

**SECTION 274116 - AUDIO VISUAL SPECIFICATIONS**

PART 1 - GENERAL

1.1 SCOPE OF SPECIFICATION

- A. This specification covers all Audiovisual Systems as described herein for the Union County Government Complex. The Contractor shall provide fully functional systems, completely installed and ready to use.
- B. All Audiovisual, Telecom, and Electrical drawings and equipment lists pertaining to this specification shall be considered as a part of this specification.
- C. Drawings and specifications are the property of the Owner and are not to be used on any other project or work.

1.2 RELATED DOCUMENTS

- A. AV-series drawings, including floor plans, elevations and signal diagrams.
- B. AV Equipment spreadsheet.

1.3 DEFINITION OF TERMS

- A. The term "Owner" refers to UCGC
- B. The term "Architect" refers to DIG
- C. The term "Consultant" refers to MGE Unified Technologies Corp.
- D. The term "Bidder" is the Audiovisual Contracting firm (the integrator) submitting a bid response to this specification.
- E. The term "AV Contractor" is the firm that has been awarded the contract for this specification and has responsibility for the performance specified herein pertaining to the audiovisual systems and equipment.
- F. The term "Sub-Contractor" is any firm or individual hired by the Contractor to perform any of the work detailed herein.
- G. The term "Equipment" refers to any and all items, off-the-shelf or custom, used to assemble the system.
- H. The term "System" refers to singularly and/or collectively, the complete, interconnected assemblage of equipment as specified and intended herein.
- I. The term "Herein" refers to the audiovisual drawings and specifications.
- J. The term "N.I.C." (Not in Contract) refers to material or labor related to, or that functions as part of, the audiovisual system which is not within the scope of work for this specification but is to be furnished or installed by other Contractors.

- K. The term “O.F.E.” (Owner Furnished Equipment) refers to equipment provided by the Owner. Contractor shall be responsible for installing and integrating this equipment into the system.
- L. Equipment designated as FUTURE shall have wiring and connectors provided, ready for installation of the equipment itself, as indicated on the Block Diagram drawings.
- M. The term “Provide” means furnish and install.
- N. The term “Shall” is a mandatory directive.
- O. The term “Will” is informative.

#### 1.4 CONTRACTOR RESPONSIBILITY

- A. The Contractor shall furnish all equipment and materials to ensure a complete and operating system. The NIC and OFE equipment and materials are specifically exempted from this requirement.
- B. The Contractor shall survey all OFE equipment prior to installation to confirm they are accurate to their description and are in good working order.
- C. It is the responsibility of the Contractor to ensure that the work herein described shall be complete in every detail necessary to provide a complete, properly functioning system in compliance with all requirements of this specification.
- D. The contractor shall provide AV source equipment with support for enough HDCP keys so that it can be routed to all sinks simultaneously. If a particular AV source cannot be found to support enough HDCP keys to route to all sinks simultaneously, the contractor shall:
  - 1. Notify the Engineer
  - 2. Configure the AV switching equipment so that it shall not distribute more HDCP keys than the AV source supports.
- E. The contractor shall configure the EDID presented to each AV source to indicate only the video timings supported by ALL sinks used for viewing and distributing video.
- F. The contractor shall configure the EDID presented to each AV source to indicate support for only the audio formats actually supported by ALL the sinks used for distributing audio.
- G. The contractor shall verify the data rate supported by each shielded twisted pair cable used for AV distribution.
- H. The contractor shall provide display equipment that does not overscan the video signal when full-pixel sources are routed.
- I. The Contractor shall generate all shop drawings, materials and technical information for the complete installation and wiring of the system.
- J. The Contractor shall provide the on-site installation and wiring, and shall provide on-going supervision and coordination during the implementation phase.

- K. The Contractor shall not sub contract any project team members (defined herein as engineer, programmer, project manager, or technician) without prior notification of and approval from the Consultant and/or Client.
- L. The Contractor shall be responsible for system(s) adjustment from initial adjustment through final balancing as herein prescribed and shall provide all test equipment for the system checkout and acceptance tests. Failure to accurately adjust system parameters (as per manufacturer's specifications and in accordance with all performance specifications set forth in this specification) will require that the AV Contractor re-perform all adjustments from the beginning of the process and compensate other project team members for time lost due to the need to repeat procedures.
- M. The Contractor shall assign a dedicated senior project manager and senior engineer. These individuals are expected to actively participate for the life of the project.
- N. The Contractor shall assign a dedicated senior project manager and senior engineer to participate in the room close out processes to streamline the punch-list closure and room turn over process.
- O. The Contractor shall assign a single (senior) engineer with advanced audio training to oversee the audio balancing and adjustment for all systems (this shall not be left to the base installer.) This engineer shall manage the creation and distribution of standardized audio site files internally, and assist in the revision of files as required. The individual shall also assist in the troubleshooting and resolution of any discrepancies with the audio systems not performing properly due to infrastructure, telephone lines, PBX, audio bridge service or room acoustic issues.

## 1.5 DESCRIPTION OF AUDIO-VISUAL SPACES

- A. Lobby (2001)
  - One (1) 55" diagonal wall-mounted displays.
  - Display has a networked Digital Signage Player as source.
- B. Typical Lobby (1100,2015)
  - Two (2) 55" diagonal wall-mounted displays.
  - Each display has a networked Digital Signage Player as source.
- C. Café (1110)
  - Two (2) 65" diagonal wall-mounted displays.
  - Each display has a Digital Signage Player and Network Video Decoder as sources.
  - Five (5) overhead speakers are fed from a Networked Power Amplifier w/ Microphone Input.
  - Handheld voice microphone.
  - Designed for overflow viewing / listening of Commissioner's Meeting Room proceedings.
- D. Commissioner's Meeting Room (1240)
  - Video
    - Two (2) 70" diagonal wall-mounted displays each with Network Video Decoder on wall behind Dias.

- Four (4) 55” diagonal wall-mounted displays each with Network Video Decoder facing Audience.
  - Two (2) 55” diagonal ceiling-hung displays each with Network Video Decoder facing Audience.
  - Two (2) cart-mounted displays each with Network Video Decoder which can be connected at AV plate located at front of the Dias.
  - Two (2) 55” diagonal wall-mounted displays w/ integral speakers each with Network Video Decoder installed in Building-1, Level-2 elevator lobby for overflow viewing/listening.
  - Two (2) Lectern positions each with Network Video Encoder for connection to owner-furnished laptop.
  - Dias has thirteen (13) seating positions. The center position has an AV connection plate with support for:
    - One (1) Network Video Encoder
    - One (1) touch, control panel.
  - The additional twelve (12) Dias seating positions share six (6) AV connection plates, each supporting:
    - One (1) Network Video Encoder
  - Two (2) ceiling-mounted PTZ cameras facing the Dias.
  - Two (2) ceiling-mounted PTZ cameras facing the Audience.
  - Integration with Web-Conferencing computer.
  - Audio
    - Ten (10) in-ceiling speaker assemblies covering the Audience area.
    - Six (6) in-ceiling speaker assemblies covering the Dias area.
    - Spare microphone inputs at AV input plate at front of Dias.
    - Shock-mounted gooseneck microphone at each lectern.
    - Dias has thirteen (13) seating positions. The center position has an AV connection plate with support for:
      - One (1) shock-mounted gooseneck microphone
    - The additional twelve (12) Dias seating positions share six (6) AV connection plates, each supporting:
      - Two (2) shock-mounted gooseneck microphones.
    - Six (6) ceiling-mounted array microphones to cover Audience area.
    - Assistive Listening System w/ six (6) receivers.
  - Control
    - AV Control Processor and associated equipment is installed in adjacent Recording Room.
    - Table-top mounted touch control panel at center Dias position.
- E. Typical Large Conference Room (1241,1333,1338,1510,1548,2239,2610)
- 70” diagonal wall-mounted display at front of room.
  - PTZ web-conference camera installed at front of room.
  - 70” diagonal wall-mounted display at side wall of room.
  - Dedicated room web-conferencing PC w/ Dante audio mixing software.
  - In-table HDMI & USB laptop connection for owner-furnished laptop for presentation.
  - Four (4) table-top array microphones.
  - Four (4) PoE+ in-ceiling speaker assemblies.

- Table-top touch, control panel.
- F. Typical Medium Conference Room (1411,1419,1435,1531,2254,2311,2332,2333, 2410, 2525, 2533, 2559, 2622, 2640,2651,2666)
- 65” diagonal wall-mounted display at front of room – may vary w/ room size.
  - PTZ web-conference camera installed at front of room.
  - Table-top conferencing system w/ integral touch display, microphone, and laptop connections (similar to Crestron Flex)
  - Extension microphone pod.
- G. Typical Small Meeting Room or Director Office (1323,1330,1335,1418,1424,1437,1453,1521, 1532,1543,1546,1551,1552,1553,1554,2212, 2213, 2237,2253,2661)
- 46” diagonal wall-mounted display at front of room – may vary w/ room size.
  - PTZ web-conference camera installed at front of room.
  - Table-top conferencing system w/ integral touch display, microphone, and laptop connections (similar to Crestron Flex)
- H. Typical Training Room (2224)
- Video
    - 70” diagonal displays at front of room.
    - Ceiling-mounted PTZ web-conference camera aimed at instructor
    - Dedicated room web-conferencing computer w/ Dante audio mixing software.
    - HDMI/USB interface for owner-furnished laptop for presentation.
  - Audio
    - Two (2) ceiling-mounted array microphones covering student area
    - 2-channel wireless microphone system with wireless lavalier and handheld microphones for instructor. Receiver to be installed in IT IDF 2202 w/ antenna extenders.
    - Six (6) in-ceiling speaker assemblies.
    - Networked power amplifier w/ line out in IT IDF 2202
    - Assistive Listening System
  - Control
    - AV Control processor in IT IDF 2202
    - Wall-mounted touch control panel.
- I. Typical Training Room (2232)
- Video
    - 70” diagonal displays at front of room.
    - Ceiling-mounted PTZ web-conference camera aimed at instructor
    - Dedicated room web-conferencing computer w/ Dante audio mixing software.
    - HDMI/USB interface for owner-furnished laptop for presentation.
  - Audio
    - One (1) ceiling-mounted array microphones covering student area

- 2-channel wireless microphone system with wireless lavalier and handheld microphones for instructor. Receiver to be installed in IT IDF 2202 w/ antenna extenders.
  - Four (4) in-ceiling speaker assemblies.
  - Networked power amplifier w/ line out in IT IDF 2202
  - Assistive Listening System
  - Control
    - AV Control processor in IT IDF 2202
    - Wall-mounted touch control panel.
- J. Café A (2222)
- Video
    - 70” diagonal wall-mounted display at front of room.
    - Ceiling-mounted PTZ web-conference camera aimed at front of room.
    - Dedicated room web-conferencing computer w/ Dante audio mixing software.
    - HDMI/USB input plate for owner-furnished laptop for presentation.
  - Audio
    - 2-channel wireless microphone system with wireless lavalier and handheld microphones for presenter. Receiver to be installed in IT IDF 2202 w/ antenna extenders.
    - XLR wall-plate w/ connection to wired, handheld microphone w/ floor stand.
    - Six (6) in-ceiling speaker assemblies.
    - Networked power amplifier w/ line out in IT IDF 2202
    - Assistive Listening System
  - Control
    - AV Control processor in IT IDF 2202
    - Wall-mounted touch control panel.
- K. Café B (2223)
- Video
    - 70” diagonal wall-mounted display at front of room.
    - Ceiling-mounted PTZ web-conference camera aimed at front of room.
    - Dedicated room web-conferencing computer w/ Dante audio mixing software.
    - HDMI/USB input plate for owner-furnished laptop for presentation.
  - Audio
    - 2-channel wireless microphone system with wireless lavalier and handheld microphones for presenter. Receiver to be installed in IT IDF 2202 w/ antenna extenders.
    - XLR wall-plate w/ connection to wired, handheld microphone w/ floor stand.
    - Seven (7) in-ceiling speaker assemblies.
    - Networked power amplifier w/ line out in IT IDF 2202
    - Assistive Listening System
  - Control
    - AV Control processor in IT IDF 2202
    - Wall-mounted touch control panel.

L. Typical Training Rooms (2312,2543)

- Video
  - Two (2) 70” diagonal displays at front of room.
  - Ceiling-mounted PTZ web-conference camera aimed at instructor
  - Dedicated room web-conferencing computer w/ Dante audio mixing software.
  - HDMI/USB interface for owner-furnished laptop for presentation.
- Audio
  - Two (2) ceiling-mounted array microphones covering student area
  - 2-channel wireless microphone system with wireless lavalier and handheld microphones for instructor.
  - Six (6) in-ceiling speaker assemblies.
  - Networked power amplifier w/ line out.
  - Assistive Listening System
- Control
  - AV Control processor
  - Wall-mounted touch control panel.

M. Waiting Room (2110)

- Four (4) 46” diagonal wall-mounted displays, each with a networked Digital Signage Player as source.
- Twenty-two (22) in-ceiling speaker assemblies fed from networked, power amplifier w/ microphone input for background music and announcements.
- Handheld microphone w/ table-top stand.

1.6 SCOPE OF WORK

- A. The scope of work comprises the final engineering, design, supply, installation, testing, commissioning, maintenance and defects liability service of materials, labor and equipment for the complete Audiovisual System(s) installation.
- B. This Specification, in conjunction with the Drawings, establishes the requirements necessary to achieve the intended performance, installation and functions of the HD Digital Transport and Distribution System.
- C. Contractor shall provide the services necessary to furnish, install, train, and to provide maintenance support for the HD/UHD Digital Transport and Distribution System including all required peripheral apparatus conforming to acceptable industry standards. All work shall be in accordance with the true intent of these Drawings and Specifications, and as required to leave the HD/UHD Digital Transport and Distribution System complete and in satisfactory operating condition.
- D. Verify dimensions and conditions at the job site prior to installation, and perform installation in accordance with these Specifications, Manufacturers recommendations and the latest edition or revision of all applicable codes and standards.
- E. The HD/UHD Digital Transport and Distribution System shall include providing and integrating the following principal systems:

1. Audio/Video switching.
  2. Audio/Video distribution at native resolution without compression.
  3. Video interface equipment.
  4. Audio interface equipment.
  5. HDMI signal transport.
  6. HDMI 1.3 support.
  7. Deep Color support.
  8. Resolution management.
  9. HDCP key handling/management.
  10. Fast HDMI switching with keep alive HDCP link.
  11. Multi-Channel Surround Sound Audio.
  12. Digital diagnostic tools.
- F. The HD/UHD Digital Transport and Distribution System shall operate as a standalone point-to-point system delivering local content to a far-end sink (display). It shall also operate as part of a larger matrix switching system.
- G. Coordination work shall include full coordination with other trades and is to be provided with claims to be rectified at their cost. Coordination shall include, but not be limited to: on-site visits and meetings with the other trade contractors, providing technical information, assistance and direction with respect to their work and field conditions as they may affect compliance with these specifications.
- H. Furnish all materials, labor, tools and transportation, supervision, coordination and engineering services necessary to provide complete and professionally installed systems that comply with all requirements herein. Labor furnished shall be specialized and experienced in Audiovisual System installation.
- I. All materials shall be new and shall conform to applicable provisions of Underwriters Laboratories and the American Standards Association.
- J. Provide all required direction and supervision of all labor performing any work detailed herein, including AV Contractor's Sub-Contractor work, to ensure compliance with the specifications. This refers especially to on-site work. Because of the complexity of the systems, the supervision of such sub-contracted work cannot be intermittent, but shall be continuous during the installation.
- K. Provide and install all wire and cable required and make all necessary terminations and connections.
- L. Coordinate all conduit and backbox installation with the Electrical Contractor to ensure proper performance & function of the complete system.
- M. Coordinate AC power, lighting, and electrical grounding installation with the Electrical Contractor to ensure proper performance and function of the completed system.
- N. Coordinate structural work with the Construction Manager to ensure proper fit, positioning, and support for audiovisual equipment.
- O. Coordinate projection screen installation with the Construction Manager to ensure proper performance and function of projection systems.

- P. Coordinate millwork fabrication and installation with the Construction Manager to ensure proper fit and function of audiovisual equipment.
- Q. Provide any additional items not specifically mentioned herein but necessary to the proper performance and function of the system, without claim for additional payment. Such items may include hardware, transformers, power supplies, line/distribution amplifiers, pad attenuators and other devices for proper installation, interface, isolation, or gain structure.
- R. Furnish shop drawings and all equipment cut sheets. Contractor to receive written approval prior to fabrication, assembly and installation.
- S. Perform initial adjustments and verification test. Submit verification test report to client and consultant.
- T. Contractor's Project Manager, Engineer and Programmer shall participate in Consultant system commissioning at the Contractor's facility prior to shipping the system(s) to site for installation.
- U. Contractor shall adhere to all known good installation practices.
- V. Instruct the Owner in the operation of the system.
- W. Contractor's Project Manager, Engineer and Programmer shall participate in acceptance testing and perform final adjustments as required by the Consultant.
- X. Within two (2) weeks of system completion provide all system documentation, including copies of all relevant drawings and equipment manuals.
  - 1. Itemized equipment list with manufacturer information and serial numbers for every room.
  - 2. Test results from pre and post installation as described elsewhere in this specification.
  - 3. As-built drawings for every item and system. Final, approved copies shall be provided as noted, in addition to laminated hard copies in 11 x17 formats that shall be stored in the equipment rack of each room.
  - 4. Final software code to include all adjustments and settings for controller, panel, and DSP in each room. This shall include jpegs of each touch panel page.
  - 5. End User Operation Manuals
  - 6. A contact list of their key individuals, engineer, lead-tech, site lead, etc. who may be contacted should a question or problem arise. Name, title, telephone number, cell phone number, and e-mail address shall be listed for each individual.
- Y. Provide warranty services for the specified period from the date of acceptance. This warranty shall cover a minimum of four (4) visits per year, at regular intervals, to perform operation checks of the equipment, to clean recording heads, displays, screens, projector lenses and other critical surfaces, to lubricate moving parts as recommended by the respective manufacturers and to adjust and align projector to maintain optimum registration and focus.

- Z. Guarantee all equipment, components, and workmanship for the specified period from the date of acceptance, which shall be a period of no less than one (1) year.
- AA. The Contractor shall have sole responsibility for the satisfactory implementation of each system, even though the Contractor may have sub-contracted a portion of the installation or had certain manufacturers install their own equipment.
- BB. Certain equipment and materials will be provided and installed by others. Unless otherwise indicated in these specifications, or on the related drawings, these will include the following:
  - 1. All conduits, wireways, connection boxes, pull boxes, junction boxes, and outlet boxes permanently installed in walls, floors, and ceilings.
  - 2. All electrical breaker panels required to power the audiovisual and television equipment.
  - 3. All room lighting fixtures, dimmers, power receptacle outlets, and interconnecting wiring for these circuits.
  - 4. Window shade, curtain, or drapery motors and their control.
  - 5. Movable furniture, desks, and chairs. Also, moveable door motors and their control.
  - 6. All structural work, wall openings, platforms, railings, stairs, fire prevention and safety devices, rough and finished trim, painting and patching, drapes, carpets, floor coverings, computer floors, glazing, acoustical treatments, and HVAC.

#### 1.7 STATUS REPORTS

- A. The Contractor, who is awarded the project, is responsible for providing weekly status reports outlining his progress on the project. These reports should include information on the work completed during the week, the work to be completed during the upcoming week and any potential scheduling or field issues that may rise. The following should be included in this Status Report but not limited to:
  - 1. Expected date of project submittals, including equipment cut sheets, shop drawings, control system designs and any other related reports.
  - 2. Anticipated completion date and outlined percentage completion of in-house rack fabrication and testing, prior to shipping equipment to the job-site.
  - 3. Anticipated completion date and percentage completion of control system programming, prior to shipping equipment to the job-site.
  - 4. Schedule and percentage completion of on-site wiring and supervision.
  - 5. Schedule and percentage completion of on-site installation.
  - 6. Schedule Dates for Owner training once project is completed.
  - 7. Schedule for systems checkout and turnover to the Owner.

1.8 RELATED WORK FURNISHED AND INSTALLED BY OTHERS

- A. Refer to applicable Electrical, Mechanical, Telecommunications, Architectural and Structural drawings:

Electrical and Mechanical

1. Permanently installed audiovisual conduits, wireways, backboxes, junction boxes, pull boxes, floor boxes, floor pockets, receptacle boxes, and ceiling loudspeaker enclosures; unless otherwise noted.
2. AC power system feeders, isolation transformers, power conditioners, uninterruptible power supply (UPS), electric panels, circuits, conduit, branch circuits, "convenience" receptacles and receptacles required for the audiovisual equipment.
3. Room lighting fixtures, switches, dimmers, and dimming systems and low voltage (RS-232) interface control panels.
4. A/V Control System must be capable of communicating with the Lighting Control System. A/V Contractor and Electrical Contractor to coordinate appropriate connections.
5. Window shade, curtain, or drapery motors and their control and low voltage interface control panels.
6. Movable door motors and their control.
7. Fire prevention and safety devices.
8. HVAC systems (heating/ventilation/air conditioning). Architectural and Structural
9. Structural work, wall openings, platforms, railings, stairs.
10. Millwork, shelving, rough and finished trim, painting, patching, glazing.
11. Carpets, floor coverings, "computer" access floors, drapes, shades, blinds, acoustical treatments.
12. Ceilings, suspended ceiling, ceiling structures.
13. Moveable furniture, table, desks and chairs.
14. Support structures and enclosures for audiovisual loudspeaker cabinets, projectors, video monitors, etc.

Telecommunications

15. All telephone and data wiring (including BRI, PRI or ISDN) and receptacles.
16. Riser Diagram for all cable and conduit pathways.
17. Cable Television feeder service entrance and TV outlet drop cabling.

Owner-Furnished Equipment

18. The AV Contractor shall be responsible for removing and/or uninstalling OFE equipment from the Owner's location and re-installing to the new facility and/or room. At the AV Contractor's facility, he shall ascertain that the OFE equipment is performing at or above factory specifications. AV Contractor shall submit verification test documentation to MGE-UTC and client.
19. If the equipment is not operating "as-new", or is missing accessories necessary to properly integrate the equipment into the system as intended, the AV Contractor shall provide a proposal, including a time line, for returning the equipment to "as-new" condition and providing the needed accessories.

1.9 BID SUBMITTAL INFORMATION

A. Bid Conditions

1. All bids shall be submitted for equipment, materials and labor as specified herein.
2. Bidders shall read all sections of this specification and examine all related drawings in order to avoid omissions, duplications and to ensure a complete job. While efforts have been made to avoid those, discrepancies between and within the drawings and specifications or obvious omissions or duplications shall be referred to the Construction manager and or Consultant for clarification no later than three (3) weekdays before the bid closing date.
3. Where discrepancies, duplications or omissions occur, and pre-bid instructions have not been obtained, the contractor agrees to abide by the Consultant's decision.
4. Bid submittal prices shall be valid for a minimum of sixty (60) days.
5. All bids are to be submitted as described in the covering documentation.
6. No extensions will be granted for any reason.
7. The Contractor shall not sub contract any project team members (defined herein as engineer, programmer, project manager, or technician) without prior notification of and approval from the Consultant and/or Client.

B. Qualifications

Bidder shall demonstrate compliance in writing with all the following requirements:

1. Confirmation of regular business conditions under the present name and/or address during the previous five (5) years. The number of years in business under a previous name or company.
2. Successful completion, with present key staff, of five (5) projects of the type and/or magnitude of that specified herein.
3. At least five years experience in the fabrication, assembly, and installation of audiovisual systems of similar magnitude and quality as specified for the subject job, and shall submit documentation to this effect with the bid return.

4. Identify the project principle, project manager, project engineer and key staff. Indicate the percentage of time to be dedicated to the project.
5. Each bidder shall list staff to be assigned to the project that has (a) specific manufacturer certification (i.e., Biamp, Cisco, ClearOne, Crestron and Polycom), (b) professional certification, (c) ICIA certification and (d) Crestron DigitalMedia Certified Engineer (DMC-E) certification. Indicate the type and level of certification, date obtained and expiration date.
  - a. Indicate the team member's name and specific job function on the project
  - b. Provide resumes and certifications of key personnel.
6. Locations of all currently staffed and operational offices complete with the number of technical support personnel in each office.
7. Each bidder shall maintain an adequately equipped and staffed service department and shall regularly provide service for systems similar to this design. This shall include an office staffed with personnel at all times, Monday through Friday, between the hours of 8:00 AM and 5:00 PM. Answering services, cellular telephones, beeper numbers and call forwarding systems for after-hours emergency service.
8. Each bidder shall have at least one supervisory employee possessing a certificate, from either ICIA or another recognized organization or institution, providing formal training in audiovisual engineering or installation. Proof of this shall be supplied with bid.
9. Each bidder shall have at least one supervisory employee possessing a Bachelor or master's degree in Electrical Engineering. Proof of this shall be supplied with bid. Trade school degrees are not acceptable.
10. All employees used by the contractor to install this system must be competent technicians who are experienced in the installation and interconnection of professional audiovisual systems.
11. Each bidder shall be currently authorized by the manufacturer of the major components of the system to sell their products and initiate warranty service on the same items. Major components of the system shall include, but not be limited to, data/video projectors, video processing equipment, audio processing equipment, power amplifiers, speakers, etc. Proof of this may be requested during the bidding process. Proof of franchise shall be in the form of a letter from the appropriate manufacturer addressed to the consultant stating that the contractor is currently authorized to sell their products. Letters from the sales representative (rep) shall not be accepted as proof.

**C. Equipment Costs**

1. The bid return shall include detailed lists of all equipment to be supplied. Each piece of equipment shall be individually priced. Equipment list spreadsheets are provided herein under the Specifications. Copies of these lists shall be used, with the appropriate price information added.

2. The design intent of the system may require equipment not listed in the bid spreadsheet, but are indicated elsewhere in the contract documents, in either the drawings or the written specification. It is the sole responsibility of the Bidder to reconcile the contract documents with the equipment and labor required for this project.
3. Equipment costs shall reflect all required modifications and accessories. All substitutions for specified equipment shall be listed and individually priced on a separate page.
4. Equipment totals from each equipment list shall be entered in a Master Recapitulation of Costs form.
5. No claims for additional equipment required will be allowed, if the sole reason for such claims is that the equipment was not listed in the attached spreadsheet. It is the sole responsibility of the Bidder to verify the completeness of the equipment list.

**D. Non-Equipment Costs**

1. Non-equipment costs shall be furnished on the master Recapitulation of Costs form. These non-equipment costs shall be detailed for each of the following categories:
  - a. Engineering, Project Management, and Programming:  
  
Including all required design, shop drawings, schedules, manuals, documentation, etc.
  - b. Pre-Installation:  
  
Including all fabrication, modifications, assembly, rack wiring, custom work, etc. performed on the Contractor's premises.
  - c. Sub-contract (for on-site installation):  
  
Lump sum total for work to be provided by the jobsite electrician or other Electrical and/or General Contractor. This work shall include all field cable pulling, equipment mounting, setting of equipment racks in place, and field wiring terminations.  
  
Please note that this is a requirement for this project. The Bidder's 'On-Site Supervision' costs shall include coordination and supervision of the Electrical/ General Contractor installation work.
  - d. Installation:  
  
Provide supervision of the on-site electrical subcontract installation work: cable pulling, equipment mounting, setting of equipment racks in place, and field wiring terminations. Provide coordination, testing, initial adjustments, owner instruction, etc. performed on the Owner's premises.
  - e. General and Administrative:

- (1) Including all overhead expenses, transportation, reproduction, shipping, insurance and guarantees.
  - f. Taxes:
    - (1) Include all applicable taxes as required.
  - g. Totals:
    - (1) Sums for each column and row of the Master Recapitulation form is the Grand Total.
- E. Substitute Equipment
  - 1. Substitute equipment may be proposed but shall be in addition to the “as specified” bid and separately proposed and will be identified as “alternates” with equipment costs shown separate and apart from the costs of the equipment “as specified”.

Equivalency in quality, performance, construction and function shall be demonstrated by submitting, as applicable or required by the Consultant, the following:

    - a. Technical data sheets and specifications.
    - b. Technical information and equipment test data.
    - c. List of advantages to the Owner.
    - d. Cost and substantive differences between the alternate and the specified equipment on bid.
  - 2. The drawings and specification are based on specific equipment, functions and arrangements. Additions or revisions to equipment, materials, and labor may be necessary for the proper function and fit of any proposed substitute items to the purpose, arrangement and intent originally indicated. It is the responsibility of the Bidder to determine such additions and/or revisions and identify them in the bid submittal.
  - 3. Costs for any additional labor and additions or revisions to wiring, space requirements, equipment or other materials, required for the use of substitute equipment shall be included by the Bidder without claim for subsequent additional payment.
  - 4. Consideration in the bidding for a proposed substitute will be given only if, in the opinion of the Consultant, the substitute is equal to and/or offers significant advantage to the Owner over, the specified item.
  - 5. Service Contract
    - a. The Bidder shall offer a separate annual service contract by pricing for five (5) years on a year-to-year basis, covering all installed systems. This service contract shall cover a minimum of four (4) visits per year, at regular intervals, to perform operation checks of the equipment, to clean

recording heads, screens, projector lenses and other critical surfaces, to lubricate moving parts as recommended by the respective manufacturers and to adjust and align projector to maintain optimum registration and focus. The service contract shall commence immediately after expiration of the warranty period. (A per item price for the service contract shall be submitted with the bid).

F. "On Call" Service

1. The Bidder shall also submit separate costs for other emergency "on-call" service visits and an "in-shop" hourly rate for repair and maintenance work.

1.10 AWARD OF CONTRACT

A. A single award of contract will be made for all systems as detailed in this specification. The quoted prices shall remain firm for a minimum of sixty (60) days

B. The Owner reserves the right to reject any or all bids for any reason. Some of the reasons for rejection may include:

1. Insufficient experience of the contractor and/or company.
2. Failure to meet one or more of the requirements.
3. An unreasonably high or low bid in relation to the estimated cost of the audiovisual system.
4. Failure to provide sufficient documentation with the bid that the company is capable of installing a complete and functional system in keeping with the intent of these specifications.

C. The successful bidder may be required to issue a performance bond.

D. The successful bidder will be required to visit the site within four (4) days after award of contract.

1. Coordinate accessibility to the site with the Construction manager.
2. Report to, and receive clarification from, the Consultant any discrepancies between this specification and existing conditions and similarly report obvious omissions.
3. No subsequent additional payment will be made due to failure to thus observe or verify conditions which may affect the work.
4. Prior to purchase, the AV Contractor shall determine if any components or part numbers are anticipated to be discontinued or replaced during the life of the project, and advise MGE-UTC and the project team accordingly. The AV Contractor shall recommend alternate equipment and provide cost estimates and specification sheets for review. All changes shall be documented and tracked by the AV Contractor.

1.11 SHOP DRAWING SUBMITTAL

- A. Prior to fabrication, submit detailed shop drawings to the Engineer for approval. Do not begin installation or fabrication without such approval.
- B. Shop drawings shall be provided clearly depicting any proposed modification to the project drawings. Any modifications shall be highlighted on the shop drawings.
- C. The Contractor shall submit to the Consultant, for approval, any custom designs pertaining to the systems.
- D. Drawing submittals shall be on reproducible media and DVD/CD-ROM.
- E. Complete system construction and point to point wiring schematic drawings, including all component values, and showing complete letter and number identification of all wire and cable as well as jacks, terminals and connectors. All connections are to be shown; a detail sheet with “typical” connection diagrams is not acceptable.
- F. Shop drawings shall indicate proposed mounting arrangements and details of all equipment, including positioning devices, framework supports and interface with adjacent architecture.
- G. It is intended that any contractor furnishing materials and/or labor necessary for the completion of this specification shall furnish it in compliance with this specification. Where conflict exists with other specifications concerning such materials and labor, this specification takes precedence unless otherwise approved in writing by the Engineer.
- H. All control system pages, both touch panel based and control computer based.
- I. All control system front panel layouts, where applicable.
- J. All panels, plates, and designation strips, including details relating to terminology, engraving finish, and color.
- K. All custom designed consoles, tables, carts, support bases, and shelves.
- L. Schematic drawings of all custom components, assemblies and circuitry, including wall and/or floor plates.
- M. Field wiring details and flow (systems) schematic drawings.
- N. Patch panel assignment layout drawings.
- O. Front mechanical drawings of each equipment rack.
- P. Submit drawings electronically as full size PDF files, or as directed.
- Q. Submit cut sheets or data to the Owner, for “as specified” equipment only as directed by the Architect/ Owners/ or Construction manager. In the event the Architect/ Owner/ or Construction manager does not require equipment cut sheets to be submitted, MGE-UTC must receive two (2) bound sets of cut sheets and as PDF files on one (1) DVD/CD-ROM.
- R. Locations shown herein are approximate. Base shop drawings on actual equipment, installation, and field conditions. Where possible, make equipment and field measurements prior to the preparation of shop drawings, fabrication and installation to ensure proper fit

and function of the equipment. However, this requirement shall not delay the progress of the work. Allow for trimming and fitting wherever the taking of field, or other measurements, before fabrication might delay the work. Costs for failure to coordinate equipment details with site conditions and designated equipment locations shall be borne by the AV Contractor.

- S. The review and approval of shop drawings shall be general only and shall not relieve the AV Contractor from responsibility for proper design, engineering and installation; for deviations from the specifications or drawings due to field conditions; conflict with the work of others that may result from such deviations; or for errors of any sort.
- T. Shop drawings shall include and clearly indicate any proposed modification of the specifications or drawings.
- U. Verification of the focal lengths of projection lenses to achieve the specified image sizes.
- V. Shop drawings shall include all items of equipment, whether a stock manufactured item or custom-built item shall be supported by complete and detailed schematic drawings and replacement parts lists. No “black boxes” or unidentified components shall be acceptable under this specification.
- W. Shop drawings shall be produced by the AV Contractor from the Consultant’s contract drawing set, and be generated in AutoCAD (no later than version 14), with layer naming, color convention, and drawing numbers as directed by the Consultant. The drawings shall consist of:
  - 1. Cover Sheet identifying the following:
    - a. Name and location of project.
    - b. Name and address of the AV Contractor.
    - c. Design for which the drawings are for: “Audiovisual Systems”.
  - 2. Notes, symbols, schedules, wiring details, grounding details; including and in addition to those in the contract drawings.
  - 3. Floor plans of each floor, indicating AV Areas and Drawing Numbers of the associated Audiovisual Facilities Part Plans.
  - 4. AV Facilities Plans shall indicate the AV equipment layout plan, sections proving no obstruction of projected images, and elevations depicting projected images.
  - 5. AV Electrical Plans shall indicate conduit sizes, quantities and wire pulls for the purpose of field wiring. Include wire run sheets, cable termination schedule, and any other field wiring details.
  - 6. System drawings for audio, video, and control systems showing point-to-point wiring interconnections of all equipment with cable numbers. Include manufacturer and part number of all cable, jacks, terminal blocks, and connectors.
  - 7. Mechanical drawings, in full size, for all custom fabricated metal work items such as connector panels, control panels, connectorized or grommet wall plates and cover plates, and mounting box assemblies. Include all dimensions, materials, and

construction details. Submit samples of lettering, label sizes and typeface to be used on custom plates, panels and other equipment.

8. Mechanical drawings for any custom fabricated wood and millwork items and assemblies including all dimensions, materials, and construction details.

#### 1.12 SAMPLES

- A. Submit samples of substitute materials or equipment to, and as required by, the Consultant to prove equivalency to items specified or suitability for the system.
- B. Submit samples of custom work, finishes or other materials to, and as required by, the Consultant to verify appearance and quality.
- C. Submit cabling samples of all low voltage cabling, properly labeled, at a minimum of one foot sample with stripped ends.
- D. All costs for shipping samples shall be borne by the Contractor.

#### 1.13 JOB CONDITIONS

- A. Keep the job adequately staffed at all times. Unless illness, loss of personnel or other circumstances beyond the control of the Contractor intervene, keep the same individual in charge through completion of the project.
- B. Cooperate with all appropriate parties in order to achieve well coordinated progress with the overall construction completion schedule and acceptable final result.
- C. Watch for conflicts with the work of other Contractors on the job and execute, without claim for additional payment, moderate moves or changes as are necessary to accommodate the work of others or to preserve symmetry and pleasing appearance.
- D. Immediately report to the Consultant any design or installation irregularities or conflicts, particularly architectural elements, that interfere with the screen viewing, intended angles or projection, or loudspeaker coverage, so that appropriate action may be taken.
- E. Do all cutting, patching and painting necessary for proper and finished installation of the system and repair any damage done as a result of the installation.
- F. Clean up and dispose of all trash on a regular basis from all system work areas.

#### 1.14 QUALITY ASSURANCE

- A. Equipment and materials supplied shall be complete, model numbers accurate and performance shall conform to manufacturer's specifications.
- B. All equipment and materials shall be new and shall conform to applicable provisions of Underwriters Laboratories and the American standards Association.
- C. Repair or replace any items damaged during installation.
- D. Procure and pay for all necessary permits, licenses, inspections, and observe any requirements stipulated therein.

- E. Comply with all applicable federal, state, and local labor regulations: and applicable local union and trade regulations.
- F. The installation shall conform to the latest federal, state and local electrical and safety codes and regulations or codes and regulations of other authorities having jurisdiction. Where conflicts exist, the most stringent code or regulations shall apply.
- G. The system shall be registered under the most current applicable rulings of the Federal Communications Commission (FCC). Provide the FCC registration number with the equipment submittal. All components and installations shall bear an Underwriters' Laboratories (UL) listing and shall conform to the latest edition or revision of the following codes and standards were required:
  - 1. ANSI - American National Standards Institute
  - 2. ASTM - American Society for Testing and Materials
  - 3. BICSI - Building Industry Consulting Services International
  - 4. EIA - Electronics Industries Association
  - 5. FCC - Federal Communications Commission
  - 6. ICEA - Insulated Cable Engineers Association
  - 7. IEEE - Institute of Electrical and Electronics Engineers
  - 8. ISO - International Organization for Standardization
  - 9. NEC - National Electrical Code
  - 10. NEMA - National Electrical Manufacturer's Association
  - 11. NFPA - National Fire Protection Association.
  - 12. TIA - Telecommunications Industry Association
  - 13. UL - Underwriters Laboratories, Inc.
- H. The code or standard establishing the more stringent requirements shall be followed where areas of conflict occur between codes and standards or between codes and standards and Drawings and Specifications.

#### 1.15 CLOSE OUT DOCUMENTATION

- A. Within two (2) weeks of system completion provide all system documentation, including copies of all relevant drawings and equipment manuals.
  - 1. Itemized equipment list with manufacturer information and serial numbers for every room.
  - 2. Test results from pre and post installation as described elsewhere in this specification.
  - 3. As-built drawings for every item and system. Final, approved copies shall be provided as noted, in addition to laminated hard copies in 11 x17 formats that shall be stored in the equipment rack of each room.
  - 4. Final software code to include all adjustments and settings for controller, panel, and DSP in each room. This shall include jpegs of each touch panel page.
  - 5. End User Operation Manuals

6. A contact list of their key individuals, engineer, lead-tech, site lead, etc. who may be contacted should a question or problem arise. Name, title, telephone number, cell phone number, and e-mail address shall be listed for each individual.
- B. Provide warranty services for the specified period from the date of acceptance. This warranty shall cover a minimum of four (4) visits per year, at regular intervals, to perform operation checks of the equipment, to clean recording heads, screens, projector lenses and other critical surfaces, to lubricate moving parts as recommended by the respective manufacturers and to adjust and align projector to maintain optimum registration and focus.
- C. Guarantee all equipment, components, and workmanship for the specified period from the date of acceptance, which shall be a period of no less than one (1) year.

#### 1.16 GUARANTEE AND SERVICE

- A. All systems, equipment and components shall be guaranteed free of defects in materials and workmanship for a period of one (1) year from the date of acceptance by Owner. Repair and replace such items within twenty-four (24) hours following report of defects by the Owner.
- B. All manufacturers' equipment warranties shall be activated in the Owner's name and shall commence on the date of system acceptance. In the case of Contractor modified equipment, the manufacturer's warranty may be voided. In such cases provide a warranty equivalent to that of the original manufacturer.
- C. The Contractor shall be available on call and on twenty-four (24) hour notice without cost to the Owner during the two weeks of operation following acceptance of the system by the Owner to assist him or his representative in any operational problems that may arise during this initial period of operation.
- D. Provide warranty services for the specified period from the date of acceptance. This warranty shall cover a 24hr on site response time, minimum of four (4) visits per year, at regular intervals, to perform operation checks of the equipment, to clean recording heads, screens, projector lenses and other critical surfaces, to lubricate moving parts as recommended by the respective manufacturers and to adjust and align projector to maintain optimum registration and focus.

#### 1.17 INSURANCE

- A. All equipment and materials shall be fully insured against loss or damage from vandalism, theft, fire, etc.
- B. Certificates of insurance for Workman's Compensation and Liability for all personnel shall be provided to the Owner and be kept on file.
- C. Keep insurance in full force up until acceptance of the system by the Owner or until the Owner relieves the Contractor in writing of this responsibility, whichever is earlier.

### PART 2 – PRODUCTS

#### 2.1 MAJOR EQUIPMENT

- A. Refer to the Audio-Visual Equipment spreadsheet for a list of all major components, including manufacturers, part numbers and quantities. Contractor shall provide any additional components required to deliver a turn-key installation that provides the functionality described in Section 1.1.
- B. Contractor shall include tax on all equipment specified herein for bids and budget purposes or as directed by the GC/CM administering the bid.
- C. Detailed performance specifications for equipment shall be those published by the manufacturer effective on the date of this document for all equipment models number listed herein.
- D. Provide, if available from the manufacturer, rack mount kits for equipment shown to be rack mounted on drawings. Provide Middle Atlantic Products or custom rack mount hardware as required if “off-the-shelf” kits are unavailable.
- E. Note that some equipment may be mounted inside the equipment racks or rack mounted on the rear rails as noted on drawings.
- F. Accessory security covers, for certain signal processing equipment, which is available from the equipment manufacturer, shall be provided as specified herein.
- G. Equipment listed as ‘Custom by the AV Contractor’ shall be custom fabricated and/or assembled by the Contractor as detailed herein.

## 2.2 MISCELLANEOUS EQUIPMENT

- A. Where miscellaneous equipment is listed below or in the drawings by manufacturer or model number, it is for the purpose of establishing standards for quality, performance, construction, and function. Equipment supplied from approved manufacturers listed shall be to the same standards. Where a single manufacturer/model is listed only that manufacturer/model is acceptable.
- B. Provide quantities as indicated in the drawings and/or as required for a complete installation.
- C. Consistency of products and manufacturer shall be maintained for the same or similar items and functions throughout the installation.
- D. Audiovisual Wire and Cable:
  - 1. Audiovisual cabling shall be industry standard: Belden, Crestron, Extron, Liberty, and West Penn.
  - 2. Unless noted otherwise elsewhere in the design drawings, the following cable types shall be used. Note that all part numbers are for plenum-rated cables:
    - a. AUDIO/MIC: 2/22 STRANDED, SHIELDED (BELDEN 82761)
    - b. SPEAKER / DC PWR: 2/16 STRANDED (BELDEN 6200UE)
    - c. RF: RG58/U COAX, 50-OHM (BELDEN 88240)
    - d. VIDEO: RG-59/U COAX, 75-OHM (BELDEN 1506A)
    - e. VIDEO & CATV: RG6/U COAX, 75-OHM (BELDEN 1189AP)
    - f. SDI: LOW-LOSS RG6 COAX, 75-OHM, PLENUM (BELDEN 1695A)

- g. S-VIDEO (EXTRON MHR-2P)
  - h. RGBHV – (EXTRON MHR-5P)
  - i. CRESNET (CRESTRON CRESNET-P)
  - j. DM NET (CRESTRON DM-CBL-P)
  - k. 8G+ (CRESTRON DM-CBL-8G-P)
  - l. RS-232 & CONTROL (BTX YR48891)
  - m. CAT5E (BELDEN 1213)
  - n. CAT6 (BELDEN 2413)
  - o. CAT6A (BELDEN 10GX13)
  - p. CAT6A, SHIELDED (BELDEN 10GX53F)
  - q. FIBER: 50-MICRON OM3 (BELDEN FX OM3)
3. For DC control circuits, wiring shall be #22 AWG stranded, multi-conductor as required, with overall shield if appropriate. Size for no more than 1% voltage drop.
4. Note that conduit sizes are based on conduit fill code requirements for specific quantities of Liberty wire within each conduit. If another approved cable manufacturer is substituted, insure that conduit code requirements are met.
- E. Cable mounted and panel mounted connectors (Female and male):
- 1. Approved manufacturers: Liberty, Canare, Neutrik, and Switchcraft.
  - 2. Any multi-pin connectors to be used shall be Amphenol MS series, AMP CP series, EDAC or ELCO, ITT/Canon EP series, or Winchester MRAC series.
- F. Custom wall plates, cover plates, ceiling plates, floor box plates, and millwork & lectern plates (for audiovisual receptacles and controls):
- 1. All plates shall be equivalent in type, color, and finish to other plates in the same room unless otherwise specified on drawings.
  - 2. Size of plates as shown on drawings. Field verification before fabrication shall be required.
  - 3. Black or white filled engraving, whichever provides the highest contrast to the plate color and finish as specified on drawings.
  - 4. Typeface shall be Helvetica Bold with height as shown on drawings.
  - 5. Approved manufacturers: Same as for other plates in room, unless custom as specified on drawings.
  - 6. Verify finish of all plated and panels with the Architect and submit samples prior to fabrication.

## 2.3 EXECUTION

- A. The Digital Transport and Distribution System shall be manufactured by Crestron Electronics, Inc. and shall be Crestron DigitalMedia or engineer approved equal.

- B. Although efforts have been made to avoid discrepancies, Contractor shall verify intended equipment types and quantities, by examining both the drawings and specification, to ensure a complete installation as intended herein.

### PART 3 – INSTALLATION

#### 3.1 SYSTEM REQUIREMENTS

- A. Requirements herein referring to Materials, equipment or work related to, or that function as part of, the system but not within the work scope of this specification, shall apply to the supplying and/or installing contractor who shall comply with said requirement. Where conflict exists with other specifications concerning such work, this specification takes precedence unless otherwise approved in writing by the Architect. Contractor for this specification is responsible for reporting to the Consultant irregularities, errors or omissions in such work that may affect the performance or function of the system so that appropriate action can be taken.

#### 3.2 EQUIPMENT DELIVERY

- A. All equipment, especially portable, shall be shipped to the site only after ensuring that secure storage facilities are available to protect the equipment from damage, theft, vandalism, etc. prior to and during installation.
- B. Shipping containers shall be sturdy and provide mechanical protection of equipment during shipping, handling, and storage. Provide inner plastic sheeting and padding to protect against moisture, dust, and shock.

#### 3.3 INSTALLATION OF SYSTEMS

- A. Layout, construction and wiring shall be performed to the highest standards of acknowledged industry and professional practice and shall be in strict adherence to the latest editions of:
  - 1. “Audio System Design and Installation”, Phillip Giddings.
  - 2. Handbook for Sound Engineers, “The New Audio Encyclopedia”, Glen Ballou.
  - 3. Sound System Engineering “Recommended Wiring Practices”, Don Davis.
- B. Located all equipment requiring adjustments, cleaning or similar attention so that it will be accessible for such attention. Equipment racks, in particular, shall be positioned to permit full and easy access or operation and service.
- C. Mount equipment at heights and locations indicated on the drawings and schedules. Locations indicated on drawings are generalized and approximate. Verify locations with architectural and other relevant drawings prior to installation. Check for adequacy of headroom and non-interference with other equipment such as ductwork, pipes, light track fixtures, etc. Report conflicts to the Consultant’s attention so that appropriate action May be taken before proceeding with the work.
- D. Provide protection and protective coverings to prevent visual or functional damage to Material, equipment and the work of other contractors until Owner’s acceptance. In the event of damage, make all repairs and replacements necessary to the approval of the Architect or Consultant, as appropriate, and at no additional cost to the Owner.

- E. All equipment, enclosures, boxes, cabinets, wireways, and related wiring shall be plumb and square.
- F. All equipment shall be permanently attached to the structure and held firmly in place. Furnish and install brackets, braces and supports as required with a safety factor of at least five (5).
- G. Fabricate and install supports so that the completed installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joist, slabs or structural steel, nor welding to structural steel is permitted except as approved in writing by the Architect.
- H. As a result of acceptance testing it may be necessary to move and adjust certain equipment such as speakers, projectors, and video monitors. Provide for  $\pm$  (5) degrees of adjustability for any angular orientation specified. Where normal operational adjustment is intended for the user, provide adjustability as appropriate for the purpose.
- I. Mount all equipment and components with due regard for minimization of induced electromagnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide safety and reasonable convenience for the operator.
- J. Equipment, switches (within equipment racks), receptacles, outlets, terminal block terminals and other terminations shall be logically, uniquely and permanently identified as to their function, circuit or system as appropriate. Engraved plastic laminate (Lamicoid) labeling shall be used. Imprinted plastic tape is not acceptable. Markings for these items are purposely detailed in the specification drawings to ensure consistence and clarity. Verify nomenclature size and placement with the Consultant prior to Marking.
- K. The front and rear of each rack mounted device shall be labeled with lamicoid labels (i.e. "ACR 1"); as well as all occupied slots in card frame based devices as to type of card required there. Provide lamicoid strips indicating the function of each input level control for all mixers, preamplifiers, and power amplifiers.
- L. Equipment specified herein is designed to operate in environments of normal humidity, dust and temperature. Provide appropriate protection for equipment and related wiring where extreme environmental conditions can occur.
- M. Provide protection for audiovisual equipment and cabling during construction and construction walkthrough punch listing.
- N. Video Formats and associated Data Rates:
  - 1. 1080p Deep Color – 6.75 Gbps
  - 2. 1600x1200 – 4.86 Gbps
  - 3. 1920x1200 – 4.62 Gbps
  - 4. 1080p – 4.44 Gbps
  - 5. 1360x768 – 2.54 Gbps
  - 6. 720p / 1080i – 2.22 Gbps
  - 7. 1024x768 – 1.91 Gbps

3.4 WIRING METHODS AND PRACTICES

- A. Installation of all wire and cable shall include ensuring proper:
1. Types
  2. Lengths
  3. Routing
  4. Quantities
  5. Pulling Tensions
  6. Circuit Identification
  7. Wire/cable group separations
- B. Do not pull through any box, enclosure, or fitting where change of conduit or raceway alignment or direction occurs. Do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, rollers, and other necessary items to protect cables from excess tension, abrasion, damaging or bending during pulling.
- C. Provide wire pulling lubricants and pulling tensions strictly in accordance with wire and cable Manufacturer's recommendations.
- D. Cover edges of cable pass through holes in chassis, racks, boxes, plates, etc. with rubber grommets or Heyco or Brady GRNY nylon grommets.
- E. Form in a neat and orderly manner all cable in enclosures, boxes, wireways and trays. Harness as required using Panduit cable ties of appropriate size and type. Spacing between ties to be six (6) inches maximum.
- F. Provide ample service loops at each termination so that plates, panels, and equipment can be demounted for inspection and service and so equipment in drawers or on slides can move freely.
- G. Permanently and distinctly identify all wires and cables at each end by labeling with Panduit or Brady (for example) wire Makers printed on LaserJet or DeskJet printer via computer software program. Labeling information shall include the following:
1. Descriptive information related to the cable's equipment source.
  2. Descriptive information related to the cable's equipment destination.
- H. Enter all identifications on wire/cable run schedules and/or as part of the shop drawings. Samples of this labeling can be supplied by the Consultant at the AV Contractor's request.
- I. Use the same wire color coding for the same circuit, circuit functions, or phasing throughout the system. No splices shall exist in any length of wire run except where noted on specification drawings.
- J. Exercise care in wiring so as to avoid damage to cables. Cables shall be well supported and neatly laced and dressed between racks, cabinets, consoles, or modules. Make all connections to jacks and connectors with rosin-core solder. Soldering shall be neat and shall not exhibit "cold joints". Avoid "solder splatter" which can cause shorts in exposed terminals or wiring.

- K. The terminal blocks specified for rack termination shall be wire clamp type as mentioned above. Lugs or spades are not acceptable and will be rejected. No more than two wires shall be connected to a single terminal, and the terminal block will be sized to properly accommodate wire specified. Provide spare terminals on all terminal blocks to accommodate future wiring equivalent to at least 10% of the circuits installed.
- L. Connections made with screw actuated pressure type terminal strips shall be made by stripping approximately ¼” of insulation from the stranded conductor, inserting the un-tinned wire into the pressure terminal, and tightening the terminal screw using a small screw driver which securely fits the screw head.
- M. All exposed shield drain wires shall be sheathed in properly sized clear Teflon tubing, clear shrink tube, or white “spaghetti”. Floating line level audio shields (at device outputs) shall be insulated using the proper size heat shrink tubing and completely protected against any other conductors or connector shell.
- N. Video connection shall only be by means of specified connector appropriate for the equipment or device terminations.
- O. All video outputs shall be properly terminated with the specified 75-Ohm termination.
- P. Maintain absolute phase between all points in the system. Connector phasing shall be consistent except for terminations at equipment Manufactured to other configurations.
- Q. Connector Phasing shall be as follows:
  - 1. XLR – Pin 2 is positive phase.
  - 2. 1/4" – Tip is positive phase
  - 3. Phono – Tip is positive phase
  - 4. BNC – Tip is positive phase
  - 5. F-Type – Tip is positive phase

### 3.5 GROUNDING

- A. Grounding and shielding shall conform to the following procedures:
  - 1. AC grounding applies only to AC power circuits intended for powering fixed and portable audiovisual equipment
  - 2. Active equipment refers to 120VAC power equipment. Passive devices refer to connectors, microphones, speakers, RF taps, etc.
  - 3. It is the primary intent of the following procedures to provide a safe system for personnel to operate.
  - 4. The AC power cord from active equipment shall never have its third prong grounding conductor defeated.
  - 5. To reduce noise voltage in the system it is intended that only one ground connection path exists between two pieces of equipment.
  - 6. It is further intended that all audio signal conductors connected between active devices shall be electronically balanced or transformer balanced with respect to the audio signal ground. Unbalanced audio circuits, where possible, shall utilize level Matching interfaces with active balanced circuitry or isolation transformers. Mount these devices as close as possible.

7. While short, unbalanced audio runs may function acceptably, such connections can create ground loops and shall be Made with caution. Video signal interconnection is typically unbalanced and will use its shield as the low side of the signal path.
8. Where mounting hardware in indicated as a means of grounding, ensure both a solid electrical and mechanical connection is made.
9. Cable shields shall be considered grounded if connected to the shield connection points provided by the Manufacturer of active equipment.
10. Cable shields shall NOT be used as the only means for grounding, except for certain passive equipment such as microphones and loudspeakers. Shields shall NOT be used to carry any type of signals, except for video, or DC voltage (-or common), and for phantom power for microphone circuits.
11. Between active equipment, connect to ground at the receiving end only. Shields pass straight through all terminal blocks and patch panel punch blocks.
12. Connect to shield terminal at both ends for microphone circuits and tie-lines.
13. For Video Shields (between equipment), connect and ground at both ends. To reduce low frequency interference (e.g. 60 Hz), most video devices employ input clamping. Do not use transformers. If a measurable amount of AC hum is present, then suitable means shall be employed to correct or eliminate the source of the problem.
14. Unbalanced audio circuits shall utilize two conductor shielded cable and have shields connected at device inputs and floated at device outputs. Strap shield to low side of balanced input.
15. For DC control circuit shields, typically, shields are not used to carry DC common of DC control circuits. If they are, connect the common of 0 volt side of the circuit to ground at one point only, that end being to ground at the power supply.

### 3.6 VERIFICATION AND PERFORMANCE TESTS

- A. Perform complete testing of the system from point to point. Make all adjustments and modifications necessary to bring system into compliance with industry standards, except as May be limited by equipment specifications.

### 3.7 ACCEPTANCE TESTING AND COMMISSIONING

- A. Acceptance testing and commissioning will be performed by the Consultant after no less than 3 business day's notification that the system is ready (in writing), whereby the Contractor has verified that all signals are functioning and equipment is adjusted properly. The period of time required for acceptance testing is no less than two (2) eight (8) hour days.
- B. The demonstration and acceptance tests shall be done by a Crestron DigitalMedia Certified Engineer (DMC-E).The contractor shall provide a copy of the following information in electronic format in order to verify the AV switching equipment has been installed and configured correctly:
  1. The number of HDCP KSVs supported by each source
  2. The video timing, HDCP use and audio format of each source when operating (not needed for walk-in equipment)
  3. The video timings and supported audio formats for each connected sink
  4. The video timings and supported audio formats presented in the EDID to each source – the preferred video timing shall be indicated

5. The length of cable used on all shielded twisted pair cable used for AV distribution
  6. The data rate supported by each shielded twisted pair cable used for AV distribution
- C. Acceptance testing and commissioning will include, as deemed necessary by the Consultant, any or all tests required to prove that the system functions as specified, for alignment of all equipment for optimum performance and quality, and checking of all control functions for proper operation.
  - D. In the event that the need for further adjustment or work becomes evident during acceptance testing, continue work until the system is made acceptable and at no additional cost to the Owner.
  - E. If acceptance is delayed because of defects in or failure of equipment or because the installation fails to meet the requirements of this specification, Contractor shall pay the Consultant, at the Consultant's standard rate in effect at that time, for any additional time and expenses during any extension of the acceptance testing periods.
  - F. Coordinate testing period so that access, work lighting and electrical power are available on site.
  - G. Furnish at least 1 certified lead technician for the test period (day or night) to assist in tests, adjustments and final modifications.
  - H. Furnish test equipment on site for the duration of the acceptance testing period as well as all media type for playback and recording.
  - I. Furnish all tools and Material required to make necessary repairs, corrections or adjustments required.
  - J. Furnish a draft copy of the System Reference Manual.
  - K. Ensure that audiovisual areas are in a clean and orderly condition, ready for acceptance testing.

3.8 DOCUMENTATION

- A. Keep a complete set of approved submittal drawings and consultant drawings on the job at all times.
- B. Note any changes or modifications made during installation and submit to the Consultant for review one corrected set of reproducible drawings showing the work as installed.
- C. Audio and video system block drawings identical to the MGE UTC specification drawings; with all as-built changes incorporated; with the addition of all input and output cable and terminal block numbers. A copy of these drawings shall be framed in protective plastic and provided to the Owner.
- D. Furnish a System Reference Manual prepared for a reader assumed to be technically competent but unfamiliar with this particular system.

- E. Submit a draft copy of the Manual to the Consultant at the time of acceptance testing, prepared as indicated and for approval.
- F. Furnish, within two (2) weeks following acceptance a minimum of three (3) copies of the up-to-date and approved System Reference Manual in 3-ring binders and two (2) copies on DVD/CD-ROM, appropriately titled for this project with tabular dividers. If no requirements are given by the GC, Contractor shall provide three (3) binders and one (1) DVD/CD-ROM to the Owner and one (1) DVD/CD-ROM shall be provided to the Consultant.
- G. The System Reference Manual shall contain the following sections:
  - 1. System Operation Manual:
    - a. Describe all typical operating procedures necessary to activate the system and to provide for the functional requirements detailed herein. Organize by system or activity.
  - 2. Manufacturer Manuals:
    - a. Include Manufacturer's operational instruction Manuals for all equipment as well as descriptions, capabilities and operation information for all custom items.
  - 3. Block Diagrams:
    - a. Reduced copies of the above mentioned audio and video drawings with all as built changes incorporated. Drawings shall be photographically reproduced.
  - 4. Control Settings:
    - a. A clearly identified list, post acceptance test, of settings for all fixed and semi-fixed controls and of all gain settings.
  - 5. System Performance:
    - a. Copy of the verification test report and any other relevant performance data on the system.
  - 6. Equipment List:
    - a. Include all equipment by Manufacturer, model number, serial number and local in the facility.
  - 7. Maintenance:
    - a. Items recommended for Maintenance along with recommended products, procedures and schedules for Maintenance of those items. Normally, Manufacturer's Maintenance Manuals should be used for this purpose. If information from the Manufacturer is inadequate or item is custom provide the information necessary for proper Maintenance. Include parts lists and schematics as available from the Manufactures and for all custom items.
  - 8. Service:
    - a. A clear statement of the Contractor's guarantee for the system including service phone number and weekday/weekend hours. Include similar information for on-call service. Include Manufacturer's warranty statement for all equipment including actual expiration dates.

### 3.9 INSTRUCTION FOR THE OWNER

- A. At a time designated by the Owner, provide sixteen (16) hour's instruction to the Owner's designated personnel in the use and operation of the system. The instructor shall be fully knowledgeable and qualified in system operation.

- B. Furnish a completed copy of the System Reference Manual on site at the time of this instruction period.
- C. Furnish one (1) qualified technician who has knowledge of systems installed to be present and assist the Owner at the first two (2) Major uses of each type of system.

3.10 RECOGNITION

- A. All installations shall bear the following identification plate, supplied by the AV contractor, mounted on the front of the Main rack at the top:

SYSTEM ENGINEERED & DESIGNED BY:  
MGE UNIFIED TECHNOLOGIES CORP.  
116 W. 32ND STREET, 11<sup>TH</sup> FLOOR  
NEW YORK, N.Y. 10001  
(212) 643-9055

SYSTEM FABRICATED & INSTALLED BY:  
(AV Contractor)

Panel shall be: PanelCrafters custom RackMate Header Panels.

END OF SECTION 274116