</tr>
<tr>
<td>3</td>
<td>What roofing contractor do we need to contact for the roofing repairs, as the existing roof is still under warranty?</td>
<td>Omni</td>
<td>Roofing was installed by Kalkrueth Roofing under the previous project. Roof manufacturer warranty is provided by Johns Manville. A copy of the warranty was included in the specifications after specification 075216 (SBS Modified Bituminous Membrane Roofing).</td>
</tr>
<tr>
<td>4</td>
<td>Please confirm temporary fencing will not be required on this project.</td>
<td>Omni</td>
<td>Temporary fencing is not a requirement for this project.</td>
</tr>
<tr>
<td>5</td>
<td>The SBS membrane roofing specs calls for an owner engaged leak detection quality control test (EFVM). I would like to submit a quote to perform this test. Would you be the correct contact?</td>
<td>UK CPMD</td>
<td>Per specification language the owner ‘may’ elect to engage to survey the roof for potential leaks. At this time owner is not soliciting for testing. If the owner elects to pursue testing, this will be directly contracted with the owner and would be performed outside of this general contract.</td>
</tr>
</tbody>
</table>
SECTION 097713 - STRETCHED-FABRIC WALL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes site-upholstered, stretched-fabric wall systems.
B. Related Requirements:
   1. Section 061053 “Miscellaneous Rough Carpentry” for wood furring and blocking necessary to mount stretched-fabric wall systems.

1.2 DEFINITIONS
A. NRC: Noise Reduction Coefficient.
B. SAA: Sound Absorption Average.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include fabric facing, frame edge and trim, core material, and mounting indicated.
B. Shop Drawings: For each stretched-fabric system.
   1. Include plans, elevations, sections, and installation and system details.
   2. Include details at head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate frame-edge profile and core materials.
   3. Include details at cutouts and penetrations for other work.
   4. Include direction of fabric weave and pattern matching.
C. Samples for Initial Selection: For each type of fabric facing.
   1. Include Samples of accessories involving color or finish selection.
D. Samples for Verification: For the following products:
   1. Fabric: Full-width by approximately 36-inch- long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
   2. Frame System: 12-inch- square Sample(s) showing each edge profile and corner.
   3. Core Material: 12-inch- square Sample at corner.

1.4 INFORMATIONAL SUBMITTALS
A. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
B. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Electrical outlets, switches, and thermostats.
   2. Items penetrating or covered by stretched-fabric systems including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Alarms.
      e. Sprinklers.
      f. Access panels.
   3. Show operation of hinged and sliding components covered by or adjacent to stretched-fabric systems.
C. Qualification Data: For Installer.
D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance Data: For stretched-fabric systems to include in maintenance manuals. Include fabric manufacturer's written cleaning, stain-removal, restretching, and reupholstering instructions.

1.6 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fabric: For each fabric, color, and pattern installed, furnish length equal to 10 percent of amount installed, but no fewer than 10 sq. yd., full width of bolt.
2. Framing and Related Installation Items: Furnish manufacturer's full-length units equal to 5 percent of amount installed, but no fewer than five units, including unopened adhesives.

1.7 QUALITY ASSURANCE
A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
1. Build mockup of typical wall area as shown on Drawings. Include intersection of wall and ceiling, corners, and perimeters.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Comply with fabric and stretched-fabric system manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
B. Deliver materials in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 FIELD CONDITIONS
A. Environmental Limitations: Do not install stretched-fabric systems until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
B. Lighting: Do not install stretched-fabric systems until a permanent level of lighting is provided on surfaces to receive stretched-fabric systems.
C. Air-Quality Limitations: Protect stretched-fabric systems from exposure to airborne odors such as tobacco smoke, and install systems under conditions free from odor contamination of ambient air.

1.10 WARRANTY
A. Special Warranty: Manufacturer and Installer agree to repair or replace components of stretched-fabric systems that fail in performance, materials, or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   b. Fabric sagging, distorting, or releasing from panel edge.
   c. Warping of core.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS
2.1 MANUFACTURERS
A. Source Limitations: Obtain stretched-fabric wall systems specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS
A. Fire-Test-Response Characteristics: Stretched-fabric wall systems shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency on systems prepared according to ASTM E 2573. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

2.3 STRETCHED-FABRIC WALL SYSTEMS

A. UWS, Stretched-Fabric Wall System: Manufacturer's standard system consisting of facing material stretched tightly over a frame and core material and secured in the frame.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Accutrack Systems “Accusnap 2” 6PCF” or comparable product by one of the following:
   b. Acoustical Solutions, Inc.
   c. Architectural Fabric Systems, Inc.
   d. DFB Sales, Inc.
   e. Fabricmate Systems, Inc.
   f. Fabric Wall, Inc.
   g. FabriTrak Systems, Inc.
   h. Snap-Tex International LLC.
   i. SoftWalls, Inc.
   j. Whisper Walls.

2. Core: Glass-fiber board.
   a. Core-Face Layer: Manufacturer's standard impact-resistant, acoustically transparent, copolymer sheet.
   b. Nominal Core Thickness: 2 inch.

3. Frame Edge: Square profile.
   a. Nominal Frame Thickness: 2 inch.

4. Acoustical Performance: Sound absorption NRC of 1.05 according to ASTM C 423 for Type A mounting according to ASTM E 795.

5. Nominal Overall System Thickness: Match nominal frame thickness.

2.4 MATERIALS

A. Core Materials:

1. Glass-Fiber Board: ASTM C 612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

B. Frame Construction: Manufacturer's standard, continuous, extruded plastic frame (track).

C. Facing Material: Fabric from same dye lot; color and pattern as selected by Architect from manufacturer's full range.

1. FWP-1, Facing Material: Fabric from same dye lot; preselected custom color and pattern as indicated.


2.5 INSTALLATION MATERIALS

A. Installation Products: Concealed on back of system, recommended by stretched-fabric system manufacturer to support weight of system, fabric tension, and as follows:
1. Adhesives shall have a VOC content of 70 g/L or less.
2. Fasteners: Manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, materials, substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of stretched-fabric systems.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each area and establish layout of panels and joints of sizes indicated on Drawings within a given area.

B. Before installation, allow fabric to adjust and become stable in spaces where it will be installed according to stretched-fabric system manufacturer's written instructions. Acclimatize fabric for minimum of 24 hours at ambient temperature and humidity conditions indicated for spaces when occupied for their intended use.

3.3 INSTALLATION

A. Install stretched-fabric systems according to system manufacturer's written instructions.

1. Provide continuous perimeter frames of each profile indicated, designed to be inconspicuous when covered by fabric facing, with smooth edges, and with surface finish that will not telegraph through fabric facing.

2. Install framing around penetrations.

3. Tightly fit framing to adjacent construction and securely attach to substrate.

4. Install core material with full coverage, flush with face of stretched-fabric system frame.

5. Attach frame and core to substrate with adhesive or fasteners or both to support system and prevent deformation of components.

6. Install stretched-fabric systems level and plumb unless otherwise indicated, true in plane, and with fabric square to the grain.

7. Install jointed panels with butt joints or reveals as indicated.

B. Fabric Installation: Apply fabric monolithically in continuous run over area, without joints or reveals, except where panel joints or midspan frames are indicated.

1. Fabric Direction: Run fabric up the bolt.

2. Fabric Sequence: Maintain sequence of fabric drops; match and level fabric pattern and grain.

3. Fabric Alignment: Install fabric with patterns or directional weaves so pattern or weave aligns with adjacent panels.

4. Fabric Seams: Sewn seams are not permitted.

5. Stretch and secure fabric to frame edges and so frame and frame attachment method are concealed by fabric unless otherwise indicated.


3.4 INSTALLATION TOLERANCES

A. Edge Straightness: Plus or minus 1/16 inch in 48 inches.

B. Variation from Level and Plumb: Plus or minus 1/16 inch in 48 inches, noncumulative.

C. Variation of Joint Width: Not more than 1/16 inch in 48 inches from hairline or reveal line, noncumulative.

3.5 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.
SECTION 265561 – THEATRICAL LIGHTING

PART 1 - PRODUCTS

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. All materials and installation shall comply with University construction standards. These standards are available at: http://www.uky.edu/EVPFA/Facilities/CPMD/standards/div00/div00.htm. Special attention shall be given to Divisions 02, 16 and 17. In the event of a conflict between these standards and the Contract Documents the most stringent requirement shall be met.

C. The Contractor is directed to examine each and every section of these specifications, all drawings relating to the Contract Documents, any and all Addenda, etc., for work described elsewhere that may relate to the provision of the work described herein. Materials and performance requirements are specified elsewhere herein that relate to these systems.

D. Each Electrical Contractor's attention is directed to Section 260501 - General Provisions, Electrical, and all other Contract Documents as they apply to his work.

1.2 SUMMARY

A. Section Includes:
   1. Relay Panel- Existing
   2. Control console and control devices.
   3. Lighting fixtures and accessories.
   4. Distribution components.

1.3 RESPONSIBILITY AND RELATED WORK

A. The Theatrical Lighting Contractor shall be responsible for the following:
   1. Providing and installing all theatrical lighting instruments and their ancillary parts (lamps, cclamps, plugs, color frames, gobo holders, high hats, barn doors, trombones, etc.) as specified herein.
   2. Initial and Final focus of all theatrical lighting instruments indicated on drawings.
   3. Providing a trained crew of sufficient workmen to finish focus of all theatrical lighting instruments of Consultant supervised system commissioning.
   4. Providing and installing all low voltage control face panels (DMX, RFU, Network and Architectural), control electronics and dimmer modules.
   5. Providing, installing and termination of all lighting control distribution cable, which shall be done in accordance with the manufacture's specification.
   6. Providing to the Electrical Contractor for Installation all lighting connector strips, lighting floor boxes, lighting wall boxes, dimmer racks and control electronics housings.
   7. Providing to the Electrical Contractor all hangers and other hardware required for installing the lighting connector strips.
   8. Providing a factory trained technician for system commissioning, including inspection, testing, and programming for the complete project.
   9. Providing shop drawings, As-built drawings, owner training, and operation manuals.
   10. Providing accessories and minor equipment items needed for a complete system, even if not specifically mentioned herein or in the drawings, without claim for additional payment.
11. Provide and install a set of support pipes for the theatrical lighting instruments and their associated distribution devices sized to safely handle the system weight. Coordinate any and all miscellaneous steel required with the project Structural Engineer.

12. Assuming responsibility for all engineering of systems described therein, including modification of and addition to any details as required in order to fulfill the design modification of and addition to any details as required in order to fulfill the design intent of the theatrical lighting system contract documents.

13. Furnish sufficient workmen to operate all equipment and to assist in all test specified below. Provide ladders and other devices, including 4 walkie-talkies, to allow access to all devices to be tested and communication between parties.

B. The Contractor shall be responsible for the following:

1. Providing, installing, and terminating all 120V distribution circuits and all 120/280V feeder circuits for the theatrical lighting system.

2. Terminating all 120V distribution circuits onto the lighting dimmers.

3. Termination of power distribution cable, which shall be done in accordance with the electrical engineer’s specification.

4. Providing and installing all low voltage control cabling.

5. Provision and installation of all conduit, junction boxes, electrical wireways, and cable trays required for the lighting and control distribution systems.

6. Pulling all line-voltage and low voltage cable in conduit.

7. Installation of lighting connector strips, which are provided by the Theatrical Lighting Contractor.

8. Clean all racks, panels, and boxes of dirt, dust and debris, re-assemble all equipment, and replace all panels, covers and screws prior to time of Completion Checkout.

9. Electrical Contractor is responsible for supplying electricians, as required, to turn on power to the system during first system energization, and if issues are found, correcting them before the system is re-energized.

10. All rigging and Unistrut/threaded rod to support the fixtures. All fixtures shall be rigidly mounted and free of all sway.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For stage lighting. Show fabrication and installation details for relay panels, including arrangements, characteristics, and circuit assignments of various modules. Include elevation views of front panels indicating devices and controls. Include illustrations and dimensioned outline drawings.

1. Wiring Diagrams: For power, signal, and control wiring. Show connections and circuit and channel assignments.

2. Equipment Legend: Show a unified system of designations for lighting instruments, panels, dimmers, circuits, and equipment.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around dimming equipment where piping and ducts are prohibited. Show rack layout and relationships between components and adjacent structural and mechanical elements.

B. Qualification Data: For qualified Installer.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For fixtures, distribution components, software operating manuals, instructional videotapes, and controls to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Control-Console Introduction:
   a. Descriptions of controls and features.
   b. Software instruction manuals.
   c. Setup requirements for unit and related equipment.
   d. Default settings.
   e. Maintenance procedures and schedules.

2. Control-Console Operation:
   a. Elementary on-off operation.
   b. How to set cues manually.
   c. How to patch dimmer to channels electronically.
   d. How to operate two-scene presets manually.
   e. How to operate fundamental memory.
   f. How to set and record simple cues.
   g. How to recall, play back, and revise cues and scenes.
   h. How to use submasters, and how to split cues, store and recall programs, set up special effects, and print out cues.
   i. How to set up and run system for a typical event or performance.
   j. How to get help.

3. Relay Panels:
   a. Descriptions of features, functions, and safety and security precautions.
   b. Descriptions of dimmer module features, dipswitches, non-dim functions, and racking systems.
   c. How to check loads against dimmer capacity ratings.
   d. How to set basic power-in and power-out connections.
   e. Basic maintenance requirements, including need for qualified electrician for internal maintenance; basic maintenance schedule; techniques for keeping terminals properly tightened, filter screens clean, and overheat sensors checked; and techniques for performing other required servicing.
   f. How to adjust control cards.
   g. How to get help.
   h. Description of warranty.

4. System Troubleshooting: Procedures for handling problems with common software, programming, control console, dimmer rack, and distribution system; include information on how to get help.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list if applicable.
4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Dimmer Modules: Five (5) of each type and rating installed.
2. Fuses: Three of each kind.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NECA 1.

D. Comply with NFPA 70.

1.9 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for five (5) years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within five (5) years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 45 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.10 WARRANTIES

A. The equipment items shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

B. All luminaries, equipment, finishes, and all of its component parts, and controls shall have an unconditional five (5) year warranty. Warranty shall include all light fixtures, lamps, drivers, poles, controllers, equipment, finishes and all components to be free from defects in materials and workmanship for a period of five (5) years from date of Owner’s acceptance. Replacement of luminaries, equipment, faulty materials and the cost of labor to make the replacement shall be the responsibility of the Contractor.

C. The Warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to, and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

D. LED drivers: The warranty period shall not be less than ten (10) years from the date of substantial completion. The warranty shall state the malfunctioning LED driver shall be exchanged by the manufacturer and promptly shipped to the Owner. The replacement LED driver shall be identical to, or an improvement upon, the original design of the malfunctioning LED driver.

1.11 SYSTEM COMMISSIONING

A. Section 019113 requires the engagement of a Commissioning Authority to document the completion of the Mechanical, Fire Protection, Plumbing, Electrical, Electronic Safety and Security, and associated Control Systems for the project. Section 019113 defines the roles and responsibilities of each member of the commissioning team.

B. Comply with the requirements of Section 019113 for the commissioning of the various building systems.

PART 2 - PRODUCTS
2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or within specifications herein or comparable product by one of the following:

1. Altman Lighting Co. Inc.
2. Electronic Theatre Controls.
3. Strand Lighting.
4. Martin
5. Vari-Lite

2.2 MATERIALS AND EQUIPMENT REQUIREMENTS

A. The Contractor shall be an authorized distributor of equipment and shall maintain a service department, stock sufficient replacement parts and equipment, and be authorized to provide warranty and maintenance services.

2.3 PLUG CONNECTORS

A. Pin Type: USITT S3, two-pole, three-wire, 20-A.

B. Twist-Locking Type: NEMA WD 6, two-pole, three-wire, 20-A.

2.4 LIGHTING FIXTURES AND ACCESSORIES

A. Overview.

1. The luminaire shall be a motorized color mixing luminaire employing a fixed white LED engine.

2. The luminaire shall be one of a family comprising a Profile, Spot, and Wash luminaire utilizing an interchangeable common LED Engine, and common system components.

3. The luminaire shall conform to UL 1573 stage and studio use as well as UL 8750 LED standards and tested via ETL to conform to the aforementioned UL specifications. The luminaire shall hold ETL, CE, FCC, CSA and ISO 9001 markings.

4. The luminaire shall conform to USITT DMX-512A (RDM) protocol standards.

5. The luminaire shall employ one (1) LED light source engine that will not emit light in the ultra-violet (wavelengths less than 380nm for UV-A, B, or C) or the Infrared spectrum (wavelengths of more than 800 nm). Units that emit light within this spectrum shall not be accepted.

6. The luminaire shall have an integrated control system that provides local controls offering access to set up parameters, reset functions, calibration functions, pre-programmed chase, and status reporting.

7. The luminaire shall have an output of up to 22000 lumens.

8. The luminaire shall achieve an output CRI of 81 and CCT of 7200.

9. The luminaire shall have control inputs for:

   i DMX512 (RDM) input/output connectivity via a 5 Pin DMX connector

   ii DMX512 input connectivity over Ethernet via a RJ45 connector
All control and power input and output sockets shall be located on the opposite side of the control panel to aid in cable management. There shall be no on/off switch.

B.) Physical

1.) The construction of the luminaire shall be sheet metal with molded engineering grade plastic in a matt black finish. Each top and bottom luminaire cover shall be secured in place by two quick release screws and secured to the luminaire by a safety cable.

2.) The luminaire shall not exceed 18.30 inches [465 mm] in height, 27.75 inches [705 mm] in length and 11.81 inches [300 mm] in width.

3.) The luminaire shall weigh no more than 66.58 lbs. [30.2 kg].

4.) The luminaire shall provide mounting capabilities from a pair of quick connect rails to which approved mounting devices can be attached. It shall be possible to remove the quick connect rails without the use of tools. The luminaire shall have four feet constructed from densely molded rubber for floor mounting.

5.) The luminaire shall be provided with a robust carrying grip on each side of the yoke assembly above the central pivot point. The grips shall be made of molded engineering plastic and shall be smooth and free of any burrs or other manufacturing remnants. The grips shall be securely mechanically fastened to the yoke assembly using fasteners appropriately rated for the carrying load. The grips shall be fashioned in a manner to allow easy, stress-free manual handling of the luminaire without causing injury.

6.) A safety cable lug attachment point shall be located on the base of the luminaire allowing for an appropriately load-rated steel wire rope safety bond to be secured to the base of the luminaire without impacting on the mounting rails or affecting the method of suspension in any way.

7.) The luminaire shall be rated IP20

C.) Mechanical Data.

1.) A variable speed fan shall be used to provide forced-air cooling for internal components.

2.) A full color LCD menu system shall provide essential system information and operational controls. The LCD display shall automatically orient the display according to the orientation of the unit, thus ensuring the menu is readable in various configurations.

3.) The finish shall be black.

4.) The luminaire shall be supplied with a limited two-year warranty when used in normal applications.

5.) The luminaire shall have a motorized pan and tilt system comprising a pair of two phase stepper motors. The luminaire shall have a normal pan range of 540 degrees, a tilt range of 270 degrees, and 0.014-degree resolution per step.

6.) The speed of the pan and tilt movements shall be no less than 3.4 and 2.5 seconds respectively.
7.) The luminaire shall have a mechanical pan and tilt lock. It shall be possible to lock the pan in four (4) different positions. It shall be possible to lock the tilt in nine (9) different positions.

8.) The luminaire shall have a motorized zoom system. The beam angle range shall be from twelve (12) to sixty-three (63) degrees. It shall be possible to focus the beam to a hard edge throughout the total beam angle range.

9.) The luminaire shall have a color mixing system comprising of Cyan, Magenta and Yellow coated dichroic glass flags.

10.) The luminaire shall have a separate color wheel consisting of seven (7) colors + open. It shall be possible to select a color wheel position between two (2) colors to create a split color effect.

11.) The luminaire shall have a separate variable CTO flag from 7200K to 2700K. It shall be possible to operate this independently of the color mixing system and color wheel.

12.) The luminaire shall have an electronic strobe system that operates independently to the full field dimming system.

13.) There shall be separate timing control parameters for the beam shaping system, pan and tilt movement, color mixing system and optical lenses.

14.) The luminaire shall have a separate control channel parameter. Using the control parameter, it shall be possible to individually reset the color system, pan and tilt, framing shutter system, beam softening and optical lenses. It shall be possible to fully recalibrate the luminaire from the control parameter, shutdown the luminaire, turn the luminaire display off and on, reboot the luminaire, and enable the luminaire display to show operational status information. There shall be a standard maximum output mode and an optional studio reduced output mode with variable level control to achieve quieter fan settings.

D.) Electrical.

1.) Supply Voltage shall be 120 to 240V, 50/60Hz. (+/- 10% auto-ranging).

2.) The luminaire current draw shall not exceed 820 watts.

3.) The power input and thru connectors shall be the Neutrik PowerCON True1 to ensure safe power disconnection while under load. A power input connector shall be supplied with the luminaire.

4.) The light source shall consist of one (1) five-hundred and fifty (550) watt fixed white LED engine with a Color Temperature of 7200K.
   a) It shall be possible to adjust the refresh frequency of the LED Engine.
   b) It shall be possible to adjust the Gamma correction of the LED Engine.
   c) The LED Engine shall be common to the Spot and Profile luminaires in the same family.
   d) The LED Engine shall have an elapsed LM70 time of at least 20,000 hrs duration with a drive current of 2.2A.

E.) Environmental.
1.) Maximum operating ambient temperature shall not exceed 113 degrees Fahrenheit (45 degrees Celsius)

2.) A variable speed cooling system shall be employed to maintain the optimal operating temperature of the luminaire.

3.) The luminaire shall be low maintenance and environmentally friendly, all units shall be mercury free.

F.) Operation.

1.) The luminaire shall have control inputs for:
   a) DMX512 with input/output via a DMX 5 Pin Male and Female connector
   b) DMX512 with input/output connectivity over Ethernet via a RJ45 connector

2.) The luminaire shall include an onboard LCD display and control of the following:
   i. Menu settings:
   ii. Address (DMX addressing)
   iii. Configure (Signal input settings, Artnet settings, DMX universe settings, LED engine settings, Luminaire motor settings, Display settings, Default reset)
   iv. Fixture (Status, Recalibrate, Reboot, Software version, Elapsed hours, Software crossload, Service settings)
   v. DMX (Input values, Pan/Tilt settings, DMX mode options)
   vi. Manual (Manual control of luminaire)
   vii. Test (Test settings)

3.) The luminaire shall include one (1) Fixed White LED engine delivering full field dimming - allowing for both smooth timed fades and fast blackouts.
   i. The LED engine used in the luminaire shall be high brightness and proven quality from established and reputable LED manufacturers.
   ii. There shall be a standard maximum output mode and an optional studio reduced output mode with quieter fan settings.

G.) Dimming.

1.) The luminaire shall use 16-bit nonlinear scaling techniques for high-resolution dimming.
   a. Four (4) dimming curves shall be selectable via the Programming Control parameter.
   b. The luminaire shall be digitally driven using high-speed pulse width modulations (PWM) in concert with power factor control (PFC) to ensure a smooth flicker free dimming curve from 100 to 0 % and shall be imperceptible to video cameras and video related devices.
G.) Accessories.

Provide the following additional accessories with each unit:

1) 1 x Power Lead PowerCon True1 to local power connector

2) Appropriately rated industry-standard suspension clamps

3) Operation Manual.

2.5 DISTRIBUTION COMPONENTS

A. Connector Strip: Listed and labeled by an NRTL; factory-wired wireway and receptacle assembly.
   1. Wireway: Steel or extruded aluminum, with removable cover and nominal cross-section dimensions of 3 by 4-1/2 inches.
   2. Accessories: Cable clamps, support cradles, and cable strain relief grips for each cable.
   3. Receptacles: Pigtail mounted, 18 inches long, with strain relief at wireway wall penetration.
   4. Receptacles: Flush mounted in wireway cover.
   5. Receptacle Wiring: For connecting to terminal blocks; with 125 deg C, crosslinked, PE-insulated, identification-labeled wire.
   6. Terminal Blocks: Molded-barrier type with screw lugs to suit supply conductors.
   7. Mounting Hardware: Furnished with each unit; permits surface, single-pipe-bracket, or doublepipe-bracket mounting.
   8. Finish: Semigloss or matte black.

B. Plug-in Boxes: Listed and labeled by an NRTL; factory-wired wireway and receptacle assembly, 24 inches long unless otherwise indicated; with the following features:
   1. Wireway: Steel or extruded aluminum, with removable cover and nominal cross-section dimensions of 3 by 4-1/2 inches.
   2. Accessories: Cable clamps, support cradles, and cable strain relief grips for each cable.
   3. Receptacles: Pigtail mounted, 18 inches long, with strain relief at wireway wall penetration.
   4. Receptacles: Flush mounted in wireway cover.
   5. Receptacle Wiring: For connecting to terminal blocks; with 125 deg C, crosslinked, PE-insulated, identification-labeled wire.
   6. Terminal Blocks: Molded-barrier type with screw lugs to suit supply conductors.
   7. Surface or Grid Mounting: With accessories for surface mounting or with pipe-mounting accessory bracket.
   8. Recessed Mounting: With flanged cover suitable for recessed mounting in wall.
   9. Finish: Semigloss or matte black.

C. Gridiron Junction Boxes: Listed and labeled by an NRTL; factory wired with terminal strips and concentric knockouts on all sides.
   1. Terminal Blocks: Molded-barrier type with screw lugs to suit supply conductors.
   2. Accessories: Cable clamps, support cradles, and cable strain relief grips for each cable, and brackets for surface or pipe mounting.
   3. Finish: Semigloss or matte black.

D. Floor Pockets: Listed and labeled by an NRTL; flush-mounted, receptacle outlet assembly.
   1. Box: 0.0598-inch steel sheet, 10 inches deep.
2. Cover Plate: Steel, cast iron, or cast aluminum with nonskid safety tread surface and self-closing, hinged door with cable notches.
3. Barrier for allowing installation of low-voltage control receptacle for console input or handheld remotes.

2.6 WIRE AND CABLE

A. Building Wire in Raceways: Comply with requirements specified in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Portable Power Cable: Listed and labeled by an NRTL; flexible stage and lighting power cable; Type SC, SCE, or SCT; 600 V; multiconductor; 60 deg C temperature rating.

C. Ethernet Cabling: Comply with requirements specified in Division 26 Section "Control-Voltage Electrical Power Cables."
   1. For 10/100BaseT, comply with provisions for UTP cable and hardware.
   2. For 10Base-FL, comply with provisions for 62.5-/125-micrometer, multimode, optical-fiber cable and hardware.

D. ANSI E1.11 (USITT DMX512-A) Control Cabling: Comply with requirements specified in Division 26 Section "Control-Voltage Electrical Power Cables."
   1. Standard Cable: NFPA 70, Type CM or Type CMG.
      a. Paired, low-capacitance computer cable for ANSI E1.11 (USITT DMX512-A) applications. Two pairs, twisted, #22 AWG, stranded, tinned-copper conductors. b. PE insulation.
      c. Inner Shield: 100 percent coverage, aluminum foil-polyester tape.
      d. Outer Shield: 90 percent coverage, tinned-copper braid.
      e. Outer Shield Drain Wire: Stranded, tinned copper.
      f. PVC jacket.
      g. Flame Resistance: Comply with UL 1581.
   2. Plenum-Rated Cable: NFPA 70, Type CMP.
      a. Paired, low-capacitance computer cable for ANSI E1.11 (USITT DMX512-A) applications. Two pairs, twisted, #22 AWG, stranded, tinned-copper conductors.
      b. Insulation: Foam fluoridated ethylene propylene.
      c. Inner Shield: 100 percent coverage, aluminum foil-polyester tape.
      d. Outer Shield: 90 percent coverage, tinned-copper braid.
      e. Outer Shield Drain Wire: Stranded, tinned copper.
      f. Low-smoke PVC jacket.
      g. Flame Resistance: Comply with NFPA 262.

E. Low-Voltage Control Cabling: 1. Control-Cable Conductors:
   a. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway; complying with UL 83.
   b. Class 1 Control Circuits: Stranded copper, Type THHN, in raceway; complying with UL 44.
   c. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway; complying with UL 83.
   d. Class 2 Control Circuits: Stranded copper, Type THHN, in raceway; complying with UL 44.
   e. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF; complying with UL 83.
   2. Paired Cable: NFPA 70, Type CMG.
2.7 Relay Panel – for reference only, panel is existing.

A.) Overview.

1.) The lighting control panel shall be fully digital, designed specifically for architectural and entertainment lighting control applications, and shall consist of 12, 24, 36 or 48 relays per panel. A secondary "slave" panel in each size will be available. Contact Lighting Control Panel systems shall be ETL and cETL listed.

2.) Panel setup and preset data shall, as standard, be fully user programmable on a per panel or system wide basis.

3.) Panels shall be available that support individual power feeds from standard circuit breaker panels or with integral breakers and 3 phase main lug only inputs.

B.) Mechanical.

1.) The relay panel shall be a wall-mount, dead-front switchboard, substantially framed and enclosed with 16-gauge, formed steel panels. All panel components shall be properly treated, primed and finished in fine texture, scratch resistant, silver powder coat paint.

2.) The dimensions of the relay panels shall be as follows:

   a.) 12 Relay panel: 4 inches deep, 21 inches high and 15.8 inches wide.

   b.) 24 Relay panel: 4 inches deep, 21.9 inches high and 23.5 inches wide.

   c.) 36 Relay panel: 4 inches deep, 34.8 inches high and 23.5 inches wide.
d.) 48 Relay panel: 4 inches deep, 34.8 inches high and 23.5 inches wide.

e.) Slave panels shall be the same size as panels with processors.

3.) Contact Relay panels shall be available to ship as a complete assembly or in two parts consisting of a wall mount enclosure and a relay panel insert with all electrical and electronic components preassembled.

C.) Installation.

1.) A wall mount enclosure shall be available to ship separately to permit wall mounting and conduit stub in. The relay sub panel shall be factory pre-wired and dressed. The contractor shall provide and terminate all feed, load and control wiring on screw terminals fitted within the panel.

2.) Cable entry for all panels shall be on the top of the panel. Knockouts shall also be available on the sides of the panel to simplify wiring.

3.) All terminations and internal wiring shall be accessible via a removable front cover panel. The Processor Module shall be accessible for programming at all times.

D.) Electrical.

1.) The power efficiency of the relay panel shall be greater than 95% at full load.

2.) The panels shall be suitable for 50/60hz supplies and will accept power feeds from 120, 230 and 277 volt power supplies with the installation of a panel barrier included with each panel. A 347 volt power supply shall be available for Canada.

3.) The relay panel shall have an internal power supply to support up to (16) 24vdc architectural control stations. A supplementary Power Supply shall also be available.

4.) A "Panic" facility shall close selected relays if the Processor Module is removed or fails. Relays are selected from the panel processor. It shall also be possible to select "Panic" as follows:

   a.) The panel processor on the front of the panel selects "Panic" and "Normal" operation.

   b.) Remote maintained contact closure for Fire Alarm interface.

   c.) Two remote momentary contact closures for "Panic" and "Normal" respectively.

5.) The system ground shall be made at a grounding lug in the panel.

6.) The panel shall have a 14,000 AIC fault current rating at 277 volts.

7.) The panel shall be a NEMA 1 enclosure and shall be ETL and cETL listed.

8.) The panel shall be suitable for surface or recess mounting.

9.) As an option the panel may be equipped for UL 924 emergency lighting applications.

E.) Panel Electronics, Physical.

1.) The main panel control electronics shall be housed in one Panel Processor Module (RPM). The panel control electronics shall be completely digital without employing any digital to analog demultiplexing schemes.
2.) All panel setup and preset data shall be stored in a non-volatile manner and may be transferred to a replacement Panel Processor Module without losing data.

3.) Each Panel Processor Module shall have a back-lit LCD display with a keypad for panel setup, preset control, testing, panel status, error and diagnostics.

4.) LEDs shall indicate "DMX512 Port A", "DMX512 Port B" (ShowNet), Vision.net control and Power.

5.) The Panel Processor Module shall be permanently mounted inside the panel. The RPM shall provide all necessary low voltage signal connections. The RPM shall provide the only point for contractor connection of signal cables and PANIC activation. The contractor connections shall be made with two-part plug in screw terminals (dedicated connector per input) for ease of installation.

6.) All DMX512 & RS485 communication ports and remote contact input connections shall be optically isolated from all processor electronics by a minimum of 2,500V RMS isolation.

7.) The Panel Processor shall have the provision to select any of the relay or outputs to be activated by the PANIC function. The PANIC function shall be activated or de-activated by one or more local or remote contact closures.

F.) Panel Electronics, Control And Communications.

1.) The control electronics shall provide the following control and communication inputs as standard:
   a.) One optically isolated DMX512 control input.
   b.) An RS485 control input for Vision.net architectural control. Vision.net is a control system comprised of architectural style panels for recording and playback of presets in individual assigned "rooms".
   c.) There shall be two programmable panic inputs.
   d.) One RS232 Serial programming port for remote programming using PC based configuration software.

2.) The system shall support an optional ShowNet Ethernet input to provide an additional input plus processor status monitoring and configuration.

G.) Panel Electronics, Features.

1.) The panel electronics shall provide two levels of operator interface:
   a.) A local standard interface that includes 6 menu keys and a bitmapped backlit LCD display to access standard system menus.
   b.) Remote configuration via personal computer using RS232 or ShowNet Ethernet data links.

2.) The processor control electronics shall have an update rate better than 16 ms (60 Hz) or 20 ms (50 Hz).

3.) The panel processor shall include a programmable astronomical time clock to permit programmed relay closures with a schedule of 128 events that may be programmed for days of the week, specific dates and
offsets from sunrise or sunset. The system shall also support daylight savings time adjustments for all countries.

4.) The RPM shall also have the capability to support single and double pole relays that may be mixed throughout the panel.

5.) As a standard, Contact panel status reporting shall report the following conditions/data:
   a.) Processor active.
   b.) DMX512 Port A input fail.

6.) The control electronics shall provide the following setup functions that shall be user programmable on a per panel or system wide basis:
   a.) DMX512 Port A patch.
   b.) ShowNet DMX512 patch.
   c.) Architectural patch for Vision.net control systems.
   d.) Record Vision.net presets for load pattern switching.
   e.) Occupancy sensor and photocell control inputs.
   f.) Clock events.
   g.) Set control input priority logic.

7.) The DMX512 Port A and ShowNet patching shall support a panel start address and individual relay patch. The architectural patch shall define the panel circuit/room/room channel relationship for Vision.net control systems.

8.) The control electronics shall provide a facility to disable the output of any individual relay by switching the relay off.

9.) The processor shall provide an architectural Vision.net control system preset capability of 8 presets for each of up to 256 separate rooms.

10.) It shall be possible to load new panel operating software via the Ethernet connection to the relay panel. There shall be no requirement to turn power to the panel off during the loading of panel software. It shall be possible to load new panel operating software into the processor, regardless of the state of the program storage.

H.) Mechanical.

1.) Relays shall be snap in factory wired units in single or double pole configurations.

2.) All relays shall be designed for repeat operation with mechanically operated contacts.

3.) Relays may be operated locally with a manual over-ride.

I.) Electrical.
1. Power connections shall be made on compression screw terminals. Control signal connections shall be made via plug-in connectors at each module chassis.

2. Load connections shall be via compression screw terminals on a terminal block.

3. Relays shall be rated for 120/230/277/347 volts.
   a. All relays shall be capable of continuous operation at full rated load. They shall be rated for tungsten, LED, cold cathode and HID loads.
   b. Each assigned relay shall have a programmable switching threshold between 1 and 99%.
   c. All relays shall have a local control switch to turn the relay on for testing and diagnostic purposes.

4. Relays shall be UL, ETL and cUL, cETL recognized.

J.) Accessories.

1. To supplement the internal Power Supply, a supplemental Power Supply shall be available to support up to 20 additional architectural control stations, and shall be supplied complete with an enclosure for wall mounting in the dimmer/distribution room. It shall be suitable for 90 - 277 volts ac 60 or 50 Hz supplies. A 347 volt supply shall also be available.

K.) Standards.

1. The relay panel assembly shall be ETL and cETL listed.

M.) Environmental Specification.

1. Ambient temperature extremes: 15 - 140 degrees Fahrenheit (-10 - 60 degrees Celsius).
2. Recommended ambient temperature: 64 - 77 degrees Fahrenheit (18 - 25 degrees Celsius).
3. Relative humidity: 10 - 90% non-condensing.
4. General conditions: Office level cleanliness. Interior use only

LIGHTING CONTROL SYSTEM

A. Description: Microprocessor-based modular system consisting of relays operated from remote-control stations and a control console.
   1. Comply with UL 508.
   2. Comply with USITT AMX192, ANSI E1.11, (USITT DMX512-A) for data transmission.

B. Control System: Microprocessor-based control system, ANSI E1.11 (USITT DMX512-A) protocol, with a nonvolatile system memory to adjust dimmer channel settings for different scenes, to patch dimmers to channels, and to manually or automatically change dimmer settings from one preset scene to another.
   1. Control shall support Ethernet-based LAN at every control device.
   2. Provide means to create and monitor show data on a PC using software by console manufacturer. Software shall be capable of the following:
      a. Creating show and providing for use of USITT show files.
b. Playing back show in a console-simulation mode.
c. Accessing all remote-control stations associated with the console and control system.
d. Providing standard Ethernet connection between the console control system and the PC.
e. Integrating with Lutron house lighting control system, including all required components and programming.

3. Display the following system status information on a color, 17-inch LCD monitor associated with the control console:
   a. Current channel intensities.
   b. Cue information.
   c. Monitor.

4. Moving Lights: Include a standard control library, a program patch specific to fixture(s) provided, and selective programming with ANSI E1-11 (USITT DMX512-A) addressing of fade, focus points, beam, image, color, and position.

C. Control Console: Tabletop unit with manual and computer-based programming controls, memory units, indicating devices, and the following features:
   1. Servicing access through hinged top panel.
   2. Grand-master level control.
   4. 12 submaster level controls with overlapping pile-on performance.
   5. 24 submaster level controls with overlapping pile-on performance.
   6. Bump buttons for momentary control of channels or submasters, one for each submaster level control.
   7. Two cross-fade controls for split dipless fade between scenes, each with its own fade progress indicator.
   8. One set of scene level controls for each scene when used in two-scene preset mode. Second set of scene level controls to allow setting levels into memory for expanded single scenes when used in multiple single-channel scene mode. Each set shall have same quantity of scene level controls as is used for submaster level controls.
   9. Multibutton keypad for programming in multiscene memory mode.
   10. Fade time control for assigning fade time to cues, with individual cue adjustment from one second to five minutes, minimum.
   11. Light-emitting diode with associated display controls, for displaying operating menus and memory readout.
   12. Controls for setting levels into memory.
   13. Cord and connector for connecting console to outlets for console power and control.

D. System Operation: Selectable between multichannel two-scene preset and four-channel single-scene memory. Console features include electronic patching of control signals for up to 512 dimmers and offline data storage using internal, 3-1/2-inch disk drive unit. Operational capability includes the following:
   1. Live and blind programming.
   2. Special effects programmability for automatic operation of lights in pulsating, sequential dimming and brightening, and other special operating modes. Special effects menu displays operator guidance for programming and individual step levels.
   3. Signal from fire-alarm control panel that automatically brings selected circuits to fully on or fully bright condition, overriding normal dimming and on-off controls.
   4. Inserting cues between designated cues without renumbering.
   5. Out-of-sequence playback of cues.
   6. Controlling houselights and stage lights from console by assigning their dimmers or non-dim on-off controls to a channel.
   7. Retaining programmed cues in memory for minimum of one year after power outage.
8. Automatic sequential execution of programmed cues.
9. Printing cues using parallel or serial printer port, cable, and printer. Cable and printer are not included with this system.

E. PC: Standard, unmodified, with accessories and peripherals that are configured to install and run control console manufacturer's written requirements, but not less than the following:
   1. CPU operating speed shall be at least 1.6 GHz.
   2. Memory: 1024 MB.
   4. Parallel Port: Enhanced.
   5. LAN Adapter: 10/100/1000 Mbps, internal network interface card.
   6. Three USB 2.0 ports.
   7. Sound Card: For playback and recording of digital WAV sound files that are associated with audible warning and alarm functions.
   8. Color Monitor: Not less than 17 inches (430 mm), with a minimum resolution of 1280 by 1024 pixels, noninterlaced, and a maximum dot pitch of 0.28 mm. Video card shall support at least 256 colors at a resolution of 1280 by 1024 pixels at a minimum refresh rate of 70 Hz.
10. Mouse: Standard, compatible with installed software.
11. Disk storage shall include the following, each with appropriate controller:
   a. Minimum 60 GB hard disk, 5400 rpm.
   b. Floppy Disk Drive: High density, 3-1/2-inch (90-mm) size.
12. CD-ROM Drive: 24x/10x/24x CD-RW/8x DVD combination.

F. Console Power and Control Outlets: Multiple receptacles matched to connector on console connector cord.

G. House Lighting Control Station: Architectural-type, multichannel, remote-dimmer-control station with the following features:
   1. System controls designated houselights, stage lights, and other lights.
   2. Stage lighting controls compatible with dimming and control system.
   3. Flush mounting.
   5. 7” Touchscreen

H. Entry Station: Push button activates or deactivates indicating light and presets scene of house lighting control system.
   1. Light-emitting-diode indicating light illuminates when preset command is executed.
   2. Labeled "Entry."
   3. Flush wall mounted unless otherwise indicated.

I. Key-Entry Station: Key-operated switch controls station to activate or deactivate indicating light and presets scene of lighting control system.
   1. Light-emitting-diode indicating light illuminates when preset command is executed.
   2. Labeled "Entry."
   3. Flush wall mounted unless otherwise indicated.

J. Emergency Lighting Control Station: Key-operated push button activates indicating light and brings selected dimmers to fully bright condition, i.e., the "Panic" preset. Operating push button a second time returns dimmers to previous setting.
1. Emergency mode indicating light.
2. Labeled "Emergency Lights."
3. Flush wall mounted unless otherwise indicated.

2.8 RIGGING COMPONENTS

A. Pipe Clamps: Malleable iron, suitable for clamping fixtures or items to pipe from 3/4 to 2 inches in OD. Arranged for horizontal rotation of yoke for aiming; equipped with T-bolt to lock alignment.

B. Safety Cables: Heavy-duty, flexible steel; 30-inch nominal length, with spring clip at one end and steel ring at the other end.

C. Cable Grips: Stainless steel; basket-weave type for supporting stage cables.

2.13 HARRIS BALLROOM THEATRICAL LIGHTING – EQUIPMENT LIST

A. THEATRICAL LIGHTING RELAY PANEL
   1. Strand #76922C, PANEL 36-Way Contact Relay w/ (36) 76991 1-Pole Relays & (36) Strand 76966 1-Pole CB, 120VAC with master processor and network card, Qty: 1
   2. CONBOX4, ENCLSR Rough-in Box Contact, Qty: 1

B. SIGNAL PROCESSING RACK
   1. DWR1017PD, MA 17.5in(D) 10sp Data Wall Rack w/Plexi Door- Black, Qty: 1
   2. DWRRR10, MA 17.5in 10sp DWR Rear Rail Kit, Qty: 1
   3. PANEL1UVLS, PANEL 1U Vincent Lighting Credit Panel, Qty: 1
   4. 24POESWITCH, Network Switch 24-Port 10/100 POE- Model # Linksys Smart, LGS326P (192W) (1U) , Qty: 1
   5. BR1, MA 1.75in 1sp Panel w/Brush Grommet, Qty: 1
   6. 24PATPAN, Patch Panel 24-Port CAT5e (1U) , Qty: 1
   7. 6402, Pathway Pathport Octo 8-Port Node w/Rear Terminals, Qty: 1
   8. UPS1500, UPS 1500VA 2U RM Tripp Lite, Qty: 1
   9. DPP5015, PSU 50W 15VDC Lambda DIN Mt, Qty: 1
   10. CS-940, Interactive Tech CueServer 2 DIN w/Terminal Blocks, Mounting Flanges & 2 Universe License, Qty: 1
   11. 672005420, Weidmuller Duplex GR 5-20- DIN Rail Mount, Qty: 1

C. ARCHITECTURAL CONTROL
   1. ST-IET7-CB, Interactive Tech Incite Touch LCD Panel, Qty: 1

D. CONSOLE RECEPTACLE STATION - Each ballroom partition
   1. 5001WH, Pathway 1-Gang Faceplate- White, Engraved "NET "; "DMX # IN", Qty: 1
   2. 5105WH, Pathway Insert, RJ45 Ethercon, Qty: 1
   3. 51##WH, Pathway Insert, 5-pin XLR M, Qty: 1
   4. NOTE: 1 GANG, DEEP BACKBOXES SUPPLIED BY E.C. , Qty: 1

E. POWER / DATA DISTRIBUTION
   1. Wall boxes
      a. PRB2520D1DMXF, Box w/2- Flush Duplex GR 5-20, 1- L21-30 Flush Receptacle, 1Flush XLR5(F), and 1- Ethercon Receptacle - Recessed Mount, Qty: 2
   2. Fixture Data w/ Thru
      a. Box w/ L5-20 Flush Receptacle and XLR5(M,F), Qty: 10
3. Fixture Data at the end of the line
   a. Box w/ L5-20 Flush Receptacle and XLR5(F), Qty: 5

F. THEATRICAL FIXTURES AND ACCESSORIES
   1. 88-105-6950-00, VariLite 2600 Spot includes (2) omega brackets, Qty: 10
   2. 88-105-7340-00, VariLite 2600 Wash includes (2) omega brackets, Qty: 5
   3. SAFETYB, Fehr 30in Black Safety Cable w/Spring Hook, Qty: 15
   4. MWB, Mega-Claw Black, Qty: 30
   5. 36” PowerCON TRUE1 to L5-20 Twistlock Male Cable, Qty: 15
   6. Lex 5ft XLR5 DMX Extension Cable, Qty: 25
   7. SET OF ORIGINAL CUSTOM GOBOS, Qty: 1
   8. SET OF DUPLICATE CUSTOM GOBOS, Qty: 9

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Architect’s reflected ceiling plan (RCP) shows actual locations of all light fixtures, diffusers and system devices. Report to the Architect/Engineer any conflicts. Do not scale plans for exact location of lighting fixtures.
   B. Install luminaires in accordance with luminaire manufacturer’s written instructions, applicable requirements of NEC, NECA’s “Standard of Installation”, and NEMA standards.
   C. Electrical installations shall conform to and meet IEEE C2, NFPA 70, and to the requirements specified herein.
   D. Installed luminaires shall be provided with protective covering by Contractor until such time as the space(s) is cleaned and ready for occupancy.
   E. Set permanently mounted items level, plumb, and square with ceilings and walls.
   F. Indicated mounting heights are to bottom of unit for suspended items and to center of unit for wallmounted items.
   G. Mount and connect fixtures, and install and connect distribution devices.
      1. If arrangement is not indicated, install so each fixture, dimmer, house lighting circuit, control channel, and outlet circuit can be operated, and complete system demonstrated, in all operating modes.
      2. Install safety cables secured to stage rigging or gridiron for all pipe-mounted electrical fixtures and equipment.
   H. Comply with mounting and anchoring requirements specified in Division 26 Sections "Hangers and Supports for Electrical Systems" and "Vibration and Seismic Controls for Electrical Systems."

3.2 WIRING
   A. Align, mount and level the luminaires uniformly. All luminaires shall be installed plumb/true and level as viewed from all directions. Luminaires shall remain plumb and true without continual adjustment.
   B. The Contractor shall coordinate the lighting system installation with the relevant trades so as to eliminate interferences with hangers, mechanical ducts, sprinklers, pipes, steel, etc. Avoid interference with and provide clearance for equipment.
   C. Set luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Mounting heights
specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed.

D. Recessed and semi-recessed fixtures shall be independently supported from the building structure by a minimum of four wires per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Round fixtures or fixtures smaller in size than the ceiling grid shall be independently supported from the building structure by a minimum of four wires per fixture spaced approximately equidistant around the fixture. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two 3/4 inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires for lighting fixture support in this section. Lighting fixtures installed in suspended ceilings shall also comply with the requirements of Division 09 Specification Sections GYPSUM BOARD, ACOUSTICAL PANEL CEILINGS and SUSPENDED DECORATIVE WOOD GRIDS. Support lay-in ceiling light fixtures as follows:

1. Support fixtures with four (4) wires, with one (1) at each corner. Hanger wires shall be installed within 15 degrees of plumb or additional support shall be provided. Wires shall be attached to fixture body and to the building structure (not to the supports of other work or equipment).
2. Where building structure is located such that 15 degrees cannot be maintained, the Contractor shall provide “Uni-strut” or similar structure to meet this requirement.
3. Support Clips: All fixtures shall be furnished with hold down clips to meet applicable seismic codes. Provide four (4) clips per fixture minimum or the equivalent thereof in the installation trim. Fasten to light fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application. Contractor shall install clips per manufacturer’s requirements. If screws are required, they shall be provided.

E. Lighting Fixture Supports:

1. Shall provide support for all of the fixtures.
2. Shall maintain the fixture positions after cleaning and relamping.
3. Shall support the luminaires without causing the ceiling or partition to deflect
4. For installation in suspended ceilings, ensure that the luminaires are supported such that there is no resultant bowing or deflection of the ceiling system.

F. Luminaires installed and used for working light during construction shall be replaced prior to turnover to the Owner if more than 3 percent of their rated life has been used. Fixtures shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer.

G. All lamps shall be seasoned for a minimum of 12 hours and a maximum of 100 hours in full-on mode without dimming prior any dimming and prior to turn-over to Owner. All lamps used for convenience lighting during construction for periods collective operation longer than 100 hours and any lamps which have failed/burned-out shall be replaced with identical new lamps, which shall then be seasoned as described above, immediately prior to the date of substantial completion as determined by the Architect.

H. Suspended fixtures shall hang plumb and shall be located with no obstructions within the 45 degree range in all directions. The stem, cable, canopy and fixture shall be capable of 45 degree swing. Suspended fixtures in continuous rows shall have internal wireway systems for end to end wiring and shall be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces. Aligning splines shall be used on extruded aluminum fixtures to assure hairline joints. Steel fixtures shall be supported to prevent "oil-canning" effects. Fixture finishes shall be free of scratches, nicks, dents, and warps, and shall match the color and gloss specified. Pendants shall be finished to match fixtures. Aircraft
cable shall be stainless steel. Canopies shall be finished to match the ceiling and shall be low profile unless otherwise shown.

I. Whenever a luminaire or its hanger canopy is installed directly to a surface mounted junction box, a finishing ring painted to match the ceiling, shall be used to conceal the junction box. J. Rigidly align continuous rows of light fixtures for true in-line appearance.

K. Transformers (applies to all transformers including (but not limited to) low voltage, neon, remote ballast, LED power supplies, exterior locations):
   1. Electrical Contractor to locate all transformers (including low voltage, neon, remote ballasts, led power supplies, etc.) near fixtures in a well-ventilated and accessible location. Transformers must be installed (per codes) in accessible areas large enough to dissipate the heat of the transformer. Temperatures should not exceed 100°F (38°C).
   2. Transformers should be mounted as close to the load/ feed lamp holders as practical to keep the secondary feeds as short as possible.
   3. Electrical Contractor to determine wire size according to load and wire length to eliminate voltage drop. If voltage drop is a problem after installation, the Electrical Contractor is responsible for reinstallation (at no additional cost) of transformer and wire to solve problem.
   4. Electrical Contractor to label front of transformer with load name and load location. For example: “Large Display Case @ Entry to Main Dining Room.”

L. Contractor shall be responsible for sealing all luminaires for wet locations (i.e. all knock-outs, all pipe and wire entrances, etc.) to prevent water wicking.

M. Coordinate between the electrical and ceiling trades to ascertain that approved luminaires are furnished in the proper sizes, with the proper flange details, and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.

N. All reflecting surfaces, glass or plastic lenses, ballast housings, parabolic louvers, downlighting alzak cones and specular reflectors and other decorative elements shall be installed after completion of ceiling tile installation, plastering, painting and general cleanup.

O. Handle all reflecting surfaces, glass or plastic lenses, ballast housings, parabolic louvers, downlighting alzak cones and specular reflectors and other decorative elements with care during installation or lamping to avoid fingerprints or dirt deposits.

P. It is preferred that louvers be shipped and installed with clear plastic bags to protect louvers. At close of project, and after construction air filters are changed, remove bags.

Q. Power Wiring:
   1. Install wiring as specified in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" for hardwired connections. Install wiring in raceways except cable and plug connections.
   2. Install power wiring with a separate neutral for each output circuit from main dimmer and for each house and stage lighting circuit.

R. Signaling, Remote-Control, and Power-Limited Circuits:
   1. Comply with the following unless otherwise indicated:
      a. Size conductors according to lighting control device manufacturer's written instructions.
      b. Select cable insulation, shielding, drain wire, and jacket complying with lighting control device manufacturer's written instructions.
c. Install circuits to eliminate radio-frequency interference and electromagnetic interference.

2. Remote-control circuits associated with emergency lighting control shall be installed complying with Class 1 Circuit standards in NFPA 70.

S. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points.

T. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes and in terminal cabinets and equipment enclosures.

U. Remove wall plates and protect devices and assemblies during painting.

V. Support lighting fixtures, distribution components, and accessories as specified in Division 26 Section "Hangers and Supports for Electrical Systems." Equip all pipe-mounted equipment with safety cables that are secured to supporting pipe.

W. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.3 GROUNDING

A. Bond luminaires and metal accessories to the grounding system per National Electrical Code.

B. Ground noncurrent-carrying parts of equipment including luminaires, mounting arms, brackets, and metallic enclosures. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.4 IDENTIFICATION

A. Light fixtures served from multiple power sources, such as emergency fixtures fed from emergency transfer relay, shall have the following label affixed to it:

1. “DANGER - ELECTRICAL SHOCK HAZARD - LIGHT FIXTURE HAS MULTIPLE POWER SOURCES"

B. Identify components, power, and control wiring according to Division 26 Section "Identification for Electrical Systems."

C. Label each fixture, lighting outlet, distribution device, and dimmer module with unique designation. Labels on elevated components shall be readable from the floor.

3.5 CLEANING

A. At completion of each phase and the time of final acceptance by the Owner, all lighting fixtures shall have been thoroughly cleaned with materials and methods recommended by the manufacturer.

B. Any louver or cone showing dirt or fingerprints shall be cleaned with solvent recommended by the manufacturer to a like-new condition, or replaced as necessary in order to turn over to the Owner new fixtures at beneficial occupancy.

C. All fingerprints, dirt, tar, smudges, drywall mud and dust, etc. shall be removed by the Contractor from the luminaire bodies, reflectors, trims, and lens/louvers prior to final acceptance. All reflectors shall be free of paint other than factory-applied, if any.

3.6 TESTING AND ADJUSTMENT

A. The lighting and lighting controls systems shall be synchronized and fully operable to address the lighting operation in a complete and code-compliant manner.
B. All adjustable luminaires shall be aimed, focused, locked, etc., by the Contractor under the observation of the Architect. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely by the Contractor.

C. Contractor shall coordinate with Architect to establish the number of two-member crews required for aiming and adjusting. All aiming and adjusting shall be performed after the entire installation is complete for each phase or area. The Contractor shall be responsible for notifying the Architect of appropriate time for final luminaire adjustment.

D. All ladders, scaffolds, lifts, gloves, cleaning cloths, access/adjustment tools, etc. required for aiming and adjusting luminaires shall be furnished by the Contractor.

E. Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing lighting effects, aiming shall be accomplished at night.

3.7 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data in accordance with Division 01 Specification Section SUBMITTALS and OPERATION AND MAINTENANCE, IECC and as specified herein, showing all light fixtures, control devices and all interconnecting control wire, conduit and associated hardware.

B. Contractor shall be responsible for obtaining from his supplying light fixture manufacturers, for each type of light fixture, a recommended maintenance manual including, tools required, types of cleaners to be used and replacement parts identification list.

C. Provide at least three (3) CDs/DVDs with high resolution PDF files of all equipment product data for Owner’s use in equipment identification and maintenance with recommended maintenance manuals including, at a minimum:
   1. Vendor and local representative’s contact information
   2. Tools required
   3. Types of cleaners to be used
   4. Replacement parts identification lists
   5. Equipment product data (high-quality reproducible copies)
   6. Warranty documentation

3.8 FIELD QUALITY CONTROL:

A. Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that equipment operates in accordance with requirements of this section.

B. Dimming Drivers. Test for full range of dimming capability. Observe for visually detectable flicker over full dimming range.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

D. Inspect each light fixture for damage. Replace damaged light fixtures at no cost to the Owner.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

F. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

G. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

H. Tests and Inspections:
   1. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.
   2. Visual and Mechanical Tests and Inspections:
      a. Inspect each fixture, outlet, module, control, and device for defects, finish failure, corrosion, physical damage, labeling by an NRTL, and nameplate.
      b. Exercise and perform operational tests on mechanical parts and operable devices according to manufacturer's written instructions.
      c. Check tightness of electrical connections with torque wrench.
      d. Verify proper protective device settings, fuse types, and ratings.
      e. Record results of tests and inspections.
   3. Electrical Tests: Perform tests according to manufacturer's written instructions.
      a. Continuity tests of circuits.
      b. Operational Tests: Connect each outlet to a fixture and a dimmer output circuit so each dimmer module, dimmer control and output circuit, outlet, and fixture in a typical operating mode will be sequentially tested. Set and operate controls to demonstrate fixtures, outlets, dimmers, and controls in a sequence that cues and reproduces actual operating functions for a typical system of the size and scope installed. Include operation and control of houselights and stage lights from each control location and station including optional plugin, control-console outlet locations. Record fixture and outlet assignments, control settings, operations, cues, and observations of performance.
   4. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible organization and individual. I. Stage lighting will be considered defective if it does not pass tests and inspections.

J. Prepare test and inspection reports.
   1. Prepare a schedule of lighting outlets by number; indicate circuits, dimmers, connected fixtures, and control-channel assignments. Prepare a schedule of control settings and circuit assignments for house control channels. Prepare written reports of tests and observations. Report defective materials, workmanship, and unsatisfactory test results. Include records of repairs and adjustments made.

3.9 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to six visits to Project during other-than-normal occupancy hours for this purpose.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain stage lighting equipment.

END OF SECTON 265561
SECTION 27 2423 – AUDIO VIDEO DEVICES

PART 1 - GENERAL

a) SCOPE OF WORK
i) The work described in this section includes the furnishing of all components, software licensing, materials, equipment, installation and technical labor and the performance of all operations necessary for the complete installation of audiovisual equipment in operating condition as indicated on the drawings and/or specifications.
ii) Warranty Period shall consist of full parts, labor and programming shall include 1 full year of this service.
   (1) As part of the Bid, the AV Integrator shall provide the Owner with an attached proposal to extend the warranty out to Year 2, Year 3 and Year 4 of operation.
iii) The entire responsibility for the system, its installation, operation and function shall be that of the Systems Contractor. Additional rough-ins, line voltage connections or pathways if needed, are the responsibility of the Contractor.
iv) Contractor shall take full responsibility for communicating all necessary requirements from the Owner including but not limited to:
   (1) Access to the building, this building is occupied and fully functional with scheduled events taking place. Coordinate all working times and building availability prior to starting work.
   (2) Following Information Technology space/infrastructure requirements shall be coordinated and agreed to by Owner’s IT staff:
      (a) IP addresses
      (b) Rack space
      (c) Cable tray space
b) SECTION INCLUDES
i) Work consists of new A/V equipment including:
   (1) Video projectors complete with ceiling mounting hardware and connection to the local audio/video system as detailed on the drawings and as specified herein.
   (2) A/V Distribution Systems are required to be complete with sources, inputs, displays, distribution, controls and connection to the data network and video distribution system as detailed on the drawings and specified herein.
   (3) All material and/or equipment necessary for proper operation of the system(s), not specified or described herein, shall be deemed part of these specifications

c) QUALITY ASSURANCE
i) All equipment shall be UL listed.
ii) All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electric Code.
iii) All equipment Installation Practices shall comply with the Local Electric Code.
iv) All equipment and installation practices shall comply with ANSI/INFOCOMM 2M-2010 Standard Guide for Audiovisual Systems Design and Coordination Processes
v) All equipment and Installation Practices shall comply with the latest BICSI Telecommunications Distribution Methods Manual (TDMM).
vi) All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, 862, standards as applicable.
vii) Performance Verification: All digital video systems shall be pre-tested to verify the complete compatibility of all sending, receiving and distribution components and the performance and integrity of the transmission media. The performance of each system shall be demonstrated, with all proposed components, in the presence of the Design Engineer and/or Owner prior to approval and installation. Any system failing to meet the specified performance requirements shall be rejected and re-configured as required prior to re-testing.
viii) All equipment described herein or otherwise required to perform the specified system functions shall be a regular product line, produced by the system manufacturer.
ix) All materials furnished under this contract shall be new, of highest quality and shall be of a regularly manufactured line, currently in production at the time of installation.

d) CONTRACTOR QUALIFICATIONS
  i) The A/V equipment package shall be furnished and installed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the A/V contractor to utilize a Subcontractor for any portion of the work, unless the Subcontractor has been approved in writing by the Design Engineer or owner based upon adherence to the qualifications listed herein.
  ii) The Contractor shall have on staff an AVIXA certified CTS-I or CTS-D AV systems engineer or project manager responsible for overseeing the project. In addition, the lead technician on the project shall have a CTS certification.

(1) **Proof of these certifications shall be submitted WITH THE BID.**

  iii) The Contractor shall have certification for AV over IP equipment that is being proposed. (SVSI)

e) SHOP DRAWINGS
  i) A complete and comprehensive list of materials with quantity, manufacturer, model and part number and reference to the Part 2 specification paragraph number for each item.
  ii) Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.
  iii) Qualifications: A statement of contractor’s qualifications to verify compliance with other provisions within the specifications, unless the contractor has been pre-approved.
  iv) Job specific diagrams.
    (1) This indicates a block schematic diagram that shows all major items of equipment required for the contract project and the actual interconnections that will be installed, including details of interconnection with other systems.
    (2) Rack elevations showing the configuration of all rack mounted equipment.
    (3) Loudspeaker layouts
    (4) Cabling schedule
    (5) Structural anchorage
    (6) Technical furniture
    (7) 30x42 floor plans at a scale of not less than 1/8” = 1’-0” showing the location of all items of equipment. Drawings shall also indicate each location where electrical power is required, and the specific configuration of that power connection (voltage, plug type, mounting height, etc.)
    (8) Network Coordination – the Contractor shall provide network topology diagram illustrating complete network plan for the project. The contractor shall work with the Owner’s IT department to identify all PoE, VLAN, firewall and other networking requirements to provide a fully functioning AV system.
      (a) The Contractor shall obtain blocks of static IP addresses from the Owner’s IT department in a timely fashion ahead of implementation as to give the Owner’s IT department ample time to develop these IPs.
      (b) A meeting with the Owner’s IT department is required to discuss plan of implementation and procedure.
  v) Software data – The data package shall consist of manufacturer’s data sheets of all system and application software being provided with sufficient information to verify that all specified features and functions are being addressed.
  vi) Submittals that do not contain all the required information will be REJECTED unless prior approval for partial submittals has been approved.

f) O & M MANUALS – FINAL DOCUMENTATION
  i) Copies of all approved shop drawings with the project engineer’s specific approval clearly indicated.
  ii) Comprehensive Bill of Materials with manufacturers, model numbers, quantities and descriptions.
  iii) Owner’s manuals for every item of equipment, when available from the manufacturer.
    (1) These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting and product repair/replacement information.
iv) Provide statement of warranty with O&M Manuals.

2. AUDIOVISUAL MOUNTS AND MOUNTING PRODUCTS
   a) PRODUCT EQUIVALENCY
      i) Where products are listed with multiple manufacturers, these manufacturers will be approved as equals
         if all specified features and performance targets are provided. Any equipment not specifically approved
         in writing prior to the bid date will not be considered, regardless of qualifications. Failure to provide
         the "precise functional equivalent" shall result in the removal of the alternate equipment at the
         Contractor’s expense.
      ii) Different manufacturers may require various options, accessories, converters, patch cables, etc. to
          perform the specified features and functions. Therefore, all material and/or equipment necessary for
          proper operation of the system shall be deemed part of these specifications.
   b) LED AND FLAT PANEL DISPLAY MOUNTS
      i) Rated for commercial use and for the specified display size
      ii) Manufacturer’s mount load rating shall be a minimum of five times the actual weight of the display
      iii) Articulating arm display mounts shall provide 20 degrees of forward tilt and 180 degrees of side to
           side swivel.
      iv) Hardware used to attach wall mounts shall be ASTM and/or SAE hardware no less than Grade 5 or
          ISO-rated 8
      v) Mounts shall be installed in strict compliance with the manufacturer’s instructions. Mounting
         configuration, method, and exact location of mounts to be approved prior to installation.
      vi) Manufacturers: LegrandAV, Peerless, or Premier

3. AUDIOVISUAL IMAGE CONTRAST RATIO, DISPLAY SIZE AND DISPLAY ASPECT RATIO
   a) THE FOLLOWING VIEWING REQUIREMENT CATEGORIES SHALL BE OBSERVED
      i) Passive Viewing
         (1) The viewer is able to recognize what the images are on a screen and can separate the text or main
             image from the background under typical lighting for the viewing environment. The content does
             not require assimilation and retention of detail, but the general intent is understood.
      ii) Basic Decision Making
         (1) The viewer can make basic decisions from the displayed image. The decisions are not dependent
             on critical details within the image, but there is assimilation and retention of information. The
             viewer is actively engaged with the content (e.g., information displays, presentations containing
             detailed images, classrooms, boardrooms multi-purpose rooms, product illustrations).
         (2) The viewer should be able to understand what is being communicated. Graphic images and text
             are legible to the extent that the viewer can make basic decisions on the basis of what is being
             seen. Decisions made are based on comprehending the informational content itself and are not
             dependent on the resolution of every element of detail.
         (3) Basic decision-making viewing applications include the presentation of photographs, detailed
             graphic images, product illustrations and information displays such as airline departures, sports
             score or stock quotes. In this scenario, the information obtained from the projected image informs
             a basic decision by a fully engaged viewer.
      iii) Analytic Decision Making
         (1) The viewer is fully engaged with minute detail present in the content and needs to be able to
             resolve every element of the projected image.
         (2) Analytical decision-making environments support professional assessments, such as the
             examination of medical imaging, engineering or architectural drawings, electrical schematics,
             photographic image inspection, forensic evidence or failure analysis.
   b) DISPLAY SIZE, SIGHT LINES AND DISTANCES
      i) Image sight lines shall be referenced 90-degrees perpendicular to the center-bottom of the screen.
      ii) The closest viewer to the screen shall be no less than 1 times the screen’s width away from the surface
          of the screen.
      iii) The top of the screen will be no more than 30-degrees above the line of sight for the closest viewer.
      iv) For installations identified to serve a Passive Viewing audience, the furthest viewer shall be no more
          than 8 times the image height from the surface of the screen.
v) For installations identified to serve a Basic Decision Making audience, the furthest viewer shall be no more than 6 times the image height from the surface of the screen.
vi) For installations identified to serve an Analytic Decision Making audience, the furthest viewer shall be no more than 4 times the image height from the surface of the screen.

c) IMAGE CONTRAST RATIO SHALL BE INFORMED BY ANSI/INFO COMM 3M-2011

d) IMAGE ASPECT RATIO SHALL BE 16:9 UNLESS OTHERWISE SPECIFIED

4. AUDIOVISUAL SYSTEM CONNECTIVITY AND SIGNAL INFRASTRUCTURE

a) PRODUCT EQUIVALENCY

i) Where products are listed with multiple manufacturers, these manufacturers will be approved as equals if all specified features and performance targets are provided. Any equipment not specifically approved in writing prior to the bid date will not be considered, regardless of qualifications. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate equipment at the Contractor’s expense.

ii) Refer to sole source requirements issued with bid documents for certain products that must be by certain manufacturers to be compatible with existing similar systems within the building.

b) SIGNAL TRANSPORT FORMATS AND TRANSPORT DISTANCES

i) For installations where digital A/V signals must be transported to lengths of 10 meters or less, passive DisplayPort and HDMI connectivity may be used

(1) Passive copper DisplayPort and HDMI cables up to 3 meters in length shall feature UltraHD capability and a minimum wire gauge of 32AWG

(2) Passive copper DisplayPort and HDMI cables from 3 meters up to 10 meters in length shall be Hi Speed rated and feature HDMI(e) capability with operational audio return channel or high speed Ethernet extension (HEAC) feature set

(3) All passive copper cables shall support a minimum content demand of 3840 x 2160 @ 60 fps

(4) For installations where HDMI signals must be transported more than 10 meters, but less than 20 meters, passive copper HDMI connectivity may be used. HDMI cables from 10 meters to 20 meters in length shall have a minimum of 23AWG copper conductors and must be minimally HDMI LLC Standard Speed Rated

(5) For installations where DisplayPort and HDMI signals must be transported more than 10 meters but less than 30 meters, hybrid Active-Optical cables may be used

(6) For installations where DisplayPort and HDMI signals must be transported more than 10 meters but less than 100 meters, HDBaseT solutions may be used

(a) ALL HDBaseT solutions, regardless of transport distance, must be installed using an HDBaseT.org certified fully shielded or non-continuous shielded F/UTP Cat6 cable

(7) For installations where DisplayPort and HDMI signals must be transported more than 100 meters but less than 300 meters, fully optical solutions that support UltraHD performance levels of 2160p may be used. Such fully optical solutions may be used for installations demanding transport lengths from 10 meters to 100 meters at the A/V design engineer’s discretion

ii) Manufacturers: SVSI, Crestron, Extron, Kramer.

5. Universal Serial Bus (USB) and System Interactivity

a) Devices that feature interactive capability, or devices that operate to capture content such as lecture capture products, may demand USB as a connectivity channel. The following parameters shall be met when installing USB connectivity solutions.

i) Devices operating in class 01h (audio device), 03h (human interface device), 0Ah and 02h (communications and CDC control) will be compliant with a minimal level of USB 1.1 performance

ii) HID class devices used with interactive flat panel displays will be compliant with a minimal level of USB 2.0

iii) Devices operating in class 09h (USB hub) will be compliant with a minimal level of USB 3.0 or 3.1 Gen 1

iv) USB passive copper connections shall not exceed 5 meters in total link length

v) USB connections more than 5 meters but less than 12 meters in total length may be connected using USB Active Extender Cables or boosters
vi) USB connections more than 12 meters in total length shall be connected using USB “Super Boost” technology over Cat5e cabling for lengths up to 100 meters

vii) In all USB installations, not more than three (3) tiers of USB connectivity shall be allowed without inclusion of a powered hub to restore full USB bus (Vbus) power for proper operation of downstream devices and links

viii) All USB hubs used in A/V installations will be powered hubs that are capable of delivering a minimum of 500mA at 5 volts +/- 5% over the length of the link

ix) Manufacturers: QSC, LegrandAV, Crestron, Extron

PART 2 - EQUIPMENT

6. HARRIS BALLROOM

(1) Harris Ballroom (Refer to drawings for what is in contract) Equipment: Subject to compliance with requirements, provide the following Basis-of-Design products:

(i) Video Projectors
   1. Base Bid: Digital Projection TITAN 33000 4K-UHD (2 units)
   2. Add Alternate: Christie 4k Boxer 30k lumens (2 units)
      (INCLUDE one full lamp replacement for both projectors with Add Alternate projector)
      a. RS-232 control
      b. HDMI input
      c. Provide with required zoom lens
      d. Provide CAT5/6 for management software
      e. Utilize right angle power cord

(ii) Scissor Lift
   1. Draper SLX-21 (2 units)
      a. RS-232 control
      b. LV control in rack
      c. Service, Show, and Store settings
      d. 120v unit
      e. Black in color

(iii) Projection Screen (2 units)
   1. 208” Diagonal 16:9 aspect ratio
      a. HD Material
      b. 6” drop
      c. Da-Lite, Draper, Stewart

(iv) Equipment Rack.
   1. Provide the following:
      a. Provide adequate spacing and ventilation.
      b. Provide with vented front door
      c. Provide rack layout detail with submittals.
      d. Contractor to provide rack space and depth as needed for all equipment.
      e. Drawer for wireless mic’s and other cables, etc.
      f. Middle Atlantic WRK4442 rack (2 units)

(v) EMI/RFI Surge Protection
   1. MAP PD-920R-SP

(vi) Video processing and Control
   1. Provide touch panels as indicated on plans with control programming consistent with existing programming in the building.
2. Storyboarding meetings are required with Owners to confirm functionality and graphics.

3. (vii) Lectern
   1. Middle Atlantic, Spectrum, AV Furniture
      a. Lectern shall house Unified Communications specific equipment.
      b. COLOR and FINISHING KIT AS PER Architect

(viii) Camera Systems
   1. 4k PTZ camera system with mount
   2. Requires Network Ethernet control for PTZ and video out
   3. Provide required P.o.E +
   4. CAT6A STP cable or higher
   5. Connect to Room A162E via network

(ix) TV Monitor
   1. LG Commercial, Sharp, Panasonic
      a. RS-232 control
      b. HDMI input
      c. Provide with required mount
      d. Provide with wall box where applicable.

(x) Digital Signal Processor:
   1. QSC, BIAMP, Symetrix as standard of quality manufacturers.
      a. Provide Mic/Line inputs and outputs as required
      b. Acoustic Echo Cancelling
   2. DSP configuration to include labels and meters for all inputs and outputs

(xi) Video over IP Transmission
   1. SVSI N1122

(xii) Source Devices:
   1. Denon DN-300Z Media Player (2 units)
   2. Denon DN-500BD Blu-Ray/DVD player (2 units)
   3. Digital Signage Appliance per UK Standards.
   4. PVI VeCOAX PRO4 (4) channel HDMI over Coax

(xiii) Digital Mixer
   1. Midas M32
   2. M32-Mix
   3. Midas DL-16 Portable Stage Box (2 units – one in rack for wireless, etc.)
   4. Provide with SKB 1GATOR G-TOUR-EFX4 Roto-rack
   5. Provide with I/O cables

(xiv) Microphones, etc.
   1. Shure, Sennhieser, AudioTechnica as standard of quality.

(xv) Miscellaneous Requirements:
   1. All equipment is to be rack mounted unless otherwise specified.
   2. Provide all devices, etc. with proper cables and interconnect devices.
   3. Verify all device locations.
PART 3 - EXECUTION

1.1 COORDINATION AND PREPARATION

A. Verify compatibility of mounts and brackets with type, size and weight of projector or flat-screen display being supported. Notify architect in writing if incompatibility is found.

B. Coordinate location of audio-visual equipment with power and data conduits and boxes. Verify required power and data connections are provided at installation location for each type of audio-visual equipment.

C. Provide secure anchorage and mounting substrates for all audio-visual equipment, free from movement and suitable for installation of audio-visual equipment and adjacent finishes. Provide all required brackets, hanger rods, blocking, and fasteners necessary to attach audio-visual equipment to adjacent construction. Where necessary for proper performance and appearance, provide structural supports using slotted channel framing and other hardware required for a complete and secure installation.

1. Install slotted channel framing according to manufacturer’s written instructions.
2. Anchor slotted channel framing to supporting construction with anchors and fasteners necessary to support imposed loads and provide proper performance and appearance.
3. Connect slotted channel framing members together to configuration necessary for proper function, performance, and appearance, using connectors, brackets, and fasteners recommended by manufacturer and suitable for application.
4. Coordinate projection screen pocket dimensions with details shown on architectural drawings.

1.2 INSTALLATION

A. General: Install audio-visual equipment at locations indicated, complying with manufacturer’s written instructions and reviewed shop drawings.

B. Install audio-visual equipment to ensure proper relationship between components for optimum image quality. Adjust audio-visual equipment to height required by Owner. Install manufactured trim where audio-visual equipment penetrates acoustical ceiling panels.

C. Contractor to be in attendance at two formal programs utilizing each facilities system to provide any assistance necessary.

D. Provide Friction-Wedge shaft locks or security covers on all non-user operated equipment. Mark all user controls for normal operating conditions.

E. All connections are to be made with rosin core solder, crimp type connectors, ratchet-crimped spade lug types, or other appropriate termination devices.

F. Mark all equipment and user controls for normal operating conditions per Owner.

G. Provide necessary AC power outlets inside equipment racks for all equipment.

H. Legibly identify input and output controls with lamicoid or other permanent labels. Use similar permanent means to identify all controls and electronic components (front and rear) in the system. Embossed "Dymo tape" labels, etc. are not acceptable.

I. Pre-set levels throughout each system and permanently mark equipment for future reference.

J. Fasteners and their supports shall be adequate to support their load with a safety factor of at least five (5). All mounting hardware to have an SAE rating of 5 or better. Licensed structural engineer must approve all structural and rigging components. All components shall be secured plumb and square. Provide detail for review.

K. Verify location of all equipment/devices with the Architect and Owner.

L. Minor items of equipment, etc. needed to fulfill the specifications and requirements and to provide a complete working system, even if not specifically mentioned herein, are to be supplied under this contract without additional claim for payment.

M. All equipment to be mounted in equipment racks/turrets with Torx-Post Security Screws.

N. All empty rack spaces are to be filled with blank or vented security covers. Appropriate type of security panel to be determined by method or rack cooling and method of nearby component cooling.

O. Provide permanent operational instruction guide in equipment rack(s).
P. All loose cables entering or exiting an equipment rack are to be contained in split loom tubing, or alligator skin wrap.

Q. All loose cables entering or exiting an equipment rack are to lay flat on the floor and not interfere with full operation of the equipment rack doors.

R. Install wiring in strict conformity with state-of-the-art practice. All work is to be performed with a high degree of craftsmanship.

S. Verify that conduits have been mechanically and electrically connected to receptacle boxes and building ground. Do not splice any lines in conduit.

T. Install all equipment neatly, plumb, square and true to line and level.

U. Execute, without claim for extra payment, moderate moves or changes as necessary to accommodate other equipment, proper viewing, or to preserve symmetry and pleasing appearance, and as required by engineer.

V. Approval by Owner and Consultant is required for any changes necessitated by field conditions.

W. Maintain the same individual in charge of work throughout execution, unless illness, loss of personnel, or other circumstances beyond the control of the Audio Contractor intervene.

X. All data and network installation associated with the audio system to be completed by BICSI certified technicians. Documented proof of certification to be provided upon request.

Y. Leave job site and all equipment, air filters, and materials clean and free from marks, blemishes, dust, and debris.

1.3 WIRING METHODS:

A. Install all audio system wiring in conduit or cable tray. All exposed cable not in conduit is to be a color approved by Owner/Architect.

B. Maximum cross-sectional area fill of conduits not to exceed 40% of internal area of conduit. Provide pullboxes at maximum intervals of 200' and every 270 degrees of bends.

C. Isolate all wiring, jacks, panels, etc. from conduit ground.

D. All microphone (low level) cables shall be continuous, without splices (joints), from point of origin to point of termination.

E. Splices in speaker and control cable will not be permitted, except within equipment cabinets, terminal cabinets, accessible junction boxes, or speaker backboxes.

F. Provide cable marker labels (equal to Brady B-500 series) at each end and at each splice in equipment cabinets, terminal cabinets and accessible junction boxes to correspond to circuit designations indicated on "As Built" drawings. Secure labels with clear heat shrink tubing. Use of Brady self-laminating labels is approved.

G. Terminate all audio cables within equipment racks, junction boxes, and terminal cabinets with spade-lug connectors, screw type terminal strips, or displacement type terminal strips. Connect spade lugs to cables by soldering or by crimping with Ratchet type compression crimpers.

H. Except when located in the equipment cabinets or junction boxes, make all audio splices/connections with rosin core solder or compression fittings made with compression crimpers.

I. Utilize 60% tin, 40% lead rosin-core solder for all solder type connections.

J. All a/c wiring within electronics equipment racks shall be installed in conduit in accordance with current NFPA, including all supplements. All plugs and receptacles used shall be of the isolated grounding type.

K. When conduit attaches to equipment racks or junction boxes, employ isolation fittings to prevent signal path ground loops.

L. All electronic cables within equipment racks, housings, and terminal cabinets shall be neatly tied with nylon cable ties at not more than 3" intervals, and shall be installed in accordance with the latest AES installation standards.

M. Label all cables (including power) at both ends and record on as-built drawings and details.
1.4 ACCEPTANCE
   A. Upon completion of all tests and system set-up, Contractor is to notify the Consultant that the system is ready for final approval and test. At this time, system binder is to be presented to the Owner for prior evaluation.
      1. If final acceptance is significantly delayed because of defective equipment or because of installation not in accordance with Contract Documents (as deemed by the Consultant), the Contractor shall directly pay for all additional time and expenses (including legal) of the Owner, Architect, and Consultant representatives during any resultant extensions of the acceptance testing period. This will include any/all costs associated with but not limited to additional site visits, travel, meetings, and coordination.

1.5 PROTECTION
   A. After installation, protect audio-visual equipment from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION
PART 1 - GENERAL

a) SCOPE OF WORK

i) The work described in this section includes the furnishing of all components, software licensing, materials, equipment, installation and technical labor and the performance of all operations necessary for the complete installation of audiovisual equipment in operating condition as indicated on the drawings and/or specifications.

ii) Warranty Period shall consist of full parts, labor and programming shall include 1 full year of this service.

(1) As part of the Bid, the AV Integrator shall provide the Owner with an attached proposal to extend the warranty out to Year 2, Year 3 and Year 4 of operation.

iii) The entire responsibility for the system, its installation, operation and function shall be that of the Systems Contractor. Additional rough-ins, line voltage connections or pathways if needed, are the responsibility of the Contractor.

iv) Contractor shall take full responsibility for communicating all necessary requirements from the Owner including but not limited to:

(1) Access to the building, this building is occupied and fully functional with scheduled events taking place. Coordinate all working times and building availability prior to starting work.

(2) Following Information Technology space/infrastructure requirements shall be coordinated and agreed to by Owner’s IT staff:

(a) IP addresses
(b) Rack space
(c) Cable tray space

b) SECTION INCLUDES

i) Work consists of new A/V equipment including:

(1) Video projectors complete with ceiling mounting hardware and connection to the local audio/video system as detailed on the drawings and as specified herein.

(2) A/V Distribution Systems are required to be complete with sources, inputs, displays, distribution, controls and connection to the data network and video distribution system as detailed on the drawings and specified herein.

(3) All material and/or equipment necessary for proper operation of the system(s), not specified or described herein, shall be deemed part of these specifications.

c) QUALITY ASSURANCE

i) All equipment shall be UL listed.

ii) All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electric Code.

iii) All equipment Installation Practices shall comply with the Local Electric Code.


v) All equipment and Installation Practices shall comply with the latest BICSI Telecommunications Distribution Methods Manual (TDMM).

vi) All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, 862, standards as applicable.

vii) Performance Verification: All digital video systems shall be pre-tested to verify the complete compatibility of all sending, receiving and distribution components and the performance and integrity of the transmission media. The performance of each system shall be demonstrated, with all proposed components, in the presence of the Design Engineer and/or Owner prior to approval and installation. Any system failing to meet the specified performance requirements shall be rejected and re-configured as required prior to re-testing.

viii) All equipment described herein or otherwise required to perform the specified system functions shall be a regular product line, produced by the system manufacturer.
All materials furnished under this contract shall be new, of highest quality and shall be of a regularly manufactured line, currently in production at the time of installation.

d) CONTRACTOR QUALIFICATIONS

i) The A/V equipment package shall be furnished and installed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the A/V contractor to utilize a Subcontractor for any portion of the work, unless the Subcontractor has been approved in writing by the Design Engineer or owner based upon adherence to the qualifications listed herein.

ii) The Contractor shall have on staff an AVIXA certified CTS-I or CTS-D AV systems engineer or project manager responsible for overseeing the project. In addition, the lead technician on the project shall have a CTS certification.

(1) **Proof of these certifications shall be submitted WITH THE BID.**

iii) The Contractor shall have certification for AV over IP equipment that is being proposed. (SVSI)

e) SHOP DRAWINGS

i) A complete and comprehensive list of materials with quantity, manufacturer, model and part number and reference to the Part 2 specification paragraph number for each item.

ii) Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.

iii) Qualifications: A statement of contractor’s qualifications to verify compliance with other provisions within the specifications, unless the contractor has been pre-approved.

iv) Job specific diagrams.

(1) This indicates a block schematic diagram that shows all major items of equipment required for the contract project and the actual interconnections that will be installed, including details of interconnection with other systems.

(2) Rack elevations showing the configuration of all rack mounted equipment.

(3) Loudspeaker layouts

(4) Cabling schedule

(5) Structural anchorage

(6) Technical furniture

(7) 30x42 floor plans at a scale of not less than 1/8” = 1’-0” showing the location of all items of equipment. Drawings shall also indicate each location where electrical power is required, and the specific configuration of that power connection (voltage, plug type, mounting height, etc.)

(8) Network Coordination – the Contractor shall provide network topology diagram illustrating complete network plan for the project. The contractor shall work with the Owner’s IT department to identify all PoE, VLAN, firewall and other networking requirements to provide a fully functioning AV system.

(a) The Contractor shall obtain blocks of static IP addresses from the Owner’s IT department in a timely fashion ahead of implementation as to give the Owner’s IT department ample time to develop these IPs.

(b) A meeting with the Owner’s IT department is required to discuss plan of implementation and procedure.

v) Software data – The data package shall consist of manufacturer’s data sheets of all system and application software being provided with sufficient information to verify that all specified features and functions are being addressed.

vi) Submittals that do not contain all the required information will be REJECTED unless prior approval for partial submittals has been approved.

f) O & M MANUALS – FINAL DOCUMENTATION

i) Copies of all approved shop drawings with the project engineer’s specific approval clearly indicated.

ii) Comprehensive Bill of Materials with manufacturers, model numbers, quantities and descriptions.

iii) Owner’s manuals for every item of equipment, when available from the manufacturer.

(1) These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting and product repair/replacement information.
iv) Provide statement of warranty with O&M Manuals.

2. AUDIOVISUAL MOUNTS AND MOUNTING PRODUCTS

a) PRODUCT EQUIVALENCY
   i) Where products are listed with multiple manufacturers, these manufacturers will be approved as equals if all specified features and performance targets are provided. Any equipment not specifically approved in writing prior to the bid date will not be considered, regardless of qualifications. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate equipment at the Contractor’s expense.
   ii) Different manufacturers may require various options, accessories, converters, patch cables, etc. to perform the specified features and functions. Therefore, all material and/or equipment necessary for proper operation of the system shall be deemed part of these specifications.

b) LED AND FLAT PANEL DISPLAY MOUNTS
   i) Rated for commercial use and for the specified display size
   ii) Manufacturer’s mount load rating shall be a minimum of five times the actual weight of the display
   iii) Articulating arm display mounts shall provide 20 degrees of forward tilt and 180 degrees of side to side swivel.
   iv) Hardware used to attach wall mounts shall be ASTM and/or SAE hardware no less than Grade 5 or ISO-rated 8
   v) Mounts shall be installed in strict compliance with the manufacturer’s instructions. Mounting configuration, method, and exact location of mounts to be approved prior to installation.
   vi) Manufacturers: LegrandAV, Peerless, or Premier

3. AUDIOVISUAL IMAGE CONTRAST RATIO, DISPLAY SIZE AND DISPLAY ASPECT RATIO

a) THE FOLLOWING VIEWING REQUIREMENT CATEGORIES SHALL BE OBSERVED
   i) Passive Viewing
      (1) The viewer is able to recognize what the images are on a screen and can separate the text or main image from the background under typical lighting for the viewing environment. The content does not require assimilation and retention of detail, but the general intent is understood.
   ii) Basic Decision Making
      (1) The viewer can make basic decisions from the displayed image. The decisions are not dependent on critical details within the image, but there is assimilation and retention of information. The viewer is actively engaged with the content (e.g., information displays, presentations containing detailed images, classrooms, boardrooms multi-purpose rooms, product illustrations).
      (2) The viewer should be able to understand what is being communicated. Graphic images and text are legible to the extent that the viewer can make basic decisions on the basis of what is being seen. Decisions made are based on comprehending the informational content itself and are not dependent on the resolution of every element of detail.
      (3) Basic decision-making viewing applications include the presentation of photographs, detailed graphic images, product illustrations and information displays such as airline departures, sports score or stock quotes. In this scenario, the information obtained from the projected image informs a basic decision by a fully engaged viewer.
   iii) Analytic Decision Making
      (1) The viewer is fully engaged with minute detail present in the content and needs to be able to resolve every element of the projected image.
      (2) Analytical decision-making environments support professional assessments, such as the examination of medical imaging, engineering or architectural drawings, electrical schematics, photographic image inspection, forensic evidence or failure analysis.

b) DISPLAY SIZE, SIGHT LINES AND DISTANCES
   i) Image sight lines shall be referenced 90-degrees perpendicular to the center-bottom of the screen.
   ii) The closest viewer to the screen shall be no less than 1 times the screen’s width away from the surface of the screen.
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      c. Provide with required zoom lens
      d. Provide CAT5/6 for management software
      e. Utilize right angle power cord

(ii) Scissor Lift
   1. Draper SLX-21 (2 units)
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      b. LV control in rack
      c. Service, Show, and Store settings
      d. 120v unit
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(iii) Projection Screen (2 units)
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   1. 4k PTZ camera system with mount
   2. Requires Network Ethernet control for PTZ and video out
   3. Provide required P.o.E +
   4. CAT6A STP cable or higher
   5. Connect to Room A162E via network

5. (ix) TV Monitor
   1. LG Commercial, Sharp, Panasonic
      a. RS-232 control
      b. HDMI input
      c. Provide with required mount
      d. Provide with wall box where applicable.

6. (x) Digital Signal Processor:
   1. QSC, BIAMP, Symetrix as standard of quality manufacturers.
      a. Provide Mic/Line inputs and outputs as required
      b. Acoustic Echo Cancelling
   2. DSP configuration to include labels and meters for all inputs and outputs

7. (xi) Video over IP Transmission
   1. SVSI N1122

8. (xii) Source Devices:
   1. Denon DN-300Z Media Player (2 units)
   2. Denon DN-500BD Blu-Ray/DVD player (2 units)
   3. Digital Signage Appliance per UK Standards.
   4. PVI VeCOAX PRO4 (4) channel HDMI over Coax

9. (xiii) Digital Mixer
   1. Midas M32
   2. M32-Mix
   3. Midas DL-16 Portable Stage Box (2 units – one in rack for wireless, etc.)
   4. Provide with SKB 1GATOR G-TOUR-EFX4 Roto-rack
   5. Provide with I/O cables

10. (xiv) Microphones, etc.
    1. Shure, Sennhesier, AudioTechnica as standard of quality.

11. (xv) Miscellaneous Requirements:
    1. All equipment is to be rack mounted unless otherwise specified.
    2. Provide all devices, etc. with proper cables and interconnect devices.
    3. Verify all device locations.
PART 3 - EXECUTION

1.1 COORDINATION AND PREPARATION

A. Verify compatibility of mounts and brackets with type, size and weight of projector or flat-screen display being supported. Notify architect in writing if incompatibility is found.

B. Coordinate location of audio-visual equipment with power and data conduits and boxes. Verify required power and data connections are provided at installation location for each type of audio-visual equipment.

C. Provide secure anchorage and mounting substrates for all audio-visual equipment, free from movement and suitable for installation of audio-visual equipment and adjacent finishes. Provide all required brackets, hanger rods, blocking, and fasteners necessary to attach audio-visual equipment to adjacent construction. Where necessary for proper performance and appearance, provide structural supports using slotted channel framing and other hardware required for a complete and secure installation.

   1. Install slotted channel framing according to manufacturer’s written instructions.
   2. Anchor slotted channel framing to supporting construction with anchors and fasteners necessary to support imposed loads and provide proper performance and appearance.
   3. Connect slotted channel framing members together to configuration necessary for proper function, performance, and appearance, using connectors, brackets, and fasteners recommended by manufacturer and suitable for application.
   4. Coordinate projection screen pocket dimensions with details shown on architectural drawings.

1.2 INSTALLATION

A. General: Install audio-visual equipment at locations indicated, complying with manufacturer’s written instructions and reviewed shop drawings.

B. Install audio-visual equipment to ensure proper relationship between components for optimum image quality. Adjust audio-visual equipment to height required by Owner. Install manufactured trim where audio-visual equipment penetrates acoustical ceiling panels.

C. Contractor to be in attendance at two formal programs utilizing each facilities system to provide any assistance necessary.

D. Provide Friction-Wedge shaft locks or security covers on all non-user operated equipment. Mark all user controls for normal operating conditions.

E. All connections are to be made with rosin core solder, crimp type connectors, ratchet-crimped spade lug types, or other appropriate termination devices

F. Mark all equipment and user controls for normal operating conditions per Owner.

G. Provide necessary AC power outlets inside equipment racks for all equipment.

H. Legibly identify input and output controls with lamicoid or other permanent labels. Use similar permanent means to identify all controls and electronic components (front and rear) in the system. Embossed "Dymo tape" labels, etc. are not acceptable.

I. Pre-set levels throughout each system and permanently mark equipment for future reference.

J. Fasteners and their supports shall be adequate to support their load with a safety factor of at least five (5). All mounting hardware to have an SAE rating of 5 or better. Licensed structural engineer must approve all structural and rigging components. All components shall be secured plumb and square. Provide detail for review.

K. Verify location of all equipment/devices with the Architect and Owner.

L. Minor items of equipment, etc. needed to fulfill the specifications and requirements and to provide a complete working system, even if not specifically mentioned herein, are to be supplied under this contract without additional claim for payment.

M. All equipment to be mounted in equipment racks/turrets with Torx-Post Security Screws.

N. All empty rack spaces are to be filled with blank or vented security covers. Appropriate type of security panel to be determined by method or rack cooling and method of nearby component cooling.

O. Provide permanent operational instruction guide in equipment rack(s).
P. All loose cables entering or exiting an equipment rack are to be contained in split loom tubing, or alligator skin wrap.

Q. All loose cables entering or exiting an equipment rack are to lay flat on the floor and not interfere with full operation of the equipment rack doors.

R. Install wiring in strict conformity with state-of-the-art practice. All work is to be performed with a high degree of craftsmanship.

S. Verify that conduits have been mechanically and electrically connected to receptacle boxes and building ground. Do not splice any lines in conduit.

T. Install all equipment neatly, plumb, square and true to line and level.

U. Execute, without claim for extra payment, moderate moves or changes as necessary to accommodate other equipment, proper viewing, or to preserve symmetry and pleasing appearance, and as required by engineer.

V. Approval by Owner and Consultant is required for any changes necessitated by field conditions.

W. Maintain the same individual in charge of work throughout execution, unless illness, loss of personnel, or other circumstances beyond the control of the Audio Contractor intervene.

X. All data and network installation associated with the audio system to be completed by BICSI certified technicians. Documented proof of certification to be provided upon request.

Y. Leave job site and all equipment, air filters, and materials clean and free from marks, blemishes, dust, and debris.

1.3 WIRING METHODS:

A. Install all audio system wiring in conduit or cable tray. All exposed cable not in conduit is to be a color approved by Owner/Architect.

B. Maximum cross-sectional area fill of conduits not to exceed 40% of internal area of conduit. Provide pullboxes at maximum intervals of 200' and every 270 degrees of bends.

C. Isolate all wiring, jacks, panels, etc. from conduit ground.

D. All microphone (low level) cables shall be continuous, without splices (joints), from point of origin to point of termination.

E. Splices in speaker and control cable will not be permitted, except within equipment cabinets, terminal cabinets, accessible junction boxes, or speaker backboxes.

F. Provide cable marker labels (equal to Brady B-500 series) at each end and at each splice in equipment cabinets, terminal cabinets and accessible junction boxes to correspond to circuit designations indicated on "As Built" drawings. Secure labels with clear heat shrink tubing. Use of Brady self-laminating labels is approved.

G. Terminate all audio cables within equipment racks, junction boxes, and terminal cabinets with spade-lug connectors, screw type terminal strips, or displacement type terminal strips. Connect spade lugs to cables by soldering or by crimping with Ratchet type compression crimpers.

H. Except when located in the equipment cabinets or junction boxes, make all audio splices/connections with rosin core solder or compression fittings made with compression crimpers.

I. Utilize 60% tin, 40% lead rosin-core solder for all solder type connections.

J. All a/c wiring within electronics equipment racks shall be installed in conduit in accordance with current NFPA, including all supplements. All plugs and receptacles used shall be of the isolated grounding type.

K. When conduit attaches to equipment racks or junction boxes, employ isolation fittings to prevent signal path ground loops.

L. All electronic cables within equipment racks, housings, and terminal cabinets shall be neatly tied with nylon cable ties at not more than 3' intervals, and shall be installed in accordance with the latest AES installation standards.

M. Label all cables (including power) at both ends and record on as-built drawings and details.
1.4 ACCEPTANCE

A. Upon completion of all tests and system set-up, Contractor is to notify the Consultant that the system is ready for final approval and test. At this time, system binder is to be presented to the Owner for prior evaluation.

1. If final acceptance is significantly delayed because of defective equipment or because of installation not in accordance with Contract Documents (as deemed by the Consultant), the Contractor shall directly pay for all additional time and expenses (including legal) of the Owner, Architect, and Consultant representatives during any resultant extensions of the acceptance testing period. This will include any/all costs associated with but not limited to additional site visits, travel, meetings, and coordination.

1.5 PROTECTION

A. After installation, protect audio-visual equipment from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION
LIGHT FIXTURES "EX" CURRENTLY CRATED IN STORAGE (LOCATED IN LEXINGTON)
LIGHT FIXTURE "EX" CURRENTLY CRATED IN STORAGE