

I. Drawing and Specification Revisions

1. Specification sections 27 1000 and 27 4000 issued and attached.

Note: A second addendum will be issued after the prebid meeting to include minutes from the meeting, sign in sheet, and answers to questions asked at the meeting.

SECTION 27 0000 – GENERAL TECHNOLOGY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes general administrative and procedural requirements. The following requirements are included to supplement the requirements specified in Division 1 Specification Sections.
- B. Along with the drawings and details, these specifications establish the requirements for the Midland Administration Building Board Room Audiovisual Systems.
- C. The project consists of the following major systems:
 - 1. Board Room Audio Systems
 - 2. Distributed Audiovisual System
- D. Technology-related work provided by others:
 - 1. Power and conduit systems (by electrical trades)
 - 2. Broadcast system
- E. The project consists of the following alternates to be submitted in addition to the base bid:
 - 1. **Alternate 1:**
Provide an 80" class LCD display in Meeting Room A. Provide a dedicated HDMI input in the location shown on the drawings. Pricing to include all mounts, labor for install, additional cabling, etc.
 - 2. **Alternate 2:**
Provide pricing for a Biamp Tesira solution in lieu of AudiaFLEX solution. Solution must accommodate the needs required by the current design, and provide a minimum of 2 additional inputs for possible system growth.

GENERAL REQUIREMENTS

- A. Bidders must submit a bill of materials with the proposal. BOM must list all major components, quantities, and extended price. BOM is provided for information only to assist in evaluating the various bid proposals. Bidder agrees to the scope of work outlined in the bid documents.
- B. The bid documentation does not provide for every component or requirement of installation, however, it does establish minimum requirements for the system. The final solution shall be well documented within the bid proposal. Drawings are not intended to be scaled for rough-in or to serve as shop drawings. Take all field measurements required to complete the work.

Installation within a reasonable distance from the locations shown on the drawing will be performed without additional cost.

- C. Contractor is to visit the site, examine and verify the conditions under which the work will be performed before submitting a bid response. The submitting of a bid response implies that the Contractor has visited the site and understands the conditions under which the work must be conducted. Additional charges will not be allowed because of failure to make this examination or to include all materials and labor to complete the work.
- D. Additional information provided with a bid response shall be used in the evaluation of bids, but do not replace the requirements established by the contract documents (project manual, drawings, specifications, etc.). The Technology Designer and Owner will not be responsible for reviewing equipment lists for completeness or conformance to the contract documents. Lists of material, bills of material, etc. submitted by the contractor do not replace the submittal requirements and do not replace the requirements established by the contract.
- E. The Contractor shall provide the services necessary to engineer, procure, install, test, and certify the systems described in the bid documents conforming to manufacturer specifications and applicable industry standards.
- F. All materials and equipment shall be furnished complete with all accessories normally supplied for a complete and operating system. All materials and equipment shall be new and shall be standard products in production and shall be of the manufacturer's current design. Any items with a known end of manufacture date will be specifically called out for approval before procurement. All equipment of the same or similar systems shall be by the same manufacturer.
- G. The methods of implementation shall be in accordance with the latest issue of the various authorities including but not limited to:
 - 1. ANSI American National Standards Institute
 - 2. ASTM American Society for Testing and Materials
 - 3. BICSI Building Industries 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. NECA National Electrical Contractors Association
 - 11. NEMA National Electrical Manufacturer's Association
 - 12. NFPA National Fire Protection Association
 - 13. TIA Telecommunications Industry Association
 - 14. UL Underwriters Laboratories, Inc.
- H. Notify the Technology Designer before the bid period question deadline, established at the pre-bid meeting, should any changes in bid documents be required to conform to recommended manufacturer guidelines or the applicable codes, rules, or regulations. After entering into Contract, make all changes required to conform to applicable guidelines, ordinances, rules, and regulations without additional expense to the Owner.
- I. Any required permits, licenses, inspections, approvals and fees for the work shall be secured and paid for by the Contractor. All work shall conform to all applicable codes, rules, and regulations. Perform all tests required by state, city, county and/or other agencies having jurisdiction. Provide all materials, equipment, etc., and labor required for tests.

- J. Contractor shall comply with all rules and regulations of local utility companies. Coordinate requirements with applicable companies supplying service and include the cost of all such items in proposal.
- K. Each contractor is to provide any backboards and access panels necessary for their installation. Materials are to be fire-rated. Provide D-rings, spaced no greater than 12" apart, to support cables routed to and along backboards.
- L. Each contractor is to use plenum rated cabling and accessories throughout the project.
- M. Where not provided by the electrical contractor, each contractor is required to provide their own penetrations, sleeves, and cores with firestopping. Sleeves and cores shall have nylon bushings.
- N. Install surge suppressors where ac-power-operated devices are not protected against voltage transients by integral surge suppressors specified in UL 1449. Install surge suppressors at the devices' power-line terminals. All surge suppression devices shall warranty protection of all downstream equipment.
- O. Unit prices established for the project shall remain in effect throughout the duration of the contract.

1.3 DEFINITIONS

- A. ADA: Americans with Disabilities Act.
- B. AIA: American Institute of Architects.
- C. FBO: Furnished By Others.
- D. IR: Infrared.
- E. MC: Main Cross-Connect. (Applies to MDF or Headend references).
- F. OFE: Owner Furnished Equipment. (Applies to OFCI references)
- G. POE: Power over Ethernet.
- H. RF: Radio Frequency.
- I. TR: Telecommunications Room. (Applies to MDF or IDF references).

1.4 SUBMITTALS

- A. All submittals shall be complete and organized by related items. Incomplete submittal packets will be returned unchecked. Any modifications to or deviations from the bid documents shall be specifically highlighted on the submittals. In addition to requirements specified in Division 1, include the following:
- B. Lists of material, bills of material, etc. submitted by the contractor do not replace the submittal requirements and do not replace the requirements established by the contract documents. The Technology Designer and Owner will not be responsible for reviewing lists of material for completeness or conformance to the contract documents.

- C. Copies of any professional licenses or certifications requested in the documents.
- D. Product Data: For each product indicated in the specifications or included in the scope, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.
- E. Shop Drawings: Shop drawings are to be provided in both hard-copy and electronic format (Microsoft Visio or AutoCAD format).
 - 1. Include dimensioned plan and elevation views of telecommunications rooms, with individual components labeled. Show workspace and access requirements. Identify the location of items requiring installation coordination including lighting fixtures, diffusers, speakers, sprinklers, access panels, and other architectural features
 - 2. Include scaled drawings indicating front and rear views of all equipment racks, consoles, and associated equipment indicating the relative position of the equipment, terminal connections, descriptive title, manufacturer and model number.
 - 3. Include a schematic drawing of each overall system identifying all equipment and the interconnection of components. Include both existing equipment and systems provided by others that will integrate with the voice system. Include connections with utility providers, where applicable.
 - 4. Include labeling scheme for cables and equipment.
- F. Closeout documents will include a spreadsheet identifying system components, installed location, model number, serial number, label designation, and any other pertinent data. Submittals shall include spreadsheet format for approval.

1.5 QUALITY ASSURANCE

- A. The Contractor and their Sub-Contractors shall be experienced in all aspects of the work and shall demonstrate direct experience on recent systems of similar type, complexity, and size.
 - 1. Upon request, Contractor shall furnish for both the Contractor and all Sub-Contractors information on the corporation, project manager, and installers indicating recently completed projects, technical experience, and completed training.
 - 2. The Contractor shall maintain consistent staffing for Project Management and lead installers throughout the project, with the exception of illness or loss of personnel. The Technology Designer and Owner reserve the right to require staffing substitutions if deemed beneficial to satisfactory completion of the project.
- B. The Contractor shall utilize equipment from manufacturers regularly engaged in the production of similar systems and components for a minimum of five (5) years.
- C. The Contractor shall install in accordance with all applicable codes and standards, including federal, state, and local codes and authorities.

1.6 COORDINATION

- A. Contractors shall be responsible for coordinating their configuration with the Owner, access providers, and other integrators whose systems will interact. If problems occur during implementation or commissioning, all contractors will be responsible for ongoing/additional coordination regarding configuring, testing, and troubleshooting of related/ inter-related devices until a resolution acceptable to the Owner is achieved. This includes coordination with outside

agencies such as telephone service providers, cable/satellite TV, and internet service providers when necessary

- B. Coordinate layout, rough-in requirements, and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.
- C. Coordinate with the appropriate utility companies for installation and cutover.
- D. Where multiple contractors will share a common pathway or faceplate, coordinate requirements and installation.
- E. Where the cabling and A/V contractor(s) will be sharing a faceplate, the A/V contractor is to provide the faceplate and any blank modules. The faceplate must be able to accept the termination jack chosen by the data cabling contractor. Contractors shall coordinate all faceplate and termination requirements.
- F. Contractors shall be responsible for coordinating their configuration with the Owner, access providers, and other integrators whose systems will interact. If problems occur during implementation or commissioning, all contractors will be responsible for ongoing/additional coordination regarding configuring, testing, and troubleshooting of related/inter-related devices until a resolution acceptable to the Owner is achieved.

1.7 WARRANTY

- A. The contractor warrants the system to be free of defects of workmanship or products and will inspect and repair the system within twenty-four (24) hours during the warranty period at no additional cost to the Owner. The Contractor shall respond on site within eight (8) business hours' notice, and without cost to the Owner, during this warranty period. Contractor agrees to correct system deficiencies and replace components that fail in materials or workmanship including deficiencies arising when used according to the manufacturer or Contractor's written instructions. No warranty or terms therein shall limit or be interpreted to limit remedies as provided by law.
- B. When a manufacturer's warranty is provided, it is the Bidder's responsibility to make sure the manufacturer's records reflect the correct warranty period start date as established in the contract terms.
- C. All equipment shall be provided with a three (3) year warranty unless noted otherwise. The warranty period shall begin at the date indicated on the certificate of substantial completion or the date of Owner acceptance (to be received in writing and approved by Barton Malow), whichever comes later.
- D. The warranty shall include phone support, software assurance, firmware updates, and any other special warranties.
- E. The Owner shall not be responsible for additional charges during the equipment warranty period. Labor, service charges, trip charges, etc. to configure and install equipment during the warranty period shall be included in the contractor's warranty.
- F. Contractor is to provide documentation for any and all manufacturer's warranties including the operating conditions required for the warranty.
- G. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified shall not deprive the Owner of other rights the Owner may have

under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Contractor is responsible for ensuring that no asbestos containing building materials (ACBM) are used and must certify to the Owner and Technology Designer that none was used.
- B. Any equipment, software, system, etc. with time dependent functions (e.g. bell systems) shall automatically adjust for daylight saving time without human intervention.

2.2 MANUFACTURERS

- A. Permit Competition. The name of a model, manufacturer or brand in this RFP shall not be considered as exclusive of other brands. Brands and models specified in this RFP are preferred. Midland Public Schools expects all supplies, materials, equipment or products bid by a Bidder to meet or exceed the specifications set forth in this RFP. Further, it is Midland Public School's intent that this RFP permit competition. Accordingly, the use of any patent, proprietary name or manufacturer's name is for demonstrative purposes only and is not intended to curtail competition. Whenever any supplies, material, equipment or products requested in this RFP are specified by patent, proprietary name or by the name of the manufacturer, unless stated differently, such specification shall be considered as if followed by the words "or comparable equivalent," whether or not such words appear. Midland Public Schools, in its sole and absolute discretion, shall have the right to determine if the proposed equivalent products/brands submitted by Bidder meet the specifications contained in this RFP and possess equivalent and/or better qualities. It is the Bidder's responsibility to notify Midland Public Schools in writing if any specifications or suggested comparable equivalent products/brands require clarification by Midland Public Schools prior to the Due Date for Bids. Any and all Bid deviations from specifications must be noted on the Proposal Form.
- B. Base bid shall utilize manufacturers listed in the applicable specification sections. Contractor may include deviations as voluntary alternates in addition to the base bid, not in lieu of the base bid.
- C. The Owner expects all supplies, materials equipment or products proposed by a Bidder to meet or exceed the Specifications set forth in the Bidding Documents. Further, it is the Owner's intent that the Bidding Documents permit competition. Accordingly, the use of any patent, proprietary name or manufacturer's name is for demonstrative purposes only and is not intended to curtail competition. Whenever any supplies, material, equipment or products requested in the Bidding Documents are specified by patent, proprietary name or by the name of the manufacturer, unless stated differently, such specification shall be considered as if followed by the words "or comparable equivalent," whether or not such words appear. The Owner, in its sole and absolute discretion, shall have the right to determine if the proposed equivalent products/brands submitted by Bidder meet the Specifications contained in the Bidding Documents and possess equivalent and/or better qualities. It shall be the Bidder's responsibility to notify the Owner in writing if any Specifications or suggested comparable equivalent products/brands require clarification by the Owner prior to the Due Date for Bid Proposals.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.
- B. Failure or omission of the Contractor to examine the site or documents does not relieve the Contractor. No additional payment will be made to the Contractor for failure to comply.
- C. Review building plans and installations to confirm outlet and conduit installation and location. Check outlets, conduits, raceways, cable trays, and other elements in the proposed pathways for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation in compliance with manufacturer requirements.
- D. Contractor shall choose appropriate mounting method and materials for each location based on manufacturer's requirements, wall construction, building structure, etc.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Consult with the Owner's Representative as to the method of completing work so as to avoid interfering with the Owner's operation. All systems shall remain operational and shall only be interrupted at times coordinated with the Owner's Representative.
- B. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans or specifications.
- C. The Contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification, within standards of generally accepted workmanship, and in accordance with manufacturer's recommended installation practices.
- D. The Contractor shall protect equipment and components during installation. Damage resulting from the Contractor's work shall be promptly replaced or repaired at the Contractor's expense.
- E. The Contractor shall provide all lifts and temporary supports necessary to accomplish their installation.
- F. The Contractor shall accomplish all cutting, removal and replacement of ceiling tile, drilling, coring and patching of walls, floors, casework, and ceilings required to complete their work.
- G. The Contractor, in accordance with all applicable codes, shall provide fire and smoke stopping through all partitions. Verify that penetrations of rated fire walls are made using products labeled for type of partition penetrated.
- H. All cables within racks, cabinets, or enclosures will be cable wrapped with Velcro cable ties at no greater than one-foot intervals. Cabling housed in wiring management shall be tied at no less than two-foot intervals.

- I. Due to field conditions or other situations, installation locations may have to be relocated a reasonable distance from the plan location. Unless relocations, modifications and reengineering are consistently or substantially unfavorable to either the Contractor or the Owner, there will be no additional charge or credit for this work.
- J. No additional compensation will be provided for moving installed equipment for reasons including, but not limited to:
 - 1. Performance issues.
 - 2. Failure to coordinate with other trades for existing conditions and renovations or new construction.
 - a. All drawings (including Architectural, Mechanical, Electrical, etc.) are available for review at the jobsite.
 - 3. Locations deviating from design drawings (unless approval has been obtained prior to installation).
 - 4. Failing to follow manufacturer's recommendations.
- K. The lack of permanent power does not relieve contractor of installation requirements as dictated in the specifications. If permanent power is not available, contractor must provide temporary power (e.g. UL approved extension cords) to complete installation, configuration, and testing of equipment (e.g. projectors, interactive whiteboards, etc.). Extension cords and/or other means of temporary power are to be removed immediately after the initial installation/configuration. At the time permanent power is completed, contractor to return to make final equipment connections and any necessary adjustments. Refer to the safety section of the project manual for guidelines of proper use with regards to temporary power.

3.3 CLEANING

- A. All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.
- B. Contractor shall clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

3.4 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

- A. Equipment and materials shall be protected from theft, injury, or damage. Equipment set in place must be provided with temporary protection.
- B. Provide adequate storage for all equipment and materials delivered to the site. Owner shall not be required to provide secure storage, but will attempt to accommodate the Contractor's requirements.

3.5 IDENTIFICATION

- A. Unless noted otherwise, use logical and systematic designations for facility's architectural arrangement and nomenclature.
- B. Contractor is responsible for permanently identifying all major components used in the project. Component list, identification method, and nomenclature to be coordinated with and approved by the Technology Designer.

- C. All cross connecting cable shall be adequately tagged as “to” and “from.”

3.6 FIELD QUALITY CONTROL

- A. All ancillary accessories (e.g. remote controls, keys, etc.) shall be collected, identified by installation location, and turned over to the Owner. Coordinate delivery with Technology Designer to ensure appropriate signoffs are received.
- B. The Owner and/or Technology Designer may designate an agent who may be present during testing and may provide additional testing to verify cabling installer results. The agent shall accept or reject the installation.

3.7 DEMONSTRATION AND STARTUP

- A. All training and demonstration will be provided at no cost to the District.
- B. At the completion of each phase of work, Contractor will provide four (4) hours of startup assistance for out-of-scope work, scheduled at the Owner's discretion. The assistance time may not be contiguous and does not include travel time to or from the project site. Startup assistance shall utilize staff involved in the onsite installation unless added personnel is needed to complete the base scope of work according to the project schedule or Owner's requirements. Unused time will be deducted utilizing the labor material price.
- C. At a minimum, bids shall include twelve (12) hours of training to be used for end-user or administrative training. The assistance time may not be contiguous and does not include travel time to or from the project site. Additional training requirements are listed in individual specification sections.
- D. The following systems do not require training to be included in the base bid: structured cabling.

3.8 DOCUMENTATION

- A. For multi-phase projects, adequate documentation for completed work shall be submitted as each phase is completed to allow the owner and project team to utilize the system.
- B. At the conclusion of the project (or major phase for multi-phase projects), all documentation is to be compiled into an organized, comprehensive package. Copies are to be submitted both in hard copy and electronic formats. CAD drawings shall be in Microsoft Visio or AutoCAD formats. The Contractor is responsible for any fees charged by the architect for providing CAD backgrounds.
- C. Contractor responsible for all equipment registration per manufacturer's instructions.
- D. As-Built: In addition to requirements specified in Division 1, include the following:
 - 1. As-built drawings are to reflect all changes between the bid documents and the final installation, including final location of all outlets, racks, penetrations, etc.
 - 2. Drawings for systems showing location and cabinet/enclosure layout. Include all components identifying component manufacturer and model, serial numbers, and connections.

3. Cable tests, OTDR traces, etc. are to be provided in both hardcopy format as well as electronic format. Any software necessary to view the tests must be provided to the Owner.
 4. Wiring and systems certification.
 5. Certificate of manufacturer's extended warranty, where applicable.
 6. Spreadsheet identifying system components, installed location, model number, serial number, label designation, warranty expiration, and any other project-specific pertinent data. Spreadsheet format to be approved by Technology Designer.
 7. Drawings shall be created in AutoCAD or Visio format. Hand written drawings shall be accepted for draft or working copies only.
 8. All as-built and other closeout documentation to be submitted as a PDF in addition to the native file format.
- E. Maintenance Data: In addition to requirements specified in Division 1, include the following:
1. Detailed operating instructions covering operation under both normal and abnormal conditions.
 2. Routine maintenance procedures for system operation, customized for the particular installation.
 3. Lists of spare parts and replacement components recommended being stored at the site.

END OF SECTION 27 0000

SECTION 27 1000 – GENERAL CABLING REQUIREMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Specification Sections:
 - 1. 27 0000 – General Technology Requirements
 - 2. 27 4000 – AV Requirements

1.2 SUMMARY

- A. This Section includes general cabling requirements for contractors installing cabling within their scope of work.
- B. Contractor is required to furnish and install cables and accessories in locations as shown on plan drawings, details and specifications.
- C. Scope of work includes all physical cable management hardware, including, but not limited to: backboards, cable supports, raceway, and cable management required to complete the system.
- D. Where adequate pathways are not provided by the electrical contractor, each Contractor is required to provide their own penetrations, sleeves, and cores with firestopping. Sleeves and cores shall have nylon bushings.
- E. Cabling shall be installed in a uniform matter as defined by Barton Malow, the architect, and owner. This includes installing cabling and supports in a “clean” manner, using 90 degree turns and following ceiling architecture and routing cabling in a way that is appealing to look at. The majority of the classrooms and corridors in this building have open ceilings, and this requirement will be monitored closely. Contractors are to utilize the cable tray wherever possible.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.
 - 1. All cable types
 - 2. Terminations components for each system
 - 3. Faceplates
 - 4. Equipment cabinets and racks
 - 5. Cable supports
 - 6. Grounding and surge suppression
 - 7. Firestopping

B. Shop Drawings:

1. Include dimensioned plan and elevation views of telecommunication equipment rooms, with each individual component labeled. Show workspace requirements and access for cable connections.
2. Include all labeling schemes for all systems such as station outlets, cable runs, patch panels, punchdown blocks, racks, etc.
3. Include composite drawing indicating cable routing plans. Label cable types.

C. Samples:

1. A minimum one-foot sample of each proposed cable-type to be used on this project.
2. Sample outlet including faceplate, modules, and labeling.

D. Qualification Data:

1. Include written confirmation from the manufacturer that the bidder is a certified installer for the structured cable plant solution.

1.4 QUALITY ASSURANCE

A. Data and voice cabling Contractor Qualifications: Data and voice cabling Contractor must have on-staff personnel certified by BICSI.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of a BICSI Registered Installer, who shall be present at all times when Work of this Section is performed at Project site.

B. Comply with EIA/TIA 568B-2.1, EIA/TIA 569, and EIA/TIA 606.

1.5 COORDINATION

A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

B. Coordinate site fiber and utilities entry with the owner, other contractors and outside agencies, including service providers and contractors conducting work on service providers' behalf.

C. All Contractors utilizing a shared pathway shall be responsible for coordinating and ensuring that firestopping requirements are fulfilled. Any unused penetrations installed by the electrical contractor for future use shall be firestopped by the data cabling contractor.

D. All Contractors utilizing penetrations shall be present during electrical and fire marshal inspections with adequate firestopping material and shall immediately correct any issues identified during the inspections.

1.6 WARRANTY

A. The contractor warrants the system to be free of defects of workmanship or products and will inspect and repair the system during the warranty period at no additional cost to the Owner. Contractor agrees to correct system deficiencies and replace components that fail in materials

or workmanship including deficiencies arising when used according to the manufacturer or Contractor's written instructions. No warranty, or terms therein, shall limit or be interpreted to limit remedies as provided by law

- B. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- C. The data and voice structured cable plant shall be covered by the manufacturer's extended warranty (eg. Panduit Certification Plus System Warranty, Hubbell Premise Wiring Mission Critical Warranty and System Performance Guarantee, etc.).

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. Coordinate the features of materials and equipment so they form an integrated system complying with TIA/EIA-568B. Match components and interconnections for optimum future performance.
- B. The Contractor is to use plenum rated cabling and accessories throughout the project. All cables shall be continuous and free from splices.

2.2 FACEPLATES AND SURFACE MOUNTED RACEWAYS

- A. These general requirements apply to all contractor(s) unless more specific information is included in a particular contractor's specification sections (i.e. structured cabling, audiovisual cabling, etc.).
- B. Where the data and audio/video contractor(s) will be sharing a faceplate, the video contractor is to provide the faceplate and any required blank modules. The faceplate must be able to accept the termination jack chosen by the data cabling contractor. Contractors shall coordinate all faceplate and termination requirements.
- C. Coordinate faceplate requirements with the furniture installer, where applicable.
- D. Each Contractor shall provide and install blank faceplates / inserts on any outlets provided by the electrical contractor for their potential technology use (video contractors to provide blanks for video outlets, security contractor to provide blanks for security outlets, data/voice cabling contractor to provide blanks for general purpose telecommunication outlets, etc.). These may not be identified on the drawings.
- E. Faceplate labels shall be secured to the faceplate (loose or removable labels on the screw covers are not permanent and not acceptable).
- F. The following are general guidelines for raceways:
 - 1. Surface-mounted raceway shall not be used unless the wall or other structure cannot be fished and cut into. Contractor to obtain approval prior to installing surface-mounted raceway in areas not already indicated on the drawings.

2. Surface-mounted raceways shall be sized appropriately for each installation following all manufacturers' guidelines.
 3. Steel raceway (e.g. Legrand/Wiremold) shall be used in classroom and office areas. EMT conduit may be used in lieu of steel raceways in gymnasiums or other similar spaces and only after approval is received.
 4. All surface-mounted raceways shall be steel construction (e.g. Legrand/Wiremold V700, V4000, etc.).
 5. All steel raceways shall be ivory.
- G. The following are general guidelines for faceplates:
1. For recessed boxes and surface-mounted faceplates, data faceplates shall be stainless steel with module frames or decora inserts. A/V faceplates may be plastic if necessary to provide the required A/V inserts.
 2. Where single-channel surface-mounted raceway and boxes are used, faceplates shall match the raceway color.
 3. Where dual-channel surface-mounted raceway is used (e.g. Wiremold V4000), faceplate shall match the faceplates used in the existing installation.
 4. Plastic faceplates are to be used where necessary to coordinate and match modular furniture systems.
 5. Blank faceplates are to be stainless steel. Blank inserts for dual-channel raceway shall match the faceplate type and color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.
- B. Review building plans and installations to confirm outlet and conduit installation and location. Check outlets, conduits, raceways, cable trays, and other elements in the proposed pathways for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation in compliance with manufacturer requirements.
- C. Contractors are to examine existing telecommunication rooms, equipment, cabinets, racks, etc. to ensure the conditions will not interfere with their installation. Contractors will be responsible for moving existing items where possible to allow for their installation (e.g. shifting patch panels, wire management, and equipment within a rack or cabinet; moving items on a backboard, etc. to make room for the new installation). If the rework requires re-ordering the existing items or removing wire management, review the layout with the Technology Designer and Owner.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.
- B. The Contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification, manufacturer's specifications, and within standards of generally accepted workmanship.
- C. Contractor shall be familiar and install in accordance with all applicable codes and standards, including FCC, NEC (NFPA 70), EIA/TIA 568, 569 and 606, BICSI (Telecommunications Distribution Methods Manual, current Edition), federal, state, and local building/fire codes.
- D. All cable above the ceiling must be independently and properly supported to the building structure with hangers or cable tray independent from the ceiling grid or other support systems (e.g. cables shall not be run through trusses). Each contractor will provide all supports necessary for their work.
 - 1. Separate supports are to be used for each type of cabling runs (e.g. data, voice, fiber, video, PA, security, etc.).
 - 2. Cable supports (e.g. J-Hooks) shall be wide enough to maintain required cable bend radius and to avoid pinch points on the corners of the support.
 - 3. All cable hangers/supports shall be no more than 60" apart.
 - 4. Special care will be taken to avoid damage to ceiling grid, ceiling tiles, or other installed work. Cable "draped" across ceiling tiles is unacceptable.
- E. Ensure all cables within cable trays are arranged to avoid individual cables supporting the weight of the cable bundle. Cable trays shall have appropriate bend radii for cable and fiber. Provide elbows, supports, and ties to assist in offloading the weight of the cable and adequately support the tray.
- F. Support riser cables every floor and at the top of the run with cable grips. Limit number of four-pair data riser cables per grip to fifty (50).
- G. Fiber optic cable shall be installed in orange, plenum-rated innerduct. Maximum fill is 40%.
 - 1. If Berk-Tek Armor-Tek or equivalent cabling is used, innerduct requirement does not apply.
- H. Fill rates for all cable supports must not exceed the lesser of 50 percent, or as recommended by the manufacturer(s).
- I. All wiring shall be protected from moving mechanical or physical contacts. All cabling shall be free from tension at both ends, as well as the length of each run.
- J. Cables to be kept a minimum of 18" from power lines, fluorescent fixtures, or heat generating devices. All cross connecting cable shall meet or exceed the transmission characteristics for the cable used in the adjoining segments.
- K. All cabling shall be bundled and properly secured and terminated in the telecommunication room cabinet. Cables must be properly supported and separated to avoid crushing or cinching by supports, protective covers, doors, etc. All cables within wire management cabinets will be

cable wrapped with Velcro cable ties at no greater than one-foot intervals. Velcro tie-wraps only are to be used.

- L. For general communications outlets, Contractor to provide additional 10' of cabling coiled above ceiling at each drop and 10' of cable at each telecommunication room. Unless noted otherwise, specialized systems (i.e. security and wireless) shall have 20' of cable coiled above the ceiling at each drop and 10' of cable at each telecommunication room. The additional lengths of cable shall be included in distance calculations. Cable routing within the telecommunication closet is to be approved by the Technology Designer before beginning termination.
- M. In general, adhesives and non-mechanical fastening methods of installation will not be accepted. All conduit, cable and raceway installation support must be mechanically fastened to walls, decks, slab, structure, etc.
- N. Install parallel to building lines, follow surface contours, and support the cable according to manufacturer's written instructions. Do not run adjacent and parallel to power or data cables.
- O. All horizontal cabling terminations shall be provided with sufficient additional cabling to permit re-termination within the cabinet. The additional lengths of cable shall be included in distance calculations. Service loops shall be irregularly coiled to avoid electromagnetic or antenna effects.
- P. All connections of twisted wiring shall be made in such a way as to minimize the extent in which each twisted pair is unraveled at the point of its physical termination. No more than 0.5 inches of exposed untwisted pairs shall be present at these locations.
- Q. Provide sufficient pulling lubrication for all underground cable pulls. Do not exceed the manufacturer's tension requirements for any installation.
- R. Exposed wiring will not be accepted unless approved in writing by the Technology Designer. Cabling shall be in the wall, above the ceiling, or in raceways designed for the application. A difficult installation will not be sufficient to avoid the requirement for non-exposed wiring.
 - 1. Exposed wiring will be acceptable in crawl spaces.
 - 2. Exposed wiring will be acceptable in high bay gymnasiums if the cables are run along a joist and hidden from view. Cables must be concealed from the wall to the joist.
 - 3. No exposed cabling will be allowed in natatoriums.
 - 4. No exposed cabling will be allowed in architecturally significant spaces, such as a media center or entrance lobby.
- S. In unheated crawl spaces, contractor is to install the cable at least four feet (4') from the exterior wall mounted securely to the slab or structure.

3.3 UNDERGROUND INSTALLATION

- A. Prior to beginning any underground work, Contractor shall contact MISS DIG, local utility survey staff, and utility companies for the location of all existing underground services and provide, if requested, documentation of such contact to Barton Malow Company. If necessary, Contractor shall pay for appropriate layout and locating of all existing utilities, and stake said utilities.
- B. Utilities and/or other services which are shown, or not shown but encountered, shall be protected by the Contractor from any damage arising or resulting from work, unless or until they are abandoned. If the utilities or services are damaged from Contractor's work, Contractor shall notify the Technology Designer immediately. Contractor shall repair any damage and restore

the utilities and services to an equal or better condition than that which existed prior to the damage within four (4) hours. If the Contractor does not repair the work or the Owner or Barton Malow considers the damage unresolved in a timely manner, repairs will be made at Contractor expense.

- C. Contractor shall provide and maintain proper shoring and bracing during its excavation, to protect from collapse or movement, or other type of damage until such time as they are to be removed, incorporated into the new Work or can be properly backfilled upon completion of the work and inspections.
- D. Contractor shall photograph and document the environment immediately before beginning work, upon exposing any utilities, and after work and/or repair is completed. Barton Malow shall review the work and/or repairs before any work is buried.
- E. Contractor will be responsible for all liabilities, damages, expenses, lawsuits or claims arising or resulting from such damage and will defend, hold harmless and indemnify Owner and Barton Malow Company from any claims or law suits or other expenses.

3.4 IDENTIFICATION

- A. In addition to requirements in this Article, comply with TIA/EIA-606.
- B. Use logical and systematic designations for facility's architectural arrangement and nomenclature, and a consistent color-coded identification of individual conductors. All rackfields, devices, components, etc. shall be tagged with appropriate designations on the front and rear of the equipment. All devices are to be installed and labeled in a sequential, logical order.
- C. Adhesive labels shall meet the legibility, defacement, and adhesion requirements specified in UL969 for indoor use. Cable labels shall have a durable substrate, such as vinyl, suitable for wrapping. Labeling practices shall be consistent across the installation.
- D. Cable runs shall be machine labeled within 1" of each termination. All cabling and fiber optics are to be tagged in a consistent manner, approved by the Technology Designer.
- E. Fiber Optic Safety Installation. Label all fiber optic junction boxes and termination points with "fiber-optic cable - lasers in-use - possible eye injury" warnings inside and outside of the location.
- F. At junction boxes, label with a description of the cable, termination location, and strand count.

3.5 FIELD QUALITY CONTROL

- A. Contractor will provide cabling acceptance testing. Agent of owner may provide additional testing and cable acceptance. Contractor is responsible for correcting any instances of test failures.
- B. Indicate and interpret test results for compliance with performance requirements of installed systems. All test results shall be marked as "Pass" or "Fail".
- C. All test results must be provided in both hard copy and electronic format.
- D. Contractor is responsible for correcting any instances of marginal test results or test failures.

3.6 DOCUMENTATION

A. As-Built Documentation:

1. Include scaled drawings reflecting all changes between the bid documents and the final installation, including final location of all telecommunication rooms, equipment, cable paths, outlets, etc.
2. Drawings shall include all cable routing, outlet locations, and outlet labels.
3. Drawings shall be created in AutoCAD or Visio format. Hand written drawings shall be accepted for draft or working copies only.

END OF SECTION 27 1000

SECTION 27 4000 – GENERAL A/V SYSTEMS REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Specification Sections:
 - 1. 27 0000 – General Technology Requirements
 - 2. 27 1000 – General Cabling Requirements

1.2 SUMMARY

- A. This Section includes general requirements for any contractor performing the following AV work:
 - 1. Installation of Owner-furnished equipment
 - 2. Providing Audiovisual equipment and installation.
 - 3. Audio Video Switching
 - 4. Audio Video Distribution
 - 5. Audio Video Control System

1.3 SYSTEM REQUIREMENTS - GENERAL

- A. All faceplates shall be stainless steel with silkscreen labels. Confirm labels prior to production.
- B. All A/V cabling shall be professional grade and sized appropriately for each installation. If signal degradation occurs as the result of cable selection/installation, it will be replaced at no additional cost to the owner.
- C. All A/V connectors shall be professional grade. If signal degradation occurs as the result of connector selection/termination, it will be replaced and re-terminated at no additional cost to the owner.
- D. Contractor is responsible for providing any signal amplification necessary to ensure a completely functional and professional installation whether or not such items are specifically mentioned in the plans or specifications.
- E. Contractor is responsible for all patch cables required to ensure a completely functional and professional, turn-key solution.
- F. A/V schematics, plans, details, etc. are for conceptual purposes only. Final design to be provided by contractor and approved by Technology Designer. Notify the Technology Designer before bid period question deadline, established at the pre-bid meeting, should any changes in bid documents be required to meet the design concept. After entering into the Contract, Contractor shall provide a Technology Designer-approved solution to meet design concept.

1.4 DEFINITIONS

- A. **CEC:** Consumer Electronics Control
- B. **CVBS:** Composite Video, Blanking, and Sync
- C. **EDID:** Extended Display Identification Data
- D. **HDCP:** High-Bandwidth Digital Content Protection
- E. **KSV:** Commonly called an HDCP 'key'. A unique ID for each HDMI sink that must be sent to HDCP-enabled sources in order for the sinks to receive content.
- F. **Source:** AV equipment connected to the inputs of the AV switching system
- G. **Sink:** AV equipment connected to the outputs of the AV switching system (i.e. displays, audio processors)
- H. **Video Timing:** a combination of resolution and refresh rate (i.e. 1920x1080@60)

1.5 SUBMITTALS

- A. **Product Data:** For each type of product purposed, provide the manufacturer's product data sheet in both hard-copy and electronic (PDF) formats including dimensions and data on features, performance, electrical characteristics, ratings, and finishes. Data sheets indicating multiple products must have the applicable product highlighted or marked.
- B. **Additional Data:** For all mounting hardware and accessories, provide manufacturer's recommendations for all mounting methods and materials. Include locations for each type of mount used in the project.
- C. **Preliminary A/V Schematics**
 - 1. **General Requirements:**
 - a. Submit in both hard-copy (11 X 17 or half size prints) and electronic (Visio or AutoCAD 2008 or higher) formats.
 - b. Label all devices with manufacturer part name and number. A supplementary spreadsheet with device information may be submitted in lieu of labeling every component in the schematic.
 - c. Show all Inputs/Outputs for every component. Mark unused inputs/outputs as "spare."
 - d. Show connector types for all terminations.
 - 2. **Required Schematics:**
 - a. Audio flow for each system
 - b. Video flow for each system
 - c. Control flow
 - d. Mounting methods (dimensioned)
 - e. Faceplate layouts

1.6 QUALITY ASSURANCE

- A. Contractor must maintain the following Manufacturer-specific qualifications.
 - 1. Crestron Digital Media Certified Engineer (DMC-E)
 - 2. Crestron Certified Programmer
- B. Industry-specific qualifications:
 - 1. Certified Technology Specialists (CTS)

1.7 COORDINATION

- A. Contractor must coordinate the installation with the data installers on-site. This equipment is to be housed in a rack provided by this contractor, installed in a room shared with telecommunications equipment.

1.8 WARRANTY

- A. The contractor warrants the system to be free of defects of workmanship or products and will inspect and repair the system within twenty-four (24) hours during the warranty period at no additional cost to the Owner. The Contractor shall respond on site within twenty-four (24) hours notice, and without cost to the Owner, during this warranty period. Contractor agrees to correct system deficiencies and replace components that fail in materials or workmanship including deficiencies arising when used according to the manufacturer or Contractor's written instructions. No warranty, or terms therein shall limit or be interpreted to limit remedies as provided by law
- B. All equipment shall be provided with a three (3) year warranty unless noted otherwise. The warranty period shall begin at the date indicated on the certificate of substantial completion or the date of Owner acceptance (to be received in writing and approved by Barton Malow), whichever comes later.
- C. The warranty shall include phone support, software assurance, firmware updates, and any other special warranties.
- D. The Owner shall not be responsible for additional charges during the equipment warranty period. Labor, service charges, trip charges, etc. to configure and install equipment during the warranty period shall be included in the contractor's warranty.
- E. Contractor is to provide documentation for any and all manufacturer's warranties including the operating conditions required for the warranty.
- F. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MICROPHONES

A. General Requirements

1. Provide all accessories required for a fully functional system, including but not limited to amplifiers, antennas, cables, etc.
2. Ensure FCC conformance for all frequencies used in this solution. Provide and file all documentation required for conformance.
3. All major components shall be by the same manufacturer.

B. Podium Microphone

1. Type: Cardioid condenser
2. THD: Less than 1% at 120dB
3. Tailored for speech intelligibility
4. Frequency Response:
5. Pickup Pattern: Cardioid
6. Power: Phantom power
7. Form Factor: Gooseneck, 16" minimum length
8. Connection: 3-pin XLR in tabletop stand (to be included)
9. Make/Model: Audio Technica U859 or equal by Shure

C. Lavalier Microphones

1. Type: Condenser
2. THD: Less than 1% at 120dB
3. Tailored for speech intelligibility
4. Frequency Response: 20-20,000 Hz
5. Pickup Pattern: Omnidirectional
6. Cable Length
 - a. 9' minimum permanently attached to microphone (for wired applications at board table.
 - b. 2' length for use with bodypack transmitters in wireless applications
7. Power: Phantom power for wired, battery for wireless
8. Color: Black
9. Acceptable Manufacturers
 - a. Wired Applications - Audio Technica AT-899 or equal by Shure
 - b. Wireless Applications – Audio Technica AT-899cW or equal by Shure

D. Wireless Microphone Systems

1. Must support simultaneous use of up to 10 systems.
2. Provide bodypack transmitters for use with AT-899cW (or equal by others)
3. Provide charger and rechargeable batteries, supply equal number of batteries to support use of all systems shown on the drawings.
4. Provide antenna distribution system OR system designed for remote installation of antenna systems. Receivers will NOT be located in range of primary area of microphone use.
5. Make/Model: Audio Technica System 10 Pro or equal by Shure.

2.2 MICROPHONE MUTE SWITCH

A. General Requirements

1. Provide audio muting without audible clicks.
2. Install between wired microphones and connections back to preview room
3. Permanently affix to board table top at each board seat, with or without use of belt clip.
4. Make/Model: Audio Technica ATW-RMS2 or equal by Shure.

2.3 AUDIO DSP

A. General Requirements

1. Provide full digital signal processing with modular card slots, networking/linking interface, and matrix analog audio input/output channels.
2. Provide matrix mixing capabilities of audio sources
3. Route/mix/combine sources and send to multiple destinations simultaneously
4. Includes automatic echo cancellation
5. Includes feedback suppression
6. Linkable chassis design, via Cobranet or other means.
7. Controls for the following:
 - a. Levels
 - b. Mute
 - c. Preset
 - d. Remote Presets
 - e. Logic Gates
 - f. Logic Delay
 - g. Volume
 - h. Event Scheduling

B. Acceptable Manufacturers

1. Biamp AudiaFlex
2. Approved equal

2.4 AUDIO AMPLIFIER

A. General Requirements

1. Inputs: 4 analog
2. Outputs: 4 analog
3. Power Requirements: 300 watts
4. Channel configuration: 70 volt RMS
5. THD: Less than .5% full rated power
6. Frequency Response: +/- .25dB

B. Acceptable Manufacturer

1. Crown DCi Series
2. Approved equal

2.5 SPEAKERS

A. General Requirements

1. Woofer: 6.5"
2. Tweeter: .98"
3. Transformer Taps: 3.75W/7.5W/15W/302W/60W/ @ 70V
4. Frequency Response: 50 Hz to 20 kHz (+/- 3dB)

5. Frequency Range: 40 Hz to 20 kHz (-10 dB)
6. Power Handling: 125 Watts program (8 Ohms)
7. Sensitivity: 88.5 dB @ 1W/1m
8. Coverage: 100 degree conical
9. Grill color: White
10. Mounting: Flush ceiling mount, utilize tile bridge for mounting.

B. Approved Manufacturers

1. Crestron Saros Series
2. Approved equal

2.6 HDMI INPUT PLATE

A. General Requirements

1. Female to female HDMI pass through plate.
2. Color: White

B. Acceptable Manufacturers

1. Crestron (MP-WP152-W)

2.7 SCALER RECEIVER (DM-RMC-4K-SCALER-C)

A. General Requirements

1. Video Input Signal Types
 - a. DM 8G+
 - b. HDBaseT w/Deep Color, 3D, & 4K
2. Video Output Signal Types
 - a. HDMI w/Deep Color, 3D, & 4K
3. Audio Input Signal Types
 - a. DM 8G+
 - b. HDBaseT
4. Audio Output Signal Types
 - a. HDMI
 - b. Analog Stereo

2.8 HDMI DISTRIBUTION AMPLIFIER

A. General Requirements

1. Splits one HDMI source to four outputs
2. Handles video resolutions up to 4K and Ultra HD
3. Handles 3D video and Deep Color
4. Handles Dolby TrueHD, Dolby Atmos, DTS-HD®, and uncompressed 7.1 linear PCM audio
5. HDCP compliant
6. Includes input and output sync indicators
7. No programming or control system required

8. Thin profile – less than one-inch deep
9. Provide mounting methods for installation behind flat panel display.

B. Acceptable Manufacturers

1. Crestron HD-DA4-4K-E
2. Approved Equal

2.9 HDMI TO SDI CONVERTER

A. General Requirements

1. 4K HDMI Input
2. 2 x 6G-SDI Outputs
3. Supports SD, HD, UHD 4K & DCI 4K Signals
4. Automatic input signal detection
5. Control via dip switches or software
6. Include 12v universal power supply

B. Approved Manufacturers

1. Blackmagic Designs – Mini Converter HDMI to SDI 4K
2. Approved Equal

2.10 SDI SWITCHER

A. Acceptable Manufacturers:

1. Extron SW4 3G HD-SDI Four Input 3G-SDI switcher
2. Approved Equal

2.11 FLAT PANEL DISPLAYS

A. General Requirements

1. Consistent manufacturer and series for all sizes.
2. Commercial grade flat panel LED
3. Integrated digital tuner: Not required
4. Inputs
 - a. (2) HDMI
 - b. (1) VGA
 - c. (1) Composite
5. 16.77 million colors
6. Resolution: 1080p
7. Contrast Ratio: 800:1
8. Brightness: 500 cd/m²
9. RS-232 control port
10. Aspect Ratio: 16:9
11. The unit will be mounted to facilitate cleaning and maintenance.
12. Provide proper mounting for the following:
 - a. Mounting on the face of an owner provided board table.
 - b. Mounting on the face of an owner provided podium.
13. Refer to drawings for size requirements.

2.12 CONTROL APP FOR ANDROID

- A. Provide licensing, configuration, and labor to create programming and functional layout for the owner. Provide licensing for (3) android devices minimum, each to receive the same programming functions.

2.13 AV CABLES

- A. HDMI cables and adapters are to be hi-speed HDMI cables meeting or exceeding the following:
 - 1. Certified to pass complete EDID information
 - 2. Throughput of at least 10.2 Gbps and designed for 1080p@60Hz
 - 3. Patch cables for user equipment are to be rated by manufacturer as "flexible". (example: Kramer C-MHM/MHM series).
 - 4. Provide strain relief as necessary or as recommended by manufacturer for utilized cable distance.
 - 5. Distances:
 - a. For distances up to 35' use a 24AWG HDMI cable (patch cables <15' can be 26 AWG)
 - b. For distances >35' use an HDMI digital ribbon cable.
 - 6. Manufactures:
 - a. Crestron
 - b. Extron
 - c. Kramer
- B. VGA cabling is to be high performance manufacturer-terminated UXGA-rated cable designed for transmission of computer video and ID bit signals (e.g. DDC, EDID, and/or DisplayID).
- C. Composite video cabling is to be minimum RG59 coax cable.
- D. No UTP cable shall be used for the transmission of RGBHV or video signals. UTP cable and 110 punchdown modules may be used for RCA audio connections.

2.14 AUDIO VIDEO SWITCHING

- A. General Requirements
 - 1. The AV switching system shall support at least 6.75Gbps of data transfer on each input and output to support 1080p 36-bit (Deep) Color video resolutions without compression.
 - 2. The AV switching system shall support 8 channel audio.
 - 3. The AV switching system shall support audio breakaway from video.
 - 4. The AV switching system shall have less than 5us of latency from AV input to AV output.
 - 5. The AV switching system shall downmix multi-channel audio into 2-channel audio so that the same audio content may be routed to both multi-channel and 2-channel sinks.
 - 6. The AV switching system shall be able to dither between standard and deep color video signals on each input and output.
 - 7. The AV switching system shall support the following AV signal inputs:
 - a. HDMI 1.4b (High Definition MultiMedia Interface)
 - b. DVI 1.1 (Digital Visual Interface)
 - c. DisplayPort Multimode 1.1
 - d. Analog RGB
 - e. YPbPr
 - f. S-Video

- g. CVBS
 - h. SPDIF
 - i. Analog Stereo Audio
8. The AV switching system shall be compliant with HDCP 2.2.

B. The AV switching system shall transcode the AV signals to a single signal type for distribution.

2.15 AUDIO VIDEO DISTRIBUTION

A. General Requirements

1. The AV distribution system shall use multimode fiber or shielded twisted pair for AV signal distribution.
2. The AV distribution system shall route AV signals from any input to any output with less than 1ms of latency.
3. The twisted pair structured cabling used to carry the AV signals shall be shielded.
4. The twisted pair structured cabling used to carry the AV signals shall be specified to 1.2GHz of bandwidth or greater.
5. The AV distribution system shall not require extra cabling to transmit the following control signals for AV sources and sinks:
 - a. RS-232
 - b. Infrared
 - c. Ethernet
 - d. USB Human Interface Device-class devices
 - e. Contact closure

2.16 EDID MANAGEMENT

A. General Requirements

1. The AV switching system shall allow configuration of the EDID presented to sources on each AV input.
2. Each input on the AV switching system shall be configured independently.
3. The AV switching system shall by default present an EDID to each input that includes only the video timings and audio formats common all sinks connected to the outputs.
4. The AV switching system shall allow the user to enter each input's EDID video timings individually.
5. The AV switching system shall allow the user to enable and disable support for the following items in each input's EDID
 - a. Deep color
 - b. 3D support

2.17 HDCP MANAGEMENT

A. General Requirements

1. The AV switching system shall support HDCP 1.1 or greater.
2. The AV switching system shall detect the number of KSVs supported by each source.
3. The AV switching system shall not send a source more KSVs than it supports.

4. The AV switching system shall cache the KSVs from each connected sink.
5. The AV switching system shall authenticate all cached KSVs with each source up to the source's KSV limit, so that authentication does not need to be re-started each time content is routed to a new output.

2.18 SIGNAL DETECTION

A. General Requirements

1. The AV switching system shall report the following incoming signal information to an AV control system:
 - a. Signal detect
 - b. Horizontal and vertical resolution
 - c. Signal refresh rate
 - d. Presence of HDCP
2. The AV switching system shall report the following information to an AV control system:
 - a. HDCP authentication status for each source and sink
 - b. EDID Preferred video timing for each sink
 - c. Maximum number of KSVs supported by each source

2.19 CONTROL SYSTEM

A. General Requirements

1. Refer to the drawings and details for specific device control
2. Provide additional processors if required for system operation. Include programming to utilize multiple processors in master/slave mode.
3. Support for control interfaces including computers, iPads, touch panels, and push button controls.
4. Utilize a real time, event driven, multi-tasking, multi-threaded operating system with a dual bus architecture.
5. High speed processor shall communicate directly with Ethernet, control ports and proprietary control network utilizing high-speed, parallel bus infrastructure. Control processors that communicate via a serial bus shall not be accepted.
6. Control processor shall contain 36 MB of memory, with expansion up to 4GB supported via compact flash plug in cards (externally accessible/hotswappable).
7. Support internal communications speed via two, independent communications busses. First control bus speed shall be at least 40 mb/s, second control bus speed shall be at least 300 mb/s.
8. Control system shall be capable of firing all internal IR ports simultaneously.
9. Control System shall be fully compatible with Crestron RoomView multisystem, management software and other Crestron e-Control Power Applications (i.e. e-Outlook, e-PowerPoint, etc.).
10. Control System shall support the option of add-on single or dual Port 10/100 BaseT Ethernet Modules, via a direct processor 300 mb/s communications bus/card-slot, that supports all of the following features:
 - a. TCP/IP Communications
 - b. DHCP and DNS Support
 - c. 802.11b and Bluetooth Compatibility

- d. Native Email Client
 - e. Remote Diagnostics
 - f. Remote Program Loading and Administration
 - g. Built-In Web Server
 - h. FAT32 File System for easy data management
 - i. SSL security plug in
 - j. Native NAT/Fire-Wall/Router w/dual port option
 - k. PDA Integration and Control, XPanel PDA - Pocket PC 2002
 - l. WebTablet Integration and Control – Microsoft Tablet PC
 - m. Self Generating Executable GUI, XPanel EXE – Microsoft Family of OS
 - n. Self Generating ActiveX powered IE Integration and Control, XPanel, IE
 - o. Self Generating Java powered Web Integration and Control
11. Support user assigned or dynamic IP address.
 12. Control system shall support the optional add-on of an integrated three slot card cage to support any mix of control cards for IR, RS-232/422/485, relay, digital I/O, analog input, volume, MIDI, and more
 13. Support RS-485 token passing network with data communication for a minimum distance of 5000 feet.
 14. Support a minimum of 250 proprietary network devices simultaneously.
 15. Control system manufacture shall supply Windows-based graphical programming software for drag and drop object oriented programming for the control system operation.
 16. Control system manufacture shall provide Windows-based graphical programming software, which is self-documenting in that it generates a symbolic flow diagram printout from the system program.
 17. The control system shall support a variety of wireless communication modes, including one-way and two-way radio frequency and infrared transmission.
 18. The control system shall include the following hardware configuration:
 - a. Eight IR/serial/1-way RS-232 ports.
 - b. Eight digital/analog I/O ports – TTL In/Out and analog inputs 0-10V.
 - c. Eight isolated low-voltage relays – 30VDC @1A.
 - d. Six 2-way RS-232/422/485 ports.
 - e. One compact flash memory upgrade slot.
 - f. Space for add-on three slot control card expansion cage.
 - g. Cresnet network interface.
 - h. 9" rack mount or shelf mounted chassis (removable rack ears).
- B. Interfaces
1. Refer to AV schematics for required interfaces.
 2. Provide all additional accessories required to support interfaces. This includes power, specialty back boxes, fittings, cables, etc.
- C. Programming shall be done by a Crestron Service Provider (CSP)
- D. Accepted Manufacturers
1. Crestron

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Review mounting locations before installation. Coordinate locations with the electrical, mechanical, and architectural contractors and mitigate conflicts with other devices and boards.
- B. Coordinate mounting height/locations with existing conditions and mount to avoid covering existing devices or devices to be installed during construction.
- C. Contractor shall notify Technology Designer of any conflicts before installation.

3.2 DEMOLITION

- A. Remove existing ceiling mounted projector in the board room. Include removal of all mounts and associated cabling. Provide stainless steel blank outlet covers where required.
- B. Remove existing unused ceiling speakers in meeting rooms A, B, C, and D. Remove all cabling as required.
- C. Remove existing ceiling mounted projector in meeting room A, ONLY with acceptance of Alternate 1.
- D. Remove existing audio rack and equipment from the closed in the board room.
- E. Provide other demolition of ancillary equipment in this area of the building to provide a clean, updated, professional installation.

3.3 INSTALLATION

- A. Audio Systems
 - 1. Measure and record ambient noise level during normal usage
 - 2. Design system to provide 25 dB SPLA weighted above room noise
- B. Minimum milestone progress meeting requirements
 - 1. Include (2) 2-hour sessions to review design
 - 2. Include (2) 2-hour session to review 50% progress
 - 3. The above does not preclude the awarded contractor from weekly progress meetings and calls, or any other meetings required to ensure the schedule and quality of the project meets the owner's acceptance standards.
- C. Install all components according to manufacturer's guidelines. Provide raceway as required for the installation to conceal cables.
- D. Provide wire management and cable wrap to manage and conceal cables between the wall and source. Submit cable wrap color for approval prior to installation.
- E. Install safety cable for all ceiling-mounted equipment. Safety cable shall be connected to building steel and must be independent of any ceiling grid or accessories.

3.4 DEMONSTRATION

- A. The demonstration and acceptance tests shall be done by (List any manufacturer-specific designations for the project):
 - 1. Crestron DigitalMedia Certified Engineer (DMC-E)
- B. Training & progress meeting schedules
 - 1. Include (3) 2-hour blocks for user training
 - 2. Include (2) 2-hour blocks for admin training
 - 3. Include (2) 2-hour follow-up training sessions over the initial 12 months of operation to be used for any of the systems shown above or to be used to attend an after-hours event.

3.5 DOCUMENTATION

- A. As-Built Documentation:
 - 1. Spreadsheet by building identifying installed components, location (architectural room number and owner's room number), model number, serial number, and any other pertinent data. Spreadsheet format to be approved by Technology Designer. For network-enabled projectors, include the MAC address and IP address.
 - 2. The number of HDCP KSVs Keys supported by each source
 - 3. The video timing, HDCP use and audio format of each source when operating.
 - 4. The video timings and supported audio formats for each connected sink
 - 5. The video timings and supported audio formats presented in the EDID to each source – the preferred video timing shall be indicated.
 - 6. Schematic diagram indicating equipment and interconnections.
 - a. Audio flow for each system
 - b. Video flow for each system
 - c. Control flow for each system
 - d. Rack layouts
 - 7. Contractor to turn over electronic version of source code for all control system programming. Provide both compiled and un-compiled code.
- B. Manufacturer's Instructions: Provide complete installation, set-up and maintenance instructions.

END OF SECTION 27 4000