## SECTION 011130 – AUDIOVISUAL SYSTEMS

<table>
<thead>
<tr>
<th>Table of Contents for this Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART 1 - GENERAL</strong></td>
<td></td>
</tr>
<tr>
<td>1.1. Summary</td>
<td>2</td>
</tr>
<tr>
<td>1.2. Definitions</td>
<td>2</td>
</tr>
<tr>
<td>1.3. Base System Description</td>
<td>3</td>
</tr>
<tr>
<td>1.4. Alternate(s) Description</td>
<td>6</td>
</tr>
<tr>
<td>1.5. Regulatory Requirements</td>
<td>7</td>
</tr>
<tr>
<td>1.6. Related Work</td>
<td>7</td>
</tr>
<tr>
<td>1.7.References</td>
<td>7</td>
</tr>
<tr>
<td>1.8. Project/Site conditions</td>
<td>8</td>
</tr>
<tr>
<td>1.9. Requirements Specific to this Project</td>
<td>8</td>
</tr>
<tr>
<td>1.10. Submittals</td>
<td>9</td>
</tr>
<tr>
<td>1.11. Warranty</td>
<td>14</td>
</tr>
<tr>
<td><strong>PART 2 - PRODUCTS</strong></td>
<td></td>
</tr>
<tr>
<td>2.1. General</td>
<td>14</td>
</tr>
<tr>
<td>2.2. Device Plates</td>
<td>15</td>
</tr>
<tr>
<td>2.3. Fixed Installation Cable</td>
<td>16</td>
</tr>
<tr>
<td>2.4. Pre-Manufactured and Adapter Cables</td>
<td>18</td>
</tr>
<tr>
<td>2.5. Connectors</td>
<td>19</td>
</tr>
<tr>
<td>2.6. Racks and Rack Accessories</td>
<td>21</td>
</tr>
<tr>
<td><strong>PART 3 - EXECUTION</strong></td>
<td></td>
</tr>
<tr>
<td>3.1. Preparation</td>
<td>22</td>
</tr>
<tr>
<td>3.2. Installation</td>
<td>22</td>
</tr>
<tr>
<td>3.3. Quality Control and Installation Verification</td>
<td>25</td>
</tr>
<tr>
<td>3.4. Contract Closeout</td>
<td>28</td>
</tr>
<tr>
<td><strong>APPENDIX A - DEMARCATION LIST</strong></td>
<td>29</td>
</tr>
<tr>
<td><strong>APPENDIX B - AV WEEKLY STATUS REPORT</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>APPENDIX C - AV ROOM READY CONDITIONS</strong></td>
<td>32</td>
</tr>
<tr>
<td><strong>APPENDIX D - STAGING AND VERIFICATION NOTIFICATION</strong></td>
<td>33</td>
</tr>
<tr>
<td><strong>APPENDIX E - CONTROL SYSTEM REQUIREMENTS</strong></td>
<td>36</td>
</tr>
<tr>
<td><strong>APPENDIX F - SUBMITTAL DRAWING CHECKLIST</strong></td>
<td>40</td>
</tr>
<tr>
<td><strong>APPENDIX G - EQUIPMENT LIST SPREADSHEET</strong></td>
<td>42</td>
</tr>
</tbody>
</table>
1.1. SUMMARY

A. The work covered under this Section consists of furnishing all labor, material and services to install a complete audiovisual system as shown on the Drawings and in these specifications.

B. The Integrator shall do all work which is shown on the Drawings, mentioned in the specifications or reasonably implied as necessary to complete the contract for this project.

C. The Integrator is responsible for assessing the conditions of the job site, and facilities for delivering, storing, placing, handling and installing of materials and equipment.

D. The Integrator is responsible for assessing the conditions of the job site including the RF environment for the wireless AV Ethernet network for all AV systems.

E. Failure to assess the site conditions or failure to examine any and all construction documents will in no way relieve the Integrator from the requirement of furnishing all materials and equipment, or performing any work, that may be required to complete the work in accordance with the Construction Documents.

F. Neglect of above requirements will not be accepted as reason for delay in the work or additional compensation.

G. The Scope includes but is not limited to:

1. Equipment and installation labor, including installation of Owner Furnished Equipment (OFE) as noted on the Drawings, for a fully functional system.
2. Miscellaneous components, hardware, interconnections and terminations required for proper operation of all systems.
3. All components or systems shown on the Drawings, referenced in these specifications, or both.
4. Verification of accuracy and completeness of equipment lists, dimensions, mounting details, and equipment compatibility.
5. Accurate documentation of the equipment and installation.
6. One year warranty of the equipment and installation.
7. Test equipment, tools, ladders, lifts and scaffolding required for installation.
8. Daily and final cleanup of debris caused by installation.

1.2. DEFINITIONS

A. Unless otherwise noted, the term Owner shall refer to the University of Florida.

B. Unless otherwise noted, the term Using Agency shall refer to the College of Pharmacy.

C. Unless otherwise noted, the term Architect shall refer to HOK.

D. Unless otherwise noted, the term General Contractor shall refer to BE&K.

E. Unless otherwise noted, the term Consultant shall refer to Waveguide Consulting, Inc.
F. Unless otherwise noted, the term Integrator shall refer to the AV Systems Integrator.

1.3. BASE SYSTEM DESCRIPTION

A. General:

1. The AV systems for the facility will be used primarily for research collaboration, presentations and academic instruction. The AV systems will provide a didactic presentation medium to support this teaching and communication.
2. Intersystem Connectivity:
   a. The Auditorium system will provide an overflow feed consisting of some combination of the active video camera and/or content to the Atrium Display Wall system and the first floor 30-/20-Seat Classrooms.
   b. The 30-/20-Seat Classrooms are combinable and can share content and speech reinforcement.

B. Auditorium (0133, 0134)

1. General: This space is designed to allow for presentations from multiple sources and locations. The Auditorium has a technician support space in the rear to allow a technician to facilitate the capture and/or broadcast of the session, or to assist in the making the presentation itself.
2. Video:
   a. The primary display shall consist of a suspended video projector in the booth at the rear of the Auditorium and fixed projection screen on the front wall. The projection screen is by others, and articulates to allow for the integration of program loudspeakers behind the screen.
   b. The technician shall have fully routable displays to preview cameras, monitor program content, preview sources, etc.
   c. There shall be an output from the system to the center-stage for far-end preview or teleprompter use.
   d. Several cameras shall be integrated into niches as shown on the Drawings for video capture of presenters and audience.
3. Audio:
   a. Local speech capture and reinforcement shall be provided by various wired and wireless microphones covering the entire Auditorium and Atrium areas. Speech shall be locally reinforced with distributed, in-ceiling loudspeakers.
   b. An assistive listening system shall be provided to comply with applicable codes.
   c. Local program audio reinforcement shall be provided by a center loudspeaker cluster located behind the projection screen on the front wall.
4. Input Locations:
   a. The presentation lectern shall be primarily located stage-right, but connections shall be provided at stage-left and center-stage locations.
   b. Various connections shall be provided, as indicated on the Drawings, for manned camera locations and press feeds.
   c. There shall be inputs in the booth for technician sources, both fixed and portable.
d. There shall be inputs for portable sources in the Atrium.

5. Intercom and Talkback:
   a. A production intercom system shall be provided at potential manned camera locations throughout the space.
   b. The technician shall also have a talkback microphone to facilitate communications with the space during setup.

6. Intersystem Connections:
   a. Provisions shall be made to provide inputs and outputs for connection to the Atrium Video Wall display, as indicated on the Drawings.
   b. The technician in A/V (0134) shall be capable of mixing live audio for events using a digital console, and controlling cameras using a camera control unit and touch panel interface. The technician shall also have a talkback microphone to facilitate communications with the space during setup.
   c. Provisions shall be made to provide inputs and outputs for future connection to a future AV Control Room and future Video Wall display, as indicated on the Drawings.

7. Controls:
   a. A wired touch panel shall be provided on the lectern, a wireless touch panel shall be provided in the booth, and a keypad shall be provided in the Atrium, as indicated on the Drawings.
   b. The system shall include various controls and automated functions as described herein including, but not limited to, room controls such as the lighting and motorized shades. Additional control system programming requirements are defined in Appendix E herein.

C. Atrium Video Wall (0101)

1. General: A simple video wall will be provided in the Atrium to support pre-function presentations and support digital signage initiatives. The video wall will be composed of flat panel displays with integral video compositing capabilities.
2. Video: Video will be displayed on a video wall array of flat panel displays that constitute one logical display as indicated on the Drawings. The primary source for the video wall be a digital signage player located in A/V (0134). Additional sources include an overflow feed from the Auditorium system consisting of a live video camera and/or content, and local laptop presentation via a wall plate in the Atrium.
3. Audio: Program and speech audio will be reinforced with ceiling-recessed loudspeakers in the Atrium ceiling. Speech audio will be reinforced with a wireless microphone system and remote antennas providing coverage throughout the Atrium.
4. Intersystem Connections: The Atrium Video Wall system will connect to the Auditorium system for overflow and pre-function support.
5. Controls: A wall-mounted keypad with a security cover located in the Atrium will provide source selection and audio level control. Additional control system programming requirements are defined in Appendix E herein.

D. 30-/20-Seat Combinable Classrooms (0131/0132, 0231/0232, 0331/0332)

1. General: There will be three each 30-/20-Seat Combinable Classrooms vertically stacked on the first three levels of the building. Each pair of 20/30-Seat Classrooms will be separated by an operable division and the AV system will allow for the
combining of these systems when the operable division is open. Speech reinforcement will be provided to account for the potentially larger audience when the classrooms are combined. When combined both front projection systems will be used to provide an appropriate viewing experience for the combined group.

2. **Video**: Two front projection systems will produce the primary image. When the spaces are combined, the projectors will display the same image.

3. **Audio**: Program audio will be reinforced with distributed ceiling loudspeakers. Presenter speech will be reinforced when the rooms are combined with a wireless lavaliere microphone and the same distributed ceiling loudspeakers.

4. **Intersystem Connections**: Each pair of 30-/20-Seat Combinable Classrooms will connect to the other to allow for combined session support when the operable partition separating them is open. Additionally, the 30-/20-Seat Combinable Classrooms on the first floor will support overflow audio and video from the Auditorium system.

5. **Controls**:
   a. A wired touch panel shall be provided on the lectern as indicated on the Drawings.
   b. The system shall include various controls and automated functions as described herein including, but not limited to, room controls such as the lighting and motorized shades. Additional control system programming requirements are defined in Appendix E herein.

E. **72-Seat Classrooms (0234, 0333, 0334)**

1. **General**: There will be three 72-Seat Classrooms on levels two and three of the building. Two of these spaces will be tiered, and one will be flat-floored. These spaces will serve primarily as classrooms and the AV systems for these spaces will allow for multimedia presentations from the presenter’s lectern.

2. **Video**: Front projection system.

3. **Audio**: Distributed ceiling loudspeakers for speech and program audio.

4. **Controls**:
   a. A wired touch panel shall be provided on the lectern as indicated on the Drawings.
   b. The system shall include various controls and automated functions as described herein including, but not limited to, room controls such as the lighting and motorized shades. Additional control system programming requirements are defined in Appendix E herein.

F. **Skills Lab (0435)**

1. **General**:
   a. There will be one Skills Lab on the fourth level. This space will primarily be used as lab space.
   b. The Skills Lab will be nearly identical to the 72-Seat Classrooms design, but will also support a ceiling-mounted camera for local image magnification as an additional AV presentation source.

G. **Aging Conference Room (0142)**

1. **General**: There will be one Aging Conference Room located on the first level in the research area. The conference room will serve the UF Institute on Aging. The space will be designed to support typical presentations.
2. Video: Wall-mounted flat panel display.
3. Audio: Distributed ceiling loudspeakers for program audio and table microphones for local speech broadcast to remote sites.
4. Controls:
   a. A flip-top style keypad control will be integrated into the conference room table.
   b. The system shall include various controls and automated functions as described herein including, but not limited to, room controls such as the lighting and motorized shades. Additional control system programming requirements are defined in Appendix E herein.

H. Research Conference Rooms (0362, 0462)

1. General: There will be two identical Research Conference Rooms on the third and fourth levels of the building. These spaces will be configured for local presentations and videoconferencing. Anticipated source equipment includes an Owner-furnished computer with wireless keyboard and mouse. A laptop input will be provided at the table. These conference rooms will support high-quality, integrated, HD videoconferencing.
2. Video: Wall-mounted flat panel display.
3. Audio: Distributed ceiling loudspeakers for program audio and table microphones for local speech broadcast to remote sites.
4. Controls:
   a. A wired touch panel shall be provided on the table as indicated on the Drawings.
   b. The system shall include various controls and automated functions as described herein including, but not limited to, room controls such as the lighting and motorized shades. Additional control system programming requirements are defined in Appendix E herein.

I. Academic Conference Room (0426)

1. General: There will be one Academic Conference Room located on the fourth level in the academic area. The conference room will serve the academic administration and provide traditional conference support and basic videoconferencing.
2. Video:
3. Audio:
4. Controls:
   a. A wired touch panel shall be provided on the lectern as indicated on the Drawings.
   b. The system shall include various controls and automated functions as described herein including, but not limited to, room controls such as the lighting and motorized shades. Additional control system programming requirements are defined in Appendix E herein.

1.4. ALTERNATE(S) DESCRIPTION

A. None.
1.5. REGULATORY REQUIREMENTS

A. All equipment and installations under this contract shall conform to the following:

1. ANSI/NFPA 70 National Electrical Code.

B. Integrator shall be solely responsible to possess or obtain all permits and certificates required to complete this project.

C. Integrator and employees shall perform all work in compliance with current Occupational Safety and Health Administration (OSHA) guidelines and regulations.

1.6. RELATED WORK

A. The Integrator shall coordinate with other trades and interface with other base building systems to ensure proper integration and operation of AV systems. The Integrator should request from the Owner, General Contractor or Architect complete project design drawings and specifications to coordinate their work with the work of others.

B. The Integrator shall coordinate with the General Contractor to establish AV room ready dates. See 0.

C. A representative of the AV Integrator shall attend construction meetings at the job site. This representative shall have the authority to make commitments on behalf of the AV Contractor.

D. Refer to Appendix A for specific system demarcations between the Integrator and other trades.

E. AV system and control system software.

1. Integrator shall design all graphical user interface design for all AV control touch panels for the AV systems noted in these specifications and on the Drawings. The Integrator shall review these designs with the Consultant for approval.
2. Integrator shall create all customized code for all control systems noted in these specifications and on the Drawings.
3. Integrator shall load software and configuration files into all programmable AV and control system devices.
4. Integrator shall set up and configure all programmable AV and control system devices as specified in Paragraph 3.3 and as directed by the Consultant.

1.7. REFERENCES


1.8. PROJECT/SITE CONDITIONS

A. Refer to Division 1 of the general construction documents for this project for coordination with other trades on this project.

B. Coordinate all access to the site at all times with the General Contractor and the Owner.

C. Adhere to the safety standards established by the General Contractor and the Owner while performing work on site.

D. All employees of the Integrator shall wear identification clearly indicating the Integrator’s company while on site.

E. All employees of the Integrator shall comply with rules and policies established by the Owner.

F. All vehicles of the Integrator or employees shall be parked in areas designated by the Owner.

G. Store equipment in a manner that will not interfere with others. Coordinate secured storage at the site with the General Contractor and the Owner.

H. Do not install equipment in any space not designated by the General Contractor as “AV room ready”. See 0.

I. Protect all work and equipment installed under this contract from damage by others.

J. Protect all existing work in place by others from damage by the Integrator, the Integrator’s agents/sub Integrators, or any employees, agents or sub Integrators of the Integrators vendors. The Integrator will be solely responsible for any/all damage to work in place by others.

K. Keep areas around and inside of each piece of equipment and each rack free from dust, dirt and debris throughout the project. Equipment that is not properly maintained during installation shall be replaced at no cost to the Owner before final payment is made to the Integrator.

L. All equipment and materials stored at the Integrators facility(s) or stored and/or installed at the project site will remain the property of the Integrator unless ownership is specifically assumed in writing by the Owner. The Integrator shall be solely responsible for the protection of all equipment from damage, theft or vandalism regardless of cause, until ownership is specifically assumed in writing by the Owner or the work described here in is accepted by the Owner at the time of official turnover.

1.9. REQUIREMENTS SPECIFIC TO THIS PROJECT

A. Integrator Qualifications

1. Integrator shall be an authorized reseller of all equipment provided.
2. Warranty service as defined herein shall be performed by the Integrator.
3. The Integrator shall include firm information with the bid including: staff size, total number of offices, a statement indicating whether or not the Integrator's primary business is audiovisual system contracting, and a statement of the number of immediate years the Integrator has been regularly engaged in providing and installing systems of this type and size.
4. The Integrator shall include with the bid resume(s), including years of experience, project experience, training and certifications, for proposed project team members including: project manager, project engineer, lead installer, and lead programmer.
5. The Integrator shall include with the bid a list of three to five recent projects of similar size and scope and include the following information:
   a. Project name, address, and description indicative of similarities to this project
   b. Name of primary contact and telephone number
   c. Design consultant (if applicable)
   d. Completion date
   e. Contract amount
   f. Change order amount
   g. Project manager, project engineer, lead installer, and lead programmer
   h. Indicate whether or not the project was completed on time, and if not explain why not

1.10. SUBMITTALS

A. General
   1. Unless directed otherwise in writing by the Consultant, the Integrator is not authorized to proceed with the acquisition, assembly or installation of any systems or components until the submittals outlined in this Section have been approved by the Consultant. Any acquisition, assembly or installation of any systems or components without the Consultant’s approval will be subject to removal at the Integrator’s expense.
   2. A submittal package consists of all items (forms, lists, drawings, etc.) specified for that submittal.
   3. All specified items for each submittal shall be provided at the same time. Partial or incomplete submittals will be rejected.
   4. The Integrator shall coordinate with the Consultant prior to the delivery of each Submittal to obtain the proper quantities of submittals to each recipient.
   5. Refer to Paragraph 1.10.C.2.i. for deadlines for each Submittal.
   6. Product cut sheets shall not be submitted for products listed in Part 2 or Appendix G of this specification.
   7. Product cut sheets shall be submitted for all products provided by the Integrator that are not listed in Part 2 or that are indicated as “Equal as Approved” or “Or Equal” in Appendix G of this specification.
   8. Product cut sheets shall accompany all requests for product substitutions for any reason.
   9. Provide samples of each label type to be used. See Paragraph 3.2.D.
   10. Consultant or Architect will notify Integrator if any sample products are required for fit or finish coordination. Samples shall be provided by the Integrator at no additional cost to the project, Consultant or Architect.
   11. The Integrator’s drawings shall conform to the following:
      a. Fonts must be legible (suggested minimum 1/16” on 11x17 prints).
      b. CAD files must be exportable to AutoDesk Drawing (.dwg) format.
c. AV plans for indicating AV equipment layouts shall be scaled to be not less 1/8" = 1'-0". Details for particular equipment mounting shall be scaled to be not less than 1/4" = 1'-0".

B. Weekly Status Reports:

1. The Integrator shall provide weekly status reports using the Consultant’s “Weekly Status Report” form noted in Appendix B (or equivalent form approved by the Consultant).

2. Weekly status reports shall be provided at least one business day prior to each weekly Owner's meeting from the date of the Letter of Intent to Award until the Contract Closeout.

3. These reports shall be provided to the Architect, General Contractor and Consultant via email.

4. The Weekly Status Report shall not be used as an official means of communications. It does not replace any part of a submittal, request for information, proposed change order, report of field conditions, schedule issues, etc. No official response will be given to the Weekly Status Report.

C. Project Plan Submittal:

1. Submit project team list. Include names and all contact information (email address, cell phone, etc.) for the Integrator’s Project Manager, Lead Engineer, Lead Installer and any other pertinent team members. Include names and contact information for all sub-contractors.

2. Submit project schedule in both Adobe Acrobat Document (.pdf) and native file formats.

   a. Include all milestones listed below as well as other significant milestones, activities or deadlines by others that may impact the project schedule.

   b. Integrator shall revise and keep the schedule current and accurate throughout installation and shall publish updated schedules as required

   c. Include shop rack assembly, on-site cable installation, all staging, on-site equipment installation and all Consultant verifications.

   d. Schedule shall be coordinated with the general construction schedule and shall include the General Contactor’s anticipated AV room ready dates and completion date of lighting presets programming where applicable.

   e. Schedule shall meet the anticipated first use of the Owner with adequate time allowed for setup, verification and punchlist correction of all systems.

   f. Indicate the sequence and anticipated dates of acquisition of major equipment and installation milestones.

   g. Indicate the sequence of installation and completion by room and/or system.

   h. Work shall not commence without the approval of the General Contractor and the Owner.

   i. Below are anticipated project milestones target dates. Note that while milestones may vary due to site or other conditions the anticipated first use date will not change without written approval of the Owner.

<table>
<thead>
<tr>
<th>Milestone / Deliverable</th>
<th>Calendar Days or Specific Date</th>
<th>Specification Paragraph Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Plan Submittal</td>
<td>5 days after Letter of Intent</td>
<td>1.10.C</td>
</tr>
<tr>
<td>Long Lead Equipment Submittal</td>
<td>10 days after Letter of Intent</td>
<td>1.10.C</td>
</tr>
</tbody>
</table>
AV Furniture Submittal  TBD by Integrator
Full Project Submittal  TBD by Integrator  1.10.E.1
Control System Programming  TBD by Integrator  Appendix E
Shop Staging for Auditorium and one Research Conference Room  TBD by Integrator  3.3.B
On-site Staging for Auditorium and 30-/20-Seat Combinable Classrooms (0131/0132)  TBD by Integrator  3.3.C
Full Project Verification  TBD by Integrator  3.3.D
Final Project Verification  TBD by Integrator  3.3.E
Training  Summer 2012 – TBD  3.3.F
First Use  Summer 2012 – TBD
Contract Closeout  Summer 2012 – TBD  3.4

D. Long Lead Time Equipment Submittal:

1. Submit a list of long lead items.
   a. These are items that must be ordered before Full Project Submittals are due to not adversely impact the project schedule.
   b. Do not include equipment that will be ordered later.
   c. This list shall be in the format of the equipment list noted in Appendix G.

2. The Integrator shall use reasonable judgment as to which products are legitimate long lead items.

3. Failure to include an item that may require long lead time shall not relieve the Integrator of the responsibility of furnishing said item to meet the project schedule.

E. Sample Drawing Submittal:

1. The Integrator shall submit sample drawings in hard copy or Adobe Acrobat Document (.pdf) format for the Research Conference Room system for approval of the Integrator’s drawing style and detail methodology.

2. Include all information required in Paragraph 1.10.A. and Appendix F.

F. Full Project Submittal:

1. Equipment list in the form of Appendix G. Provide in Adobe Acrobat Document (.pdf) format.

2. Shop Drawings
   a. All sheets shall be the same size, oriented the same direction, and shall be bound, not folded. Provide in Adobe Acrobat Document (.pdf) format.
   b. All information required in Paragraph 1.10.A. and Appendix F shall be included.
   c. All information and corrections from the sample drawing review shall be included.

G. AV Furniture Submittal:

1. Shop Drawings
   a. All sheets shall be the same size, oriented the same direction, and shall be bound, not folded. Provide in Adobe Acrobat Document (.pdf) format.
   b. All information required in Paragraph 1.10.A. and Appendix F shall be included.

2. Samples
   a. Provide finish samples for selection by the Architect.

H. Shop Staging Notification:

1. Five days prior to Shop Staging the Integrator shall provide notification to the Consultant stating that all rooms listed in the schedule Paragraph 1.10.C.2.i. meet all conditions listed in Paragraph 3.3.B.
   2. Notification shall be in accordance with Appendix D.

I. On-site Staging Notification:

1. Five days prior to On-site Staging the Integrator shall provide notification to the Consultant stating that all rooms listed in Paragraph 3.3.C. meet all conditions listed in Paragraph 3.3.C.
   2. Notification shall be in accordance with Appendix D.

J. Full Project Verification Notification:

1. Five days prior to Full Project Verification the Integrator shall provide notification to the Consultant stating that all rooms listed in Paragraph 3.3.D. meet all conditions listed in Paragraph 3.3.D.
   2. Notification shall be in accordance with Appendix D.

K. Final Project Verification Notification:

1. Five days prior to Final Project Verification the Integrator shall provide notification to the Consultant stating that all rooms listed in Paragraph 3.3.E. meet all conditions listed in Paragraph 3.3.E.
   2. Notification shall be in accordance with Appendix D.

L. Preliminary Project Record Documents Submittal

1. The Integrator shall submit Preliminary Project Record Documents at Final Project Verification.
   2. Preliminary Project Record Documents shall:
      a. be based on corrected/updated shop drawings
      b. include an updated equipment list in the Form of Appendix G.
      c. include half size drawings modified to reflect the actual installation
      d. include CD-ROM with manufacturer’s operation manuals arranged alphabetically and current drawings AutoDesk Drawing (.dwg) format.
M. Project Record Documents Submittal

1. Within 30 days following Final Project Verification, the Integrator shall submit complete Project Record Documents.
2. Project Record Documents shall include corrections and markups from the Preliminary Project Record Documents.
3. Project Record Documents shall consist of:
   a. Full size Record Drawings.
      1) Drawings shall meet all requirements listed in Paragraph 1.10.A.
      2) Drawings shall be based on approved Preliminary Project Record Documents.
      3) Drawings shall show the actual “As Built” condition of all AV systems.
         Include all information listed in Appendix F.
      4) All calculated figures shall be replaced with field verified values.
      5) All equipment “as left” settings and adjustments shall be indicated on drawings. Include all information listed in Appendix F.
   b. Product Information Binders shall consist of the following information, with section dividers.
      1) Title page and table of contents
      2) Warranty Statement
      3) Provide a one-year system warranty as indicated in Paragraph 1.11. Indicate warranty start and end dates, scope of warranty and conditional limitations. Indicate excluded items.
      4) Indicate procedure for obtaining telephone support and onsite service. Include a list indicating Integrator’s name, address, e-mail address and service department telephone number.
      5) Equipment list: Final equipment list broken out per room with serial numbers for each device. Include the ending date of the manufacturer’s warranty period for each product.
      6) Equipment manuals: Alphabetically arrange manufacturer’s operation manuals.
      7) Key schedule with three duplicates of each key required for operation of the systems.
      8) Half-size set of Record Drawings.
   c. Provide electronic copies to the Owner of the following:
      1) Software based control system code (user interface software and program)
      2) All custom or purpose created software, including original source code written with remark statements to document function of sub routines, macro’s and program requirements.
      3) All DSP and specific device application software in its final configuration.
      4) All equipment “as left” settings, levels, and adjustments indicated on drawing.
      5) Final equipment list with warranty and serial number information as noted in Paragraph 1.10.M.3.b.5).
      6) Record Drawings in Adobe Acrobat Document (.pdf) format.
      7) Record Drawings in AutoDesk Drawing (.dwg) format.
1.11. WARRANTY

A. Provide warranty repair or replacement for one year on all products provided by the Integrator (including products having a manufacturer’s warranty of less than one year) and all Integrator workmanship at no additional cost, except in case of obvious abuse. Consumable items such as lamps, batteries, tapes, etc. are not covered.

B. During the warranty period the Integrator shall:

1. Provide telephone support within 4 hours of a call requesting service.
2. Provide onsite support within 24 hours of a call requesting service that was not corrected by telephone support.
3. Repair or replace faulty items within 72 hours of on-site service or within manufacturers’ specific repair program whichever is quicker.

C. Integrator shall not involve the Owner or Using Agency with removing, re installing equipment, shipping or receiving equipment being repaired under warranty, nor shall the Owner or Using Agency be responsible for any shipping or freight charges associated with any item under warranty.

D. Both the Consultant and the Owner or Using Agency shall be copied with all paperwork related to any/all warranty work during the Warranty period.

E. The Warranty Period will commence no sooner than the date of first beneficial use by the Owner or Using Agency (whoever is first) and no later than the date of Contract Closeout.

PART 2 - PRODUCTS

2.1. GENERAL

A. Acceptable Products are listed below and in Appendix G and establish the Basis for Design for the AV systems.

B. Integrator shall be fully responsible for making a substitute product match the requirements, description and functionality of the originally specified product regarding all options, accessories and external interface requirements.

C. Where a comparable product by another manufacturer is listed but a specific model number is not indicated, the comparable product must meet all listed specifications of the primary specified product as a minimum, and the primary specified product (manufacturer and model number) shall be used as the basis of design.

D. B-stock, previously installed, refurbished or used equipment shall not be provided on this project.

E. All products shall be new and under warranty at the time of installation.

F. Where the specification lists several manufacturers for a major item, or group of items, the Integrator shall provide all of those items from one manufacturer (i.e., all Type A loudspeakers shall be brand “X” not a combination of brands “X” and “Y”).
G. The Integrator shall provide all options, accessories and hardware necessary to meet the function of the design even if they are not specifically listed (e.g., rack mount kits, separate or additional power supplies, input modules, transformers, etc.).

H. The acceptability of a proposed substitution shall be considered under the following terms listed in the “Substitutions” column of Appendix G:

1. The term "No Substitutions" shall denote that only the listed product(s) are acceptable and no substitutions will be considered or approved.
2. The term "Equal as Approved" shall denote that equivalent products will be considered as substitutes for the specified products.
3. The term "Or Equal" shall denote that functionally equivalent products shall be acceptable without written approval by the Consultant.

I. Where a specified item has been discontinued by the manufacturer and/or replaced by a new model, the Consultant may require submission of the new model for evaluation prior to acceptance as a substitute.

J. Product substitution is allowed only by expressed written consent of the Consultant and only before the Bid is received.

K. Unless a specified product has been discontinued by the manufacturer, there shall be no product substitution after the issuance of the Contract Award, Notice to Proceed, or Letter of Intent to Award, whichever is earlier.

L. The Integrator is solely responsible for the completeness and accuracy of take-offs and bids.

1. Appendix G is the Consultant’s good faith effort to provide an AV equipment list based on the Drawings and Specifications. However, Integrators are cautioned that the list may not be complete, may have discrepancies against the Drawings, and may not indicate all pertinent information required to prepare an accurate bid.
2. Determination of final quantities to meet the function of the design shall be the sole responsibility of the Integrator.

2.2. DEVICE PLATES

A. Wall / Floor/ Ceiling Mounted Device Plates:

1. NEMA gang type plates shall be standard or jumbo size as required at each plate location.
2. Plates larger than NEMA 2-gang type plates shall be 1/8" aluminum or 1/16" stainless steel.
3. All plates shall be sized to cover the mounting box and rough opening.
4. All text and graphics shall be engraved.
5. Finish to be approved by Architect.
6. Connectors shall be fixed to plates and panels using screws and nuts, or by using the mounting method integral to the connector. Rivets are not acceptable.
7. Detailed drawings of plates panels showing information required in Appendix F shall be submitted prior to fabrication. No exceptions.
8. Provide blank plates with approved finish for ALL AV System wall, floor and ceiling boxes that do not have receptacles.
9. At all non connectorized pass-throughs provide a secured grommet in ceiling, wall or plate.
10. Acceptable manufacturers
   a. ProCo Plateworks® / Captain NEMA®, RCI, Wireworks, Whirlwind, Panel Authority, Panel Crafters
   b. Integrator

B. Rack Mounted Panels

1. Rack panels with connectors, switches, controls, etc., shall be 16-gauge, flanged construction.
2. All text and graphics shall be engraved.
3. Finish shall match rack unless noted otherwise.
4. Detailed drawings of panels showing information required in Appendix F shall be submitted prior to fabrication. No exceptions.
5. Acceptable manufacturers
   a. ProCo Plateworks® / Captain NEMA®, RCI, Wireworks, Whirlwind, Panel Authority, Panel Crafters
   b. Integrator

2.3. FIXED INSTALLATION CABLE

A. General:

1. Following are cable types for fixed installation within the base building raceway and within fixed AV equipment racks. Unless specifically noted elsewhere, these are NOT acceptable for user interface cables used in lecterns/credenzas or for connection of portable equipment.
2. Do not exceed cable manufacture’s pull-force or bend radius recommendations.
3. All cable used on this project shall be rated for plenum use unless specified otherwise.
4. All speaker cable shall be sized by the Integrator to produce less than 1dB of loss in the speaker/cable circuit.
5. All video cable shall be sized by the Integrator to meet the criteria listed in Paragraph 3.3.
6. Integrator shall select the UTP cable type (Cat 5, Cat5e, Cat6, “media”/”low skew”, etc.) for correct operation of AV over UTP equipment.

B. Audio or Video over “media”/”low skew” installed UTP cable (NOTE: not for use in EIA/TIA rated applications): Four pair, solid conductor, #23 AWG UTP.

1. Liberty TRUphase-P
2. Comparable product by Belden, Extron, Altinex.

C. Audio or Video over UTP portable patch cable: Four pair, stranded, #23 AWG UTP.

1. Liberty 24-4P-P-L5-* (* = color designator)
2. Comparable product by Belden, Comm/Scope, West Penn.

D. EIA/TIA rated Category 6 UTP: Four pair, solid conductor, #23 AWG UTP.

1. Liberty 24-4P-P-L6-* (* = color designator)
2. Comparable product by Belden, Comm/Scope, Gepco, West Penn.
E. AMX or Crestron Control Cable: Two pair - one pair shielded, one pair unshielded. Unshielded pair #18 AWG; shielded pair #22 AWG. NOTE: Also acceptable for use within lecterns.
   1. Liberty AXLINK-P
   2. Comparable product by West Penn Wire, Belden.

F. Mic or Line Level Signal: Single twisted pair, overall shield, #22 AWG.
   1. Liberty 22-2C-PSH-WHT
   2. Comparable product by West Penn Wire, Belden, Gepco.

G. Mic or Line Level Signal with Pair for Contact closure: Two pair- one pair shielded, one pair unshielded. Both pair #22 AWG.
   1. Liberty 22-2P-PINDSH-WHT
   2. Comparable product by West Penn Wire, Belden, Gepco.

H. Speaker Level: 16/2 UTP with overall jacket.
   1. Liberty 16-2C-TTP-* (* = color designator)
   2. Comparable product by West Penn Wire, Belden, Gepco.

I. Speaker Level: 14/2 UTP with overall jacket.
   1. Liberty 14-2C-TTP-* (* = color designator)
   2. Comparable product by West Penn Wire, Belden, Gepco.

J. Speaker Level: 12/2 UTP with overall jacket.
   1. Liberty 12-2C-TTP-* (* = color designator)
   2. Comparable product by West Penn Wire, Belden, Gepco.

K. Speaker Level: 10/2 UTP with overall jacket.
   1. Liberty 10-2C-TTP-WHT
   2. Comparable product by Belden.

L. Wireless Mic Antenna Coax Cable (less than 75'): RG-58/U
   1. Liberty RG58-CMP-WHT
   2. Comparable product by West Penn Wire, Canare, Gepco, Comm/Scope.

M. Base Band Video Cable: RG-59/U
   1. West Penn WP25819
   2. Comparable product by Belden, Canare, Gepco, Comm/Scope, Liberty.

N. CATV, MATV, or CCTV Trunk Line: RG-11/U Quad Shield
   1. Liberty RG11-QUAD-PL-WHT
   2. Comparable product by West Penn Wire, Canare, Gepco, Comm/Scope.

O. CATV, MATV, or CCTV Drop Line: RG-6/U Quad Shield
1. Liberty RG6-QUAD-CMP-WHT
2. Comparable product by Belden, Canare, Gepco, West Penn Wire, Comm/Scope.

P. Super High Resolution RGBHV Cable: Five (5) RG-59 super high resolution coax cables, in an overall jacket.
1. West Penn WP258195
2. Five (5) West Penn WP25819

Q. Miniature High Resolution Cable: Five (5) miniature high resolution coax cables, in an overall jacket, terminated with BNC connectors. **NOTE: This type cable is a high loss cable. Consider requirements of Paragraph 3.3.C.5.b, before selecting this cable.**
1. Liberty RGB5C-25-CMP
2. Comparable product by Extron, Belden, Canare, Gepco, West Penn Wire, Comm/Scope

R. AES3: Single twisted pair, overall shield, #24 AWG, Non-Plenum.
1. Liberty 24-“P-P-DIG-AUDIO
2. Comparable product by Belden, Canare, Gepco, West Penn Wire, Comm/Scope

S. HD, SDI, and video tie lines: RG-6/U
1. Belden 1695A
2. Comparable product by Liberty, Extron, Canare, Gepco, West Penn Wire, Comm/Scope

T. General Control Cable: Plenum rated, AWG, number of conductors, pairs and/or shield depending on specific control function (e.g., IR, RS 232, dry closure, etc.).
1. Liberty model # as required to meet functionality
2. Comparable product by Belden, Gepco, West Penn Wire, Comm/Scope

U. Lectern, credenza, cart and portable cables:
1. Use highly flexible, pre made or molded cables.
2. Select AWG, number of conductors, pairs and/or shield as required depending on specific function.
3. Acceptable Manufacturers: Bi Tronics, HOSA, Mogami, Extron, Canare, MarkerTek, Tek Net, Comprehensive or HAVE.

V. Additional cable types as required. Cable type shall be approved by the Consultant prior to use.

2.4. PRE-MANUFACTURED AND ADAPTER CABLES

A. S-video Cable: 4pin DIN to 2 x BNC Female. Lengths as required.
1. Liberty E-SVM-2BNCF
2. Comparable product by Extron.
2.5. CONNECTORS

A. 1/4 Inch Cable Connectors: Non long frame type.
   1. Neutrik “NP” Series
   2. Comparable product by Switchcraft.

B. BNC Cable Connectors: 3 piece, true 75Ω crimp type.
   1. Acceptable manufacturers: Kings, Liberty, Extron, Canare, ADC, Trompeter, Cambridge
   2. Connector shall be compatible with cable type.

C. F Cable Connectors: True 75Ω crimp type.
   1. Acceptable manufacturers: Gilbert, Trompeter, T&B
   2. Connector shall be compatible with cable type.

D. Loudspeaker Cable Connectors: 4 or 8 pole.
   1. Neutrik Speakon NL4FC or NL8FC
   2. Comparable product by Switchcraft.

E. IHF (RCA) Audio Cable Connectors: For all IHF (RCA) audio jacks, gold center pin, spring type strain relief.
   1. Canare F 09
   2. Comparable product by Switchcraft.

F. IHF (RCA) 75Ω Video Cable Connectors: For all IHF (RCA) video jacks.
   1. Canare RCAP C series
   2. Comparable product by Trompeter
3. Connector shall be compatible with cable type and shall be installed using factory approved tool and die.

G. XLR Cable Connectors: Number of pins as required.
   1. Black shell with gold pins, unless otherwise noted.
   2. Neutrik “XX” series
   3. Comparable product by Switchcraft

H. 1/4 Inch Panel Connectors: All conductors shall be insulated from panel.
   1. Neutrik “NJ” series
   2. Comparable product by Switchcraft

I. Recessed BNC Panel Connectors: Shield shall be insulated from panel, shell finish to match adjacent surfaces.
   1. Neutrik NBB75DFIB
   2. Comparable product by Canare

J. Non-recessed BNC Panel Connectors: Shield shall be insulated from panel, shell finish to match adjacent surfaces.
   1. Neutrik NBB75FI
   2. Comparable product by Canare (with insulating washers) for floor boxes (non recessed).

K. Recessed F Panel Connectors: Feed thru type, female to female. Shield shall be insulated from panel.
   1. Canare FJ JRU
   2. Comparable by Trompeter, ADC.

L. Non-recessed F Panel Connectors: Feed thru type, female to female. Shield shall be insulated from panel.
   1. Canare FJ JR
   2. Comparable by Trompeter, ADC.

M. Loudspeaker Panel Connectors: 4 or 8 pole.
   1. Neutrik Speakon NL4MP or NL8MP
   2. Comparable product by Switchcraft

N. IHF (RCA) 75 Ohm Video Panel Connectors: Shield shall be insulated from panel. Color code as shown on the Drawings.
   1. Canare RJ RU
   2. Comparable product by Switchcraft.

O. RJ 45 Panel Connectors: Recessed Cat 5 or Cat 5e compliant, 8 contacts, Latch hook Retention of RJ45 plugs, 110 Punch down IDC terminals on rear.
   1. Neutrik NE8FAV Y110
2. Comparable product.

P. XLR Panel Connectors: Black shell, gold pins.
   1. Neutrik “D” Series
   2. Comparable product by Switchcraft.

Q. 3.5mm (1/8”) Cable Connectors: Mini TRS for balanced mono audio or unbalanced 2 channel audio.
   1. Canare F-12
   2. Comparable product by Switchcraft.

R. BNC Terminators: 75Ω, 1%.
   1. Canare BCP *
   2. Comparable product by Trompeter, ADC.

S. Electrical/Electronic Hardware: Telco 66 type punch blocks are not acceptable. All materials located in plenum spaces must be plenum rated.
   1. Terminal barrier strips - provide marker strips
      a. Phoenix UK
      b. Comparable product by Cinch, Beau.
   2. Split ring punch block - provide marker strips
   3. ADC ICON series

2.6. RACKS AND RACK ACCESSORIES

A. All accessories shall be from the same manufacturer as the rack enclosure.

B. Provide the following accessories for each rack shown on the Drawings.
   1. Side panels for each individual rack or for end racks of each group of racks.
   2. Solid or fan top as shown on the Drawings and solid rear door.
   3. Grounding stud in top rear of rack.
   4. Full height rear mounting rails
   5. Full height solid copper bus bar bonded to rack.
   6. Rack work light.
   7. Horizontal lacing bars (as required).
   8. Blank Panels as necessary to close front of rack.
   9. Vents, blowers, fans and fan packs as necessary to properly dissipate heat.
   10. Power distribution as required.
   11. Caster base as shown on the Drawings or as dictated by field conditions.
PART 3 - EXECUTION

3.1. PREPARATION

A. Before starting installation, verify proper installation of the following work by others:

1. Backboxes and conduit– installed per the Drawings and these specifications.
   a. Stub outs finished with j boxes or insulated bushings on end of conduit.
   b. Pull boxes installed per NEC based on total number of turns and angles and on linear feet of conduit.
   c. Pull strings inside all conduits.

2. 120VAC power circuits, isolated ground conductors and equipment ground conductors
3. Fixed millwork
4. Cable tray
5. Supports or blocking for flat panel displays
6. Projector support for ceiling mounted projectors

B. Provide written notification to the Architect and Consultant of any problems impacting the Integrator’s work. Failure of the Integrator to notify the Architect and Consultant in a timely manner of incomplete, inadequate, unfinished, or otherwise unacceptable prerequisite work by other trades in the base building infrastructure will not relieve the Integrator of the responsibility to complete the work under this contract.

3.2. INSTALLATION

A. General:

1. All equipment and enclosures described in this specification shall be installed plumb and square unless specifically detailed otherwise.
2. All equipment, except that designated as movable, portable or loose equipment, shall be secured and permanently attached to racks or structure in a manner which will require the use of a tool (e.g., screw driver, nut driver, etc.) for removal.
3. All supports shall meet or exceed the load requirements of the intended application with a minimum safety factor of five.
4. Support hardware shall have SAE Grade 8 load rating (min.).
5. All equipment mounted overhead that has a composite weight, including mounting hardware and brackets, of forty pounds or more shall be mounted using plans and specifications approved by a licensed structural engineer. All fees and expenses related to structural approval shall be paid by the Integrator.

B. Firmware

1. The Integrator shall install the firmware versions selected by the Consultant for all programmable or configurable devices.
2. The Integrator shall be responsible for up to two additional firmware changes per device until project closeout.
3. Integrator shall notify the Consultant prior to any change of firmware in any programmable or configurable device until the Integrator is released from all installation and warranty responsibilities.
C. Equipment Racks, Conduit, and Raceways

1. Electrical power distribution
   a. Provide labels on receptacles within AV racks indicating branch panel and circuit number.
   b. See the Drawings for details of power raceway entering and mounting inside rack.

2. Provide a full height, technical ground bus bar in each equipment rack, mount adjacent to the power raceway and electrically bond to rack.

3. Install rack mounted equipment as indicated on the approved AV shop drawings, and make connections within the racks before delivery to job site.

4. Provide insulated connections between the building electrical raceway and the equipment racks.

5. Provide insulated connections between the AV raceway and the equipment racks.

6. Provide EMT stubs, with insulated bushings to protect cable, into the above ceiling area for routing cable into the equipment racks.

7. Segregate circuit types as noted in Paragraph 3.2.F.2.

8. Do not exceed 40% conduit fill.

D. Labeling

1. General
   a. Handwritten labels are not acceptable.
   b. Do not indicate the Integrator’s name on movable, portable or loose equipment, touch panels, cables, or wall plates.
   c. Integrator’s name may be displayed on rack panel only as shown on the Drawings.
   d. Label type, text and graphics shall be approved by the Consultant before fabrication of labeling, plates or other labeled items.
   e. All labels shall be legible.

2. Provide permanent, self adhesive labels on the front panel of rack mounted equipment to indicate system designation/functionality (e.g., Automixer 3, Press Feed ADA, Speech Amp-Zone A, etc.).

3. Provide permanent, self adhesive labels on the back of rack mounted equipment.
   a. Indicate system designation/functionality.
   b. Text shall be identical to equipment front panels.
   c. Indicate IP address for all networked equipment located in secured racks or locations.
   d. Phone number.

4. Provide permanent label on plug end of power cords of all rack mounted equipment identifying the power cord with the equipment.

5. Provide labels for front panel input and output buttons of AV routers, switches, mixers, etc.

6. Provide text/graphics engraved directly on receptacle plates, panels, and rack panels.
   a. Use eighth inch letters with contrasting fill color.
   b. Label all plate mounted connectors and receptacles as shown on approved shop drawings
   c. Label plates with plate designation shown on approved shop drawings.
7. For all installed wiring provide permanent labels using wire numbers or designation as shown on approved shop drawings.
   a. Wire labels shall be one of the following types
      1) Self adhesive label under clear heat shrink,
      2) Direct printed heat shrink
      3) Direct printed, self adhesive, self laminating
   b. Position labels as shown in wiring standard details on the Drawings.
   c. Provide wire labels on both ends of cable.

E. Wiring
   1. Do not make any in line cable splices unless specifically noted.
   2. Use only cable pulling lubricants approved by the cable manufacturer.
   3. Provide grommets or chase nipples at cable entry where conduit is not installed.
   4. Provide cable anchors for any cable or cable bundle larger than 1 inch diameter, permanently installed and not in conduit. Do not use sticky back cable anchors.
   5. Provide a service loop for each cable that connects to equipment in racks or AV furniture. Service loop length shall be sufficient to allow one re-termination without removing cable ties.
   6. All cables connecting to a movable lectern, cart, or desk or lectern shall be highly flexible cable, specifically designed by the manufacturer to be flexed repeatedly. Permanent install type cable is not acceptable for this application.
   7. All cable bundles of more than one cable connecting to a movable lectern, cart, or desk or lectern shall be enclosed in a flexible braided sleeve and be of the minimum length extending from the furniture edge as noted on the Drawings.
   8. The Integrator shall take precautions to ensure that cabling is not kinked, compressed or otherwise damaged such that performance is compromised.
   9. Bend radius shall not be less than recommended by the cable manufacturer.
   10. Do not exceed the maximum permissible pulling tension. Consult the cable manufacturer for exact data.
   11. Use soft Velcro based cable ties located at random distances apart for installation of specialty cable such as HD-SDI, Category cable, fiber, etc.

F. Service and segregation of installed cables
   1. Refer to the Drawings for
      a. Standard wiring termination
      b. Labeling details
      c. Special wiring details
   2. Standard cable segregation – similar signal types or signal levels may be grouped together as approved by the Consultant.
      a. Microphone: below -30 dBu
      b. Line: -30 dBu to +24 dBu
      c. Loudspeaker: Greater than +24 dBu
      d. Video: 1 volt peak-peak into 75 Ohms
      e. Control Circuits: 0-28 Volt into <50k Ohms and Data: 2 Volt peak-peak into 100 Ohms
      f. Fiber
G. Terminations

1. Use crimping tools recommended by the termination manufacturer. Use ratcheting crimp tools for spade lugs and Molex pins.

2. Provide insulated spade lugs for screw terminals, two lugs per terminal maximum.

3. Use properly sized spade lugs for cable gauge and screw size.

4. Conductors in phoenix type connectors shall not be tinned.

5. Ferrules in phoenix type connectors shall not be used.

6. Terminate conductors with proper mating connectors.

7. Wire Nuts are not acceptable.

8. Audio shield/drain wires shall not be connected to the connector body at any time.

9. Only one cable or set of wires shall be installed into any single connector; do not loop cable in and out of a connector. Provide a terminal block to parallel any audio signal wiring.

10. Dual channel audio circuits using 5 pin XLR type connectors shall be made using a dual twisted pair type cable (Canare Star Quad, ProCo Ameriquad, or equivalent).

11. If multiple connection types are available on a given piece of equipment, the screw terminal type (including phoenix type) shall be used as first choice, with XLR connections used as second choice, and other connectors as last choice.

12. Maintain proper polarity when wiring components and loudspeakers.

13. Provide vertically mounted 1/2 inch, painted plywood or 1/8 inch thick blank panels for mounting terminal strips. Do not mount terminal strips on the bottom of racks.

14. Use only true 75 Ohm BNC cable end connectors designed for the intended coaxial cable required. Apply connector with a crimp die certified to be used with the intended coaxial cable and BNC. Feed through must also strictly maintain 75 Ohms.

15. For HD-SDI, do not use any connectors or feed-throughs not specifically rated through 3gHz digital bit rate.

16. Bi-directional serial terminations shall always be assumed to be at minimum 5-wire in the absence of approved information which indicates otherwise.

3.3. QUALITY CONTROL AND INSTALLATION VERIFICATION

A. General

1. The Integrator shall plan for the following shop or site visits by the Consultant:
   a. Shop staging and verification
   b. On-site staging and verification
   c. Full project verification
   d. Final project verification and training

2. The Integrator shall setup all rooms and systems to conform to the conditions listed below for each shop or site verification and shall notify the consultant that all required rooms are ready for each verification in accordance with Paragraph 1.10.H. and Appendix D.

3. At the Consultant’s request, the Integrator shall provide proof of conformance for any room or system that the Consultant concludes to be non-conforming.

4. Proof of conformance shall be the responsibility of the Integrator.

5. Incomplete systems or failure to complete the room setup prior to the Consultant arriving for the shop or site verification will result in additional trips for the Consultant. The Integrator will be financially responsible for all additional fees and expenses associated with these trips.

6. The Integrator shall make adjustments to all rooms and systems as directed by the Consultant during the shop or site verifications.
B. Shop Staging and Verification for the Auditorium

1. For verification the Integrator shall demonstrate to the Consultant complete functionality of each room or room type selected for shop staging.
2. All systems shall be configured to the following criteria.
   a. Audio
      1) The Integrator shall adjust all AV sources to provide source to source variation of less than 3dB SPL (measured A-weighted slow).
      2) Signal to noise ratio of any complete audio path shall be greater than 60dB.
      3) Total harmonic distortion of any complete audio path shall not exceed 0.1%
   b. Video
      1) Set the brightness and contrast of displays using a plugue test or similar test pattern.
      2) Set displays to accommodate the resolutions shown on the Drawings.
      3) Set projectors to accommodate the following resolution(s): 1920x1080.
      4) 16:9, 16:10, or 15:9 aspect ratios presented on a 4:3 or 5:4 display shall fill the screen width. This shall be accomplished with no external or internal scaling or stretching.
      5) 4:3 and 5:4 aspect ratios presented on a 16:9, 16:10, or 15:9 display shall fill the screen height. This shall be accomplished with no external or internal scaling or stretching.
      6) Video signals passing through UTP transmitters and receivers, computer interfaces, and other video processing equipment shall be adjusted so that the signals appear identical to signals directly connected to the display.
      7) Set transition effects, switching modes, picture-in-picture (PIP), or other scaler/switcher display and codec settings as directed by Consultant.
   c. Control Systems
      1) Control system shall be fully connected and communicating with all controllable devices.
      2) Control of building or environmental systems shall be demonstrated by use of mock-ups or proxies.
      3) Control system program shall be loaded and functional.
   d. RF Systems
      1) RF system shall be free of noise and crosstalk
      2) RF level at lowest and highest rated system channel shall be between +6dBmV and +12dBmV.

C. On-site Staging for the Auditorium

1. The Integrator shall accelerate the construction of one of each room or room type for the On-site Staging.
2. All Owner furnished equipment shall be installed and working properly in all rooms selected for onsite staging. All software that is required for integration with AV system
shall be installed by the Owner (or by the Integrator under the coordination/supervision of the Owner), and functioning properly

3. For verification, the Integrator shall demonstrate to the Consultant complete functionality of each room or room type selected On-site Staging.

4. During the On-site Staging the Integrator shall implement changes to the installation and setup as directed by the Consultant and will implement the changes throughout the project as directed by the Consultant.

5. The Integrator shall configure all systems shall be configured to meet the criteria listed in Shop Staging and the following criteria.

a. Audio
   1) Set the audio system to provide seat-to-seat variation of +/-4dB in the 2kHz octave band (measured A-weighted slow).
   2) Audio path shall maintain absolute system polarity such that:
      a) Positive acoustic pressure at the front of all microphones creates a positive voltage at the positive terminal of all line outputs and a positive acoustic pressure at all loudspeakers.
      b) Positive voltage at the positive terminal of all line inputs creates a positive voltage at the positive terminal of all line outputs and a positive acoustic pressure at all loudspeakers.

b. Video
   1) Projected images shall be in focus, free of any keystone (no digital keystone allowed), free from any obstruction.
   2) A display generated test pattern shall fill the screen and be plumb, square, and true.
   3) All images shall be free from ghosting or smearing.
   4) Analog RGBHV signal amplitude through any signal path shall not exceed +/-3dB across the operational bandwidth up to 450 MHz.
      a) Cable type shall be selected to meet this requirement
      b) Video line drivers or peaking amplifiers shall be added only when signal loss due to cable length exceeds this requirement and cannot be corrected by selecting a lower loss cable.
      c) Video line drivers or peaking amplifiers shall be adjusted to provide the least amount of correction to bring the signal within this requirement.

c. Control Systems
   1) Control system program shall be loaded into all controllable devices including touch panels.
   2) Control of building or environmental systems shall be fully functional.
   3) All controllable devices and systems shall be controllable from the control system touch panel or button panel.

d. RF Systems
   1) RF level at lowest and highest rated system channel at all cable outlets shall be between +6dBm and +12dBm.

e. AV Wireless Ethernet
   1) Perform a wireless site survey to identify existing active wireless access points in the area along with channel allocations, SSID information and
Security Information and determine the number and placement for additional types (802.11a, 802.11b/g, 802.11i, etc.) of access points, gateways and repeaters necessary to provide proper coverage and network performance throughout the facility for the wireless Ethernet devices listed in Appendix G.

2) Develop and recommend a channel allocation map with non-overlapping channels for each area within the buildings to maximize wireless network performance.

3) Procedures for the wireless site survey are referenced in Paragraphs 1.7.B and 1.7.C.

D. Full Project Verification

1. All AV systems that are a part of this project shall be completely installed and functional.
2. All Consultant’s directions and all criteria listed under Shop Staging and On-site Staging shall be applied to all audio, video, control, RF and AV wireless Ethernet systems throughout the project.
3. All Owner furnished equipment shall be installed and working properly in all rooms. All software that is required for integration with AV system shall be installed by the Owner (or by the Integrator under the coordination/ supervision of the Owner), and functioning properly.
4. Incomplete systems or failure to complete the room setup prior to the Consultant arriving will result in additional trips for the Consultant. The Integrator will be financially responsible for all additional fees and expenses associated with these trips.
5. The Integrator’s Project Manager or a senior technician who is familiar with the system shall demonstrate the complete functionality of each AV system to the Consultant.
6. The Consultant will create a punchlist of deficiencies that must be corrected by the Integrator prior to Final Project Verification.
7. Items added to the punchlist during this verification will not be re-verified or removed from the punchlist during this verification.

E. Final Project Verification

1. All items listed in the punchlist created during the Full Project Verification shall be corrected.
2. The Integrator’s Project Manager or a senior technician who is familiar with the system shall demonstrate that all items in the punchlist have been corrected.
3. Punchlist items or other installation issues not corrected and resulting in the inability to demonstrate the complete functionality of all AV systems will result in additional trips for the Consultant. The Integrator will be financially responsible for all additional fees and expenses associated with these trips.

F. Training

1. The Integrator shall train the Using Agency in the proper operation of the system.
2. The Integrator’s Project Manager or senior technician who is familiar with the system shall assist with Training.

3.4. CONTRACT CLOSEOUT

A. Contract Closeout will be based on completion of Final Project Verification, completion of punchlist items, acceptance of Project Record Documents and Completion of training.
APPENDIX A - DEMARCATION LIST

A. General: This Appendix Describes demarcation points in the Work to determine where the Integrator’s responsibilities end in the specific instances noted below.

B. Electrical System Connections: The Integrator shall coordinate with the General Contractor to extend the AV AC power circuits and insulated ground wires into each equipment rack.

C. Raceway (conduit and backboxes): The Integrator shall provide blank plates or panels for all AV floor, wall and ceiling boxes that are shown on the Drawings, but do not have AV devices and/or connectors at this time. Colors and types shall be coordinated with the Architect. Devices and plates for other trades (HV power, voice/data, security, etc.) within the AV floor boxes are by others.

D. Firestopping: Where penetrations of fire-rated assemblies are involved, Integrator shall seal penetrations with appropriate firestopping systems per the general construction documents.

E. Cabling: All audio, video and control cabling shall be provided, installed and terminated by the Integrator as noted on the Integrator’s Construction documents. Voice/data cabling, unless specifically noted otherwise, are the responsibility of others.

F. Cable Termination: Where cable installation is required, this will include wall and/or floor jacks, plates and terminations at room devices, and service loops at patch bay locations.

G. Projector and Monitor Mounts: The Integrator shall install all projectors and monitor mounts as indicated on the approved shop drawings. Integrator shall verify location and structural suitability before attaching projectors, monitors and mounts. Integrator shall satisfy the requirements in Paragraph 3.2.A.5.

H. Low Voltage Connections to Base building Devices:
   1. Low voltage control interfaces for lighting dimmers, window treatments and electric projection screens will be installed by others as a part of the base building. Integrator shall verify proper operation of these control systems before any interconnection to the AV control system.
   2. Integrator shall investigate all hardware and software control conflicts between the base building control systems and the AV control system before interconnecting the systems. Report any conflicts, potential or existing, to the Architect, in writing, before interconnecting the systems. Damage caused to the base building control systems due to the improper connection of AV control systems shall be the sole responsibility of the Integrator.
   3. Where indicated, Integrator shall select and install the appropriate cable type from the AV control system to the base building control systems interface locations.
   4. Integrator shall verify proper operation of both the base building control systems and the AV control system after interconnecting the systems, and verify proper operation of both.

I. AV Control System Connections and Devices: Integrator shall set up control system equipment with IP Addresses and proprietary control network addresses, install all necessary hardware cards, and adjust all appropriate DIP switch settings, and any other equipment settings such as baud rate and protocol settings. Integrator shall include all of this information in Project Record Documents.
APPENDIX B - AV WEEKLY STATUS REPORT

A. The following form is the Consultant’s “AV Weekly Status Report”. The Integrator shall provide weekly status reports in this format or an equivalent format approved by the Consultant.
AV WEEKLY STATUS REPORT

WEEK OF: ____________________________________________

AV INTEGRATOR: ____________________________ BY: ________________

CLIENT / PROJECT NAME: ____________________________________________

ROOM NAMES / NUMBERS: ____________________________________________

Provide a summary for each of the following areas. Use additional sheets as needed.

General:

Purchases:

Assembly:

Field Conditions:

Issues of Concern:
APPENDIX C - AV ROOM READY CONDITIONS

A. Before installing AV equipment on site, the following conditions must be met for each space where AV equipment is to be installed.

1. All water piping completely installed and tested
2. Dirt and dust sources removed. HVAC running with filters in place and AV-rooms "broom-clean"
3. Major construction activities completed, especially activities that may create physical damage to equipment or racks such as:
   a. Overhead work that may cause debris or dust
   b. Chemical work such as concrete cleaning and finishing
   c. Welding or grinding
   d. Activities that may cause excessive vibration

4. Building systems and finishes
   a. Ceiling work completed (ceiling tiles installed, lighting installed and operational)
   b. Shades and screens installed and operational
   c. Floor finish installation complete
   d. Wall treatments complete

5. Security
   a. AV areas secure
      1) for equipment, rack and tool storage
      2) Staging and work area for final assembly work on racks or in furniture and millwork
      3) Equipment installation areas that are not yet turned over to the owner
   b. Keys provided to AV integrator with limited distribution
   c. Security badges and clearances obtained for all on-site personnel
   d. Corporate Privacy or Government Security non-disclosure agreements properly executed

6. AV system infrastructure
   a. AV field cabling pulls complete
   b. All AV construction related items completed
   c. All AV power wiring in place, tested and on
   d. All millwork and furniture containing AV equipment in place
   e. System interfaces installed (lighting, screens, motorized drapes, etc.)
   f. Cabling by others in place (data/telecom, cable TV, fiber)
   g. Lighting installed and available for use in AV spaces

B. Before adjusting AV equipment to meet the conditions in Paragraph 3.3, C, the following conditions must be met, in addition to the items listed above, for each space where AV equipment is to be installed.

1. HVAC balanced
2. Lighting system configured (lighting presets programmed)
3. Shade system configured
4. IT Services live
APPENDIX D - STAGING AND VERIFICATION NOTIFICATION

A. The following text shall be used to notify the Consultant that the specified rooms or project is ready for verification.

B. One letter of notification is required for each of the following:

1. Shop Staging, Paragraphs 1.10, G. and 3.3, B.
2. On-site Staging, Paragraphs 1.10, H. and 3.3, C.
3. Full Project Verification, Paragraphs 1.10, I. and 3.3, D.
4. Final Project Verification, Paragraphs 1.10, K., and 3.3, E.

C. The Integrator shall copy or retype the text of the following letter onto the Integrator’s letterhead and fill in or select the appropriate text.

D. See sample letter at the end of Appendix D.
This letter serves as notification to Waveguide Consulting that (insert Integrator’s name) has completed the required setup and is ready for (select one of the following: Shop Staging, On-site Staging, Full Project Verification or Final Project Verification).

(Insert Integrator’s name) acknowledges that all rooms and systems specified for this staging or verification meet all specified installation and setup requirements.

Printed name of Project Manager

Signature of Project Manager Date

(Insert Integrator’s name) acknowledges that incomplete systems or failure to complete the room setup as specified prior to the Consultant arriving for staging or verification will result in additional trips for the Consultant.

(Insert Integrator’s name) acknowledges that (Insert Integrator’s name) will be financially responsible for all additional fees and expenses associated with these trips.

As (Insert Integrator’s name) duly authorized representative, I have read and agree to this agreement.

Printed name of signatory

Signature Date
SAMPLE NOTIFICATION LETTER

AACMEE AV INTEGRATION
123 Avenue Street
Anytown, State

This letter serves as notification to Waveguide Consulting that AACMEE AV INTEGRATION has completed the required setup and is ready for On-site Staging.

AACMEE AV INTEGRATION acknowledges that all rooms and systems specified for this staging or verification meet all specified installation and setup requirements.

____________________________________________________
Printed name of Project Manager

____________________________________________________
Signature of Project Manager                                           Date

AACMEE AV INTEGRATION acknowledges that incomplete systems or failure to complete the room setup as specified prior to the Consultant arriving for staging or verification will result in additional trips for the Consultant.

AACMEE AV INTEGRATION acknowledges that AACMEE AV INTEGRATION will be financially responsible for all additional fees and expenses associated with these trips.

As AACMEE AV INTEGRATION's duly authorized representative, I have read and agree to this agreement.

____________________________________________________
Printed name of signatory

____________________________________________________
Signature                                           Date
APPENDIX E - CONTROL SYSTEM REQUIREMENTS

A. General:

1. Control system touch panels or button panels shall be programmed by the AV Integrator. This section shall describe the typical control programming requirements.
2. Verify and follow campus or building standards per Owner.
3. All requirements herein shall be verified and approved by the Owner prior to commencement of programming.
4. All requirements herein are minimum requirements, full and specific functionality shall be coordinated with Owner through the integration process.
5. User interfaces should be task driven, and should use graphics that rely on shape and text changes in addition to color changes to be usable for the widest audience.

B. Submittals:

1. The Integrator shall include a schedule of milestones for software programming in the Project Plan submittal, reference Paragraph 1.10.C.
2. A document describing proposed user interfaces for each system shall be submitted per the approved Project Plan, reference Paragraph 1.10.C. The submittal shall include:
   a. A user interface overview describing the proposed structure and layout including engraving for keypad controls
   b. Annotated screen shots of all proposed touch panel user interface pages
   c. A description of proposed system startup and shutdown behaviors and options
   d. A description of proposed source selection and device control behaviors
   e. A description of proposed presentation tools and options

C. User Interfaces

1. End User Touch Panels:
   a. System power control
   b. Room controls including shades and lights (where applicable)
   c. Display controls including power status, lamp life for projectors, etc.
   d. Basic source selection of system sources with associated device controls
   e. Basic audio level controls
   f. Videoconferencing controls with basic camera presets (where applicable)

2. Technician Touch Panels (Auditorium only):
   a. System and device power control as possible
   b. Room controls including shades and lights
   c. Basic source selection of all sources with associated device controls
   d. Advanced routing for cameras, press feeds, technician preview monitors, etc.
   e. Layout configuration preset selection for press/overflow feed including various flavors of camera and content windowing layouts
   f. Advanced audio level controls

3. Atrium keypad shall include:
   a. Basic source selection for video wall
   b. Audio level controls for Atrium loudspeaker zone
4. Aging Conference Room keypad shall include:
   a. System power control
   b. Basic source selection
   c. Basic audio level control

D. Functional Requirements:

1. Room environmental controls, if present, shall be controlled from the user interface with that room as described above.
   a. Lighting Control - Lighting control and the associated presets shall be programmed by others. Provision for recall of the lighting presets in AV spaces is accommodated through TCP/IP intersystem communication. This is the line of demarcation between the Integrator's work and work by others. The Integrator shall coordinate the number and nomenclature for lighting presets with the Owner and communicate their understanding in the submittal process.
   b. Motorized Shade Control - Electronic shade control shall be made available where applicable. The shade control shall include Up, Down, and Stop. Where applicable, sun shades shall be controlled independently of blackout shades. Where applicable interior shades shall be controlled independently of exterior shades. Where applicable, shades shall be controlled in zones so that a proper viewing environment is created without blocking the entire exterior view. The Integrator shall coordinate the number and nomenclature for motorized shade presets with the Owner and communicate their understanding in the submittal process.
   c. Occupancy Sensor – The AV system occupancy sensor shall be used to manage the energy consumption of the AV system. Time duration values shall be user configurable from the user touch panel, where applicable, to place the system in a Standby and then an Off state. The timers shall also be capable of being disabled from the user touch panel. The exact behavior or the Standby and Off states shall be coordinated with the Owner through the submittal process.

2. Power control of a system is device and system dependent. As a standard when the system is turned on, the command to turn on all system devices shall be given. All devices should be ready for the user once the system is started. Some devices have dedicated “On” and “Off” commands while some devices toggle On/Off using the same command. Minimize the possibility of system start error–due to premature user button presses–by initiating a lockout–wherever possible–until the system is fully started. On system shutdown, all controlled devices, with the exception of the control system processor, shall be powered off or put in a standby state. Power sequencing shall be as per approved shop drawings.

3. Projectors - The projector’s input is generally an automatic selection through code as part of the system startup and/or source selection. User level controls shall be “On”, “Off”, and “Blank” (Picture Mute). Note: Most projectors have a cool-down period on shutdown that is required to protect lamp life. Code shall be prevent the projector from being turned back on until the cool-down period has been satisfied, and this prevention of normal user control shall be communicated to the user via the user interface.

4. All audio outputs shall be muted on system shutdown. The Owner shall determine whether audio levels are reset to default settings/levels on startup or remain as last left.
a. Program audio (i.e. audio from AV sources such as a laptop, PC, DVD, etc.) shall be controlled from a single set of controls including “Up”, “Down”, and “Mute.” An indication should be provided for the current level. It is recommended that the “Mute” button clearly indicate sound waves for the unmuted state and the use the international symbol for “no” for the muted state.

b. Speech audio (i.e. locally reinforced speech) shall have a single set of controls including “Up”, “Down”, and “Mute.” An indication should be provided for the current level.

5. Blu-ray™ Players - The following device control functions shall be provided: Power On/Off, Play, Pause, Fast Forward, Rewind, Skip Forward, Skip Back, Menu, Top Menu, Enter, Back, and Navigational Arrow Keys.

E. Process:

1. Prior to creating any custom code, the Integrator shall meet with the Owner and Consultant to review graphic user interface (GUI) requirements. Best practices as defined by the Infocomm “Dashboard for AV Controls” shall be adhered to.

2. The Integrator shall demonstrate systems programming for the end user touch panel to the Consultant during Shop and Site Staging. The Integrator shall provide changes to the user interface and/or control programming beyond that described by the approved GUI, based on direction provided during staging.

3. The Integrator shall demonstrate full systems programming to the Consultant during Full Project Verification. This code shall incorporate any changes directed by the Consultant during staging. The Integrator shall provide changes to the user interface and/or control programming beyond that described by the approved GUI, based on direction provided during verification.

4. Within 30 days after final acceptance of programming the Owner shall provide to the AV Integrator in writing any requested software changes. Within 30 days of receipt of the request, the AV Integrator shall provide one additional site visit to implement changes to the user interface and/or control programming.

F. Warranty:

1. The AV Integrator shall provide warranty for one year on all custom software. Response time for warranty issues shall be the same as that described in the specification and required for the equipment installation.

2. Upon successful completion of these services, the AV Integrator shall provide an electronic copy of all software specific to this project to the Owner along with a nontransferable license to all software for the Owner’s use solely in connection with the maintenance and modification of these systems. All copies of the software shall remain in control of the Owner. Warranties relating to the software will apply only to the original, unmodified software, as provided by the AV Integrator at the end of the project.

G. Qualifications:

1. The individual responsible for programming the systems shall be a Crestron Certified Programmer with current certification credentials.

2. The Integrator shall include with the bid the resume(s) for the individual(s) that will be providing custom programming services.

   a. Indicate whether individual(s) is/are employees or subcontractors of the AV Integrator.
b. Provide a list of three to five recent projects of similar size and scope programmed by the individual listed. Include references.
APPENDIX F - SUBMITTAL DRAWING CHECKLIST

A. FORM (ALL SHEETS)

1. Submittal copy quantity requirements satisfied
2. Submittal content satisfied
3. Adequate sheet size for drawing
4. All notes and other text legible throughout the drawing set
5. Contact info for each responsible party (architect, owner, Integrator, etc...) clearly printed on the drawings
6. Table of contents with necessary fields present (Sheet Title, Sheet Number, Description, etc...)
7. Drawing titles and sheet names match the Table of Contents
8. Sheet titles make sense
9. Drawing order makes sense
10. Spelling checked and corrected

B. FIT (EQUIPMENT LAYOUT PLAN, RCP, ELEVATION, DETAILS)

1. All of the equipment shown on plan view in the correct position
2. All equipment uniquely identified
3. Equipment clearances through distances, and elevations clearly marked, dimensioned and noted
4. If in scope, detail drawings for the hanging/installation/mounting of projectors, screens, cameras, surface mounted loudspeakers, ceiling suspended loud speakers, wall or floor mounted racks, displays, microphones, antennas and sensors, and camera/speaker housings
5. Equipment mounting details for equipment (composite weight including hardware) over 40 lbs. include the stamp of the Approved Licensed Structural Engineer.
6. Details contain manufacturer and model numbers for each part, detail key referenced back to Equipment layout, weight, and clearance requirements
7. Detail reference keys for every piece of equipment permanently installed overhead

C. FIT (CABLE FILL FORM, OR PLAN AND RCP)

1. Conduits uniquely identified
2. Cable types identified by make and model number
3. Cables leaving rooms uniquely identified
4. Cable quantities/types correct
5. Cables segregated by type/signal level when possible

D. FIT (RACK, FURNITURE RACK LAYOUTS AND ELEVATIONS)

1. Racks have a unique ID
2. All equipment uniquely identified within each rack layout
3. Blanks, vents, and fans positioned properly with respect to the actual heat generating equipment
4. Layout functional for daily use
5. Mounting of any external equipment such as monitors, speakers, and desk shelves detailed
6. Detail covering grounding, bonding, and the pass through of conduits to and from the racks

E. FIT (CUSTOM FURNITURE DRAWINGS)
1. Furniture drawings accurately show the form fit and function of the original design intent
2. Cable pass-troughs and equipment access panels appropriate for daily use
3. Finish samples provided unless finishes are pre-approved by owner/architect
4. Furniture uniquely identified and keyed to Equipment Layout Plans, Rack elevations, and System Line Diagrams
5. Furniture drawings contain enough detail for custom fabrication by furniture vendor

F. FIT (CUSTOM PANELS AND PLATES)

1. Plate drawings include the following manufacturing details: material type and thickness; plate finish; engraving/screening size, color, and font style; bevel and mounting hole details; connectors and switches identified by make and model number; and connector mounting method (pressure fitting, nuts and bolts, etc...)
2. All plates uniquely identified and keyed to match line diagrams and equipment layouts

G. FUNCTION (SYSTEM LINE DIAGRAMS)

1. Signal flow from input to output, left to right
2. Wiring notes make sense
3. System line diagrams accurately reflect the original system design intent
4. Equipment shown identified by manufacturer, model number, and a product description
5. All of the equipment shown has a unique ID matching the plate drawings, rack elevations, and equipment layout plans and RCP's
6. All field and rack wires uniquely identified by number
7. All terminal strips identified by locations and numbered
8. All rack power circuits and power control sequencing circuits identified
9. All pre-made cables indicated by manufacturer, make, and model number
10. Calculated measurements for RF level for taps, drops, splitters, and amps
11. All wires identified by signal type (MIC, Line, RGB, Serial, Etc...)
12. Details for DIP switch settings, IP Addresses, Baud Rates or equipment modifications
13. Detailed pin outs for all Integrator manufactured cables
14. System line diagrams contain detail markers of where to find pin out details
15. System line diagrams indicate the impedance at amplifier outputs for all speaker lines

H. MISC (MISC CONSTRUCTION DETAILS)

1. Details and elevations for any custom built equipment, architectural oddities, or any other Integrator work not covered elsewhere

I. EQUIPMENT LIST

1. Variances from the original basis of design clearly marked
2. All of the necessary equipment accessories included
3. Equipment identifiers match those on the drawings
4. Equipment quantities match those of the drawings
APPENDIX G - EQUIPMENT LIST SPREADSHEET

A. Attached is the Consultant’s suggested AV equipment list based on the AV System Drawings and Specifications. This information may be used by the potential bidders as a starting point in determining overall quantities of items and to indicate the allocation of devices budgeted in individual areas.

B. Integrators are cautioned that while the Consultant has made a good faith effort in preparing this list to be as coordinated and complete as possible, this list may not be complete, may have discrepancies against the drawings, and may not indicate all pertinent information required to prepare an accurate bid.

C. The Integrator is solely responsible for the completeness and accuracy of take-offs and bids.

D. All information indicated on this equipment list, including but not limited to quantities, manufacturers, model numbers and room allocations are non binding, and neither the Owner nor the Consultant is obligated to accept the information, in original or altered form, from the Integrator as the final Bill of Quantities.

E. The Integrator shall supply a complete and operable system meeting the requirements of the construction documents (drawings and specifications) regardless of information indicated on the AV Systems Equipment List.

F. This spreadsheet may be obtained from the Consultant in Microsoft Excel (.xls) format for use in the preparation of the Bids.

END OF SECTION 011130
## Appendix G

### UF Academic and Research Center at Lake Nona, UF-280

100% AV Construction Documents

December 7, 2011

### Appendix

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<th>Item</th>
<th>Description</th>
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### Number of Identical Rooms / Systems

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### Audiovisual Systems

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### Quantity Per Room / System

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**UF RESEARCH & ACADEMIC CENTER AT LAKE NONA**

**UNIVERSITY OF FLORIDA – ORLANDO FLORIDA**

**Issued:** December 7, 2011

**WCI Project No. 09640.00**

---

**AUDIOTRANSFER SYSTEMS**

011130 - 43
### Appendix G

#### UF Academic and Research Center at Lake Nona, UF280

**100% AV Construction Documents**

**December 7, 2011**

#### Auditorium (0133, 0134)

#### Atrium Video Wall (0101)

#### 30Seat Combinable Classrooms (0131)

#### 30Seat Combinable Classrooms (0231, 0331)

#### 20Seat Combinable Classrooms (0132, 0232, 0332)

#### 72Seat Classrooms, FlatFloored (0333)

#### Skills Lab (0435)

#### Aging Conference Room (0142)

#### Research Conference Rooms (0362, 0462)

#### Academic Conference Room (0426)

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### Number of Identical Rooms / Systems

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**Notes:**

1. **AV Bid Documents**
2. University of Florida – Orlando Florida
3. Issued: December 7, 2011
4. UF RESEARCH & ACADEMIC CENTER AT LAKE NONA
5. UF280; WCI Project No. 09640.00
6. Audiovisual Systems 011130-44
## Appendix G

UF Academic and Research Center at Lake Nona, UF-280
100% AV Construction Documents
December 7, 2011

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**BID TOTAL**

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### Equipment Price

- Miscellaneous Materials
- Labor
- Custom Programming

**Total Equipment Price**

**Miscellaneous Materials**

**Labor**

**Custom Programming**

**BID TOTAL**