

## 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 Elementary Paging and Emergency Notification project.
- C. The project consists of the following major systems:
  - 1. Structured cabling system
  - 2. PA Systems and Emergency Notification

#### 1.3 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. Other bids may be issued related to this Contractor's scope of work. This Contractor is responsible for knowing what work will be provided by others and how it affects their Work (e.g. electrical rough-ins, etc.). Contractors, during bidding or after, can contact the project team to view related drawings and/or specifications.
- E. If backend systems (power supplies, master clock, master PA console, etc.) need dedicated or hardwired electrical connections, each Contractor is to provide the requirements for their systems as part of the bid response. If the electrical requirements are not specifically called out

in the bid response, the Contractor will subcontract to a licensed electrical contractor to complete the electrical work as part of the Contractor's cost.

- F. 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.
- G. 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.
- H. 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.
- I. 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. FCC Federal Communications Commission
  5. ICEA Insulated Cable Engineers Association
  6. IEEE Institute of Electrical and Electronics Engineers
  7. ISO International Organization for Standardization
  8. NEC National Electrical Code
  9. NECA National Electrical Contractors Association
  10. NEMA National Electrical Manufacturer's Association
  11. NFPA National Fire Protection Association
  12. TIA Telecommunications Industry Association
  13. UL Underwriters Laboratories, Inc.
- J. 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.
- K. 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.
- L. 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.
- M. Each contractor is to provide any backboards and access panels necessary for their installation that meet the manufacturer guidelines for the equipment to be installed. Materials are to be fire-

rated. Provide D-rings, spaced no greater than 12" apart, to support cables routed to and along backboards.

- N. Each contractor is to use plenum rated cabling and accessories throughout the project.
- O. 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.
- P. 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.
- Q. Unit prices established for the project shall remain in effect throughout the duration of the contract.

#### 1.4 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).

#### 1.5 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 PDF format. Data sheets indicating multiple products must have the applicable product highlighted or marked.
- E. Shop Drawings: Shop drawings are to be provided in both PDF and native electronic format (e.g AutoCAD format).

- 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.

## 1.6 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, except for 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 must be a certified reseller and installer for the products/solutions provided and/or installed.
- D. The Contractor shall install in accordance with all applicable codes and standards, including federal, state, and local codes and authorities.

## 1.7 COORDINATION

- A. Contractor is to coordinate with other construction and technology contractors.
- B. Contractor is to coordinate building access with building staff including scheduling around building activities, building access, etc.
- C. 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 and internet service providers when necessary.
- D. 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.
- E. Where multiple contractors will share a common pathway or faceplate, coordinate requirements and installation.
- F. Contractor shall uncover Work as needed for review by the Owner, Technology Designer, Architect, Construction Manager, or contractors performing related work. Work uncovered for observation will be replaced at the Contractor's expense without change in the Contract Time or Contract Sum.

## 1.8 WARRANTY

- A. All division 27 and 28 systems shall be provided with a five (5) year warranty unless noted otherwise in scope specific specification sections. Manufacturer and contractor warranties are to include the entire system (equipment, software updates, licensing, installation, etc.).
- B. Unless a specification section has a specific requirement, manufacturer warranties for each component shall begin on the date that equipment is delivered from the manufacturer/supplier. The contractor 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 the Owner), whichever comes later.
- C. Contractor is to provide:
  - 1. Evidence of the manufacturer's warranty end date.
  - 2. Procedures for warranty issues (e.g. phone number to call, warranty ID numbers, etc.)
  - 3. Documentation for all manufacturer's warranties including the operating conditions required for the warranty.
  - 4. Contractor's guarantee.
- D. The manufacturer warranty shall include phone support and software assurance including patches, updates and version upgrades for both major and minor releases throughout the warranty period.
- E. After substantial completion the following are also required throughout the contractor warranty period.
  - 1. Contractor is to install critical firmware updates during the warranty period.
  - 2. Contractor is to provide an annual "health check" on the system with corresponding report noting items corrected and suggested maintenance or configuration changes.
  - 3. Contractor is to provide an overview of non-critical updates and version upgrades as they become available.
  - 4. Owner will decide which version upgrades they wish to implement.
  - 5. Contractor to install maximum of two (2) major version upgrades throughout warranty period. Contractor is to make configuration changes on the equipment and provide administrative training session on the new features and system administration, but Contractor is not required to perform any work on individual devices or computers.
- F. 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.
- G. Contractor is to register all equipment in the Owner's name, not the Contractor's. All manufacturer warranty and support must be available to the Owner directly and not required to channel through the Contractor, distributor, or other entity.
- H. 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.
- I. The contractor warrants the system to be free of product, workmanship, and configuration defects and will inspect and repair the system within 48 hours during school breaks during the warranty period at no additional cost to the Owner. The Contractor shall respond on site within four (4) 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.

- J. Contractor will be responsible for repairing/replacing (including installation) any aspect of the system unless a specific specification section states that the Owner will install replacement equipment.
- K. 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. Owner 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 Owner'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. 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 this RFP and possess equivalent and/or better qualities. It is the Bidder's responsibility to notify Owner in writing if any specifications or suggested comparable equivalent products/brands require clarification by Owner prior to the Due Date for Bids. 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. Device locations shown on drawings are diagrammatic only and may not represent intended location due to conflicts with other CAD symbols, room names, etc. Field verify conditions and coordinate device locations with other trades. Devices shall be installed to perform optimally for the usage and conditions of the space. Notify Barton Malow of conflicts that negatively affect performance prior to installation.
- E. Contractor shall choose appropriate mounting method and materials for each location based on manufacturer’s requirements, wall construction, building structure, etc.
- F. On projects where existing category cabling is to be reused, Contractors are to assume that the existing cabling is appropriately labeled, but in some instances (up to 25% of the time) labels may be missing or damaged. In these situations, the Contractor installing the equipment (i.e. wireless access points, cameras, phones, etc) will be responsible for toning and relabeling the cabling. If the cabling is found to be damaged and requires replacement or re-termination, the Contractor will be compensated for the repair or replacement by means of utilizing unit pricing.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 DEMOLITION

- A. Demolition of existing equipment and materials will be performed by the Contractor unless otherwise noted. Demolition work indicated on the drawings is conceptual in nature. Include all items related to the existing system including equipment, cabling, raceway, supports, etc., in order to remove abandoned systems or accomplish the installation of the specified new work.
- B. Unless specifically noted to the contrary, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over

to the appropriate trade for reuse. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of same, away from the premises. If requested, Contractor will provide certification showing the items have been environmentally disposed of in accordance with applicable laws.

- C. Savings due to items with residual value / trade-in credit / scrap recycling value / etc. should be reflected in the base bid.
- D. Reroute cabling and relocate equipment as required to maintain service until systems can be permanently removed.
- E. Cables shall be removed to their source and any corresponding labels removed from the equipment or termination point. Dust covers shall be installed in patch panel ports associated with removed cables. Remove corresponding patch cable from patch panel or cross-connect cable from a 66 or 110 block.
- F. Cabling contractor is to provide blank stainless-steel faceplates for any empty low-voltage boxes that will remain after demolition.
- G. Contractor shall replace ceiling tiles where removing equipment (e.g. cameras, ceiling projectors, mounts, etc.) and the new equipment will not cover the original opening. Contractor is to provide ceiling tiles (acoustical, metal, etc.) to match existing manufacturer/model unless the drawings or specifications state that the contractor can use Owner's spare tiles. Verify manufacturer/model for each location with Owner.
- H. Contractor to provide 16-gauge (min) metal cover plate for any opening (clock, speaker, AV equipment, etc.) that will not be completely covered by the new device. Paint to match surrounding surface or provide with powder coat finish in color approved by Owner. Sheet metal coverings will not be accepted.

### 3.3 INSTALLATION

- A. Equipment that extends more than 4" from the wall will be mounted above 80" above finished floor unless reviewed and approved by Technology Designer or Owner.
- B. Consult with the Owner's Representative as to the method of completing work 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.
- C. 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.
- D. 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.
- E. 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.
- F. The Contractor shall provide all lifts and temporary supports necessary to accomplish their installation.



- G. 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. Contractor is responsible for replacing any damaged tiles and cleaning the ceiling grid upon completion of their work.
- H. Contractor to ensure Owner and Technology Designer have reviewed above ceiling or concealed work before reinstalling ceiling tiles or other obstructions. If work is performed in occupied areas where ceiling tiles or other obstructions must be re-installed upon completion of work, Contractor will be required to remove and reinstall in selected areas for inspection by Owner or Technology Designer.
- I. 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.
- J. All cables within racks, cabinets, or enclosures will be cable wrapped with hook and loop tape (Velcro) at no greater than one-foot intervals. Cabling housed in wiring management shall be tied at no less than two-foot intervals.
- K. 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.
- L. 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.
- M. 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.

### 3.4 CLEANING

- A. All debris will be removed by the contractor daily as required to maintain the work area in a neat, orderly condition.
- B. Contractors working above ceiling or drilling are to bring their own vacuums unless the building custodian allows theirs to be used.

- C. Contractor shall clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

### 3.5 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.
- C. Contractor will be required to protect any Owner-Furnished-Contractor-Installed (OFCI) equipment and will be responsible for replacing any missing or damaged equipment.

### 3.6 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."

### 3.7 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.

### 3.8 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. Additional training requirements are listed in individual specification sections.

### 3.9 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. Provide progressive “as-builts” to the Owner as devices are installed, including MAC address, serial number information, and specific installed location. Provide this information to the Owner daily as necessary, through a collaborative software (ex. Google Sheets, or Office365) and in a format approved by the Owner and Technology Designer. Handwritten notes will not be accepted.
- C. 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 AutoCAD formats. The Contractor is responsible for any fees charged by the architect for providing CAD backgrounds.
- D. Contractor responsible for all equipment registration per manufacturer’s instructions.
- E. 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 equipment, outlets, racks, penetrations, etc. inclusive of the base bid, implementation add/changes, and all change orders.
  - 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. Schematics shall be created in AutoCAD or Visio format. Handwritten drawings shall be accepted for draft or working copies only.
  - 8. Drawings with floorplans shall be created in AutoCAD format. Handwritten drawings shall be accepted for draft or working copies only.
  - 9. All as-built and other closeout documentation to be submitted as a PDF in addition to the native file format.
- F. 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 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

## 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. Each Contractor is required to provide their own penetrations, sleeves, and cores with firestopping. Sleeves and cores shall have nylon bushings. Contractors are to control dust generated from penetrations, protect nearby equipment and surfaces from dust, and follow all OSHA regulations.

## 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. Cable supports
  - 5. Grounding and surge suppression
  - 6. Firestopping
- B. Shop Drawings:
  - 1. Include all labeling schemes for all systems such as station outlets, cable runs, patch panels, punchdown blocks, racks, etc.
  - 2. Include composite drawing indicating cable routing plans. Label cable types.
- C. 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. Installer Qualifications: Contractor must be certified by the manufacturer of the solution being installed and be BICSI certified.
- B. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
- C. Installation Supervision: Installation and testing shall be performed by BICSI Registered Installers or manufacturer certified installers, with a consistent supervisor who shall be present at all times when work of this section is performed.
- D. Comply with all requirements of the 2017 NEC unless jurisdiction requires a different version. Cables must comply with temperature rating requirements including Table 725.144.
- E. Comply with the current versions of TIA 568B, TIA 569, and 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. 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.
- C. 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.
- D. Each Contractor is to protect their own cables during installation. Rough cables are to be properly supported and not left on the floor. If conditions necessitate leaving cables Contractor is to put a note on the cables to reduce chance of damage by others and note cable location to controlling contractor.
- E. Each Contractor to protect their cables in areas where ceilings will be painted to ensure cable sheath is not painted.
- F. For projects where the structured cabling for access points, video surveillance cameras, etc. is being provided by a different contractor, the Contractor providing and installing the equipment (access point, video surveillance camera, etc.) will be responsible for coordinating the cable locations with the structured cabling contractor. In general:
  1. Equipment contractor is to extend the cable to the final equipment mounting location including penetrations, firestopping, waterproofing, raceway, etc. Equipment contractor to provide longer patch cables if needed to reach the mounted equipment location.
  2. For areas where equipment will be mounted in accessible ceiling, cabling contractor is to run the cable to the center of the space for wireless access points or the general area where video surveillance cameras or other equipment are shown. Coil adequate cable to reasonably relocate the equipment within the space.

3. For outdoor equipment, stairwells, equipment in open ceiling spaces to be mounted adjacent to accessible the accessible ceiling in an adjacent space (corridor, etc.) cabling contractor is to run the cable to the adjacent interior space. Equipment contractor is to create the penetration and extend cable to final equipment location, and seal the penetration as required for weatherproofing or firestopping.
4. For open ceiling areas where cabling will be routed away from the adjacent accessible ceiling (e.g. along the perimeter of the space or along the beams/trusses and dropped down to the equipment location in a gymnasium, natatorium, atrium, etc.), the cabling contractor is to run the cable near/above the equipment location. Equipment contractor is to extend cable to final equipment location.

## 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-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, CONDUIT, 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. Coordinate faceplate requirements with the furniture installer, where applicable.

- C. Each contractor shall provide and install blank faceplates / insert on any outlets provided by the electrical contractor for their potential technology use (video outlets, security outlets, data/voice general purpose telecommunication outlets, etc.).
- D. Faceplate labels shall be secured to the faceplate (loose or removable labels on the screw covers are not permanent and not acceptable).
- E. Each Contractor installing cabling is responsible for all surface-mounted raceways and conduit not provided by the electrical contractor. Common potential locations requiring conduit for cables are described below:
1. Conduit for security cameras, wireless access points, audiovisual components, or general communications outlets installed outdoor or in large open spaces without drop ceilings (i.e. gymnasium, cafeteria).
  2. Security cabling for access control systems and intrusion detection systems in vestibules, entrances, doorways, or other areas where cabling cannot be concealed.
  3. Other public spaces where cabling cannot be concealed, and contractor could have reasonably known they existed.
  4. In all other instances requiring surface-mounted raceways that the contractor could not have reasonably known about from construction coordination drawings (e.g. ceiling plans) or pre-bid walkthroughs made available to the contractor whether or not they participated, unit pricing will be utilized. Approval must be obtained prior to installation.
- 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. Legrand/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), 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. Each cable bundle shall include a maximum of 192 cables.
  - 5. 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 plenum rated armored cable.
- 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 nearest accessible 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 manufacturers 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 conduit or raceways designed for the

application. A difficult installation will not be sufficient to avoid the requirement for non-exposed wiring.

1. Contractor to install conduit in exposed areas along cable pathway. Raceway can be used for the vertical segment transitioning to the outlet location (e.g. from ceiling space down wall to outlet). Conduit in exposed areas are to be painted to match surrounding conduits/ceiling color.
  2. Exposed wiring will be acceptable in crawl spaces.
  3. 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.
  4. No exposed cabling will be allowed in natatoriums.
  5. No exposed cabling will be allowed in architecturally significant spaces, such as a media center or entrance lobby.
  6. In instances greater than 15' requiring conduit that the contractor could not have reasonably known about from available drawings (e.g. ceiling plans) or pre-bid walkthroughs made available to the contractor whether or not they participated, the contractor may request reimbursement for the installation. Approval must be obtained prior to installation.
- S. Locate service loops in accessible ceiling unless location in exposed room is approved by Owner..
1. Example: in areas with a drop ceiling "cloud" in the room but exposed ceilings on the room perimeter, the service loop is to be above the cloud.
  2. Example: cables running from drop ceiling corridor to a space with open ceilings are to have the service loop in the corridor at the penetration location.
- T. 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. 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 from any claims or lawsuits or other expenses.

### 3.4 IDENTIFICATION

- A. In addition to requirements in this Article, comply with TIA-606.
- B. Use logical and systematic designations for facility's architectural arrangement and nomenclature, and a consistent color-coded identification of individual conductors. All rack fields, 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. Handwritten drawings shall be accepted for draft or working copies only.

END OF SECTION 27 1000

SECTION 27 1500 – DATA HORIZONTAL CABLING

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 cabling requirements for contractors installing structured data cabling within their scope of work.
- B. The cabling infrastructure shall be implemented as a data solution compliant with TIA standards under T568B.
- C. Extent of the cabling systems work is indicated by the drawings and schedules, and is hereby defined to include, but not by of limitation, the provisions of:
  - 1. Horizontal cables to the telecommunication rooms.
  - 2. All termination blocks, outlets/jacks, patch panels, patch cords, etc.
  - 3. Termination, cross connect, and patching.
- D. Data cables shall be routed so as not to exceed 90 meters in length. Notify the Technology Designer before bid period question deadline, established at the pre-bid meeting, should any changes in bid documents be required to conform to this limitation. After entering Contract, Contractor shall provide Technology Designer-approved solution to meet the 90-meter requirement without additional expense to the Owner.
- E. Color Coding:
  - 1. The following chart describes the cable type/color for the primary structured cabling systems defined in this spec section.

| <b>System</b>                   | <b>Cable Type</b> | <b>Distributi on Cable</b> | <b>Patch Cable (Station)</b> | <b>Patch Cable (Closet)</b> | <b>Jack Color (User End)</b> | <b>Jack Color (Patch Panel)</b> |
|---------------------------------|-------------------|----------------------------|------------------------------|-----------------------------|------------------------------|---------------------------------|
| Data                            | CAT 6             | Blue                       | Black                        | Blue                        | Black                        | Black                           |
| Wireless (info. only)           | CAT 6A            | Purple                     | Purple                       | Purple                      | Purple                       | Purple                          |
| Paging / Emergency Notification | CAT 6             | Orange                     | Orange                       | Orange                      | Orange                       | Orange                          |

- F. Patching:

1. This Contractor is responsible for patching to all switches. Switches will be provided, by others, equal to the number of data ports.
2. Do NOT patch unused patch panel ports.

G. Patch Cables:

1. Provide patch cables for use within telecommunication rooms. Provide one for every data cable installed throughout the project.
  - a. Patch cables shall be the minimum lengths necessary to patch while utilizing the wire management. Technology Designer to approve patching method.
2. In addition to the patch cables to be used in the telecommunication rooms, provide three foot (3') patch cables for use at the station end. Colors are to match the system use from the table above. Provide one for every data cable installed throughout the project.

### 1.3 DEFINITIONS

- A. ER: Equipment Room
- B. MC: Main Cross-connect [Applies to references to MDF]
- C. TR: Telecommunication Rooms [Applies to references to IDF]
- D. PoE: Power over Ethernet

### 1.4 SUBMITTALS

- A. Prior to ordering, confirm colors of horizontal cables, patch cables, and jacks.
- B. Product Data: For each type of product indicated, provide a product data sheet in electronic (PDF) format. Data sheets indicating multiple products must have the applicable product highlighted or marked.
  1. Cable
  2. Faceplates
  3. Terminations (Patch panels, jacks, etc.)
  4. Patch cables (Identify lengths, colors, and quantities)
- C. Qualification Data:
  1. Include written confirmation from the manufacturer that the bidder is a certified installer for the cable plant solution.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Contractor must be certified by the manufacturer of the solution being installed and be BICSI certified.

- B. Installation Supervision: Installation and testing shall be performed by BICSI Registered Installers or manufacturer certified installers, with a consistent supervisor who shall always be present when work of this section is performed.
- C. Comply with current versions of TIA 568B, TIA 569, and TIA 606.

## 1.6 COORDINATION

- A. Coordinate cables for door entry, video surveillance, wireless infrastructure, etc. with the contractor who will be installing the equipment for termination location and method.
- B. Other bids may be issued related to this contractor's scope of work. This Contractor is responsible for knowing what work will be provided by others and how it affects their Work (e.g. electrical rough-ins, etc.). Contractors, during bidding or after, can contact the project team to view related drawings and/or specifications.

## 1.7 WARRANTY

- A. 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.
- B. The cable plant shall be covered by the manufacturer's warranty for a minimum of fifteen (15) years (e.g. 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-568-B. Match components and interconnections for optimum future performance.
- B. One manufacturer must be used for all termination jacks, patch panels, and patch cables.
- C. Contractor is to use plenum rated cable and cabling accessories throughout this project.
- D. All Category 6A cables will be UL limited power (LP) rated.

### 2.2 MANUFACTURERS

- A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any deviations must be approved in writing by the Technology Designer before installation.
  - 1. Data Cable
    - a. Berk-Tek

- b. Belden
  - c. Commscope
  - d. General
  - e. Liberty Wire & Cable
  - f. Lucent
  - g. Mohawk
  - h. Superior Essex
  - i. Approved Equal
2. Patch Panels, Faceplates, Station Terminations, Jacks, other Accessories
- a. Hubbell
  - b. Panduit
  - c. Ortronics
  - d. Leviton
  - e. Approved Equal

### 2.3 DATA CABLE AND TERMINATIONS

#### A. Cable Standards:

1. Cabling shall be contiguous, plenum rated, four-pair UTP cable compliant with EIA/TIA 568B-2.1 standards. Refer to the table in Section 1 for cable rating.
2. Cable shall be solid copper.
3. Cabling shall be certified as a complete system with other components required herein to achieve manufacturers cabling system extended warranty.

#### B. Termination Standards:

1. Terminations shall be modular, T568B RJ-45 jacks. Refer to the table in Section 1 for cable rating.
2. Video surveillance, wireless access point, or other equipment terminations shall be modular T568B RJ-45 jacks in a plenum-rated biscuit box located in the nearest accessible ceiling or junction box to the end device. Alternatively contractor can use a modular plug terminated link (i.e. direct connect) that meets the ANSI/TIA-568-C.2 clause 6.3 requirements. If a modular plug terminated link (MPTL) is used, testing must be performed with the appropriate channel adapter.

### 2.4 INDOOR/OUTDOOR DATA STATION CABLING

#### A. Cable Standards:

1. Cable is to be continuous UTP cable rated for indoor and outdoor installations between two environmentally protected points, including underground pathways. Refer to the table in Section 1 for cable rating.
2. Use in areas with thermal or chemical exposure.
3. Plenum-rated required when cabling indoors extend beyond 50' from the building entry location.
4. Cable shall have an UV-resistant sheath and a core of solid-copper conductors, dual insulated resistant to chemical, moisture, and thermal exposure.
5. Cabling shall be certified as a complete system with other components required herein to achieve manufacturer's cabling system extended warranty.

#### B. Manufacturer:

1. Hitachi Cable Drybit Indoor-Outdoor Cable

2. Super Essex with FEP Jacket CMP Indoor/Outdoor
3. Approved equivalent

C. Termination standards:

1. Contractor shall install lightning protectors in telecommunication room for each data cable.
2. Terminate in telecommunication room in existing patch panel.
3. Terminate at station location in "biscuit box" in nearest accessible ceiling or as recommended by station equipment manufacturer/installer.

## 2.5 EXTENDED DISTANCE CABLING

A. General Requirements:

1. Extended distance cabling is only to be used for video surveillance and IP-paging devices with cable distances under 150m.
2. Prior to installation the contractor must demonstrate functionality with the end point (i.e. camera) and a spool of cable that meets or exceeds the expected distance, and obtain Owner sign off.
3. Contractor is to note on each cable test result that the cable run uses extended distance cabling.
4. Cable must be a different color or have a distinctive stripe to visually separate it from the Category cable used throughout the project. Review color or designation with project team before ordering.

B. Approved Manufacturers:

1. Belden RemotelP Cable
2. Paige GameChanger Cable
3. Approved equivalent

## 2.6 PATCH PANEL DISTRIBUTION FRAME TERMINATIONS

A. Standards:

1. Patch panels must be 19", 48-port patch panels with T568B terminations.
2. Patch cables shall match the structured cabling type (i.e. Cat 6 patch cables for Cat 6 drops; Cat 6A patch cables for Cat 6A drops, etc.).
3. Patch panels shall accept keystone jacks and the contractor shall leave unused ports unpopulated. Keystone color should match the distribution cable color.
4. Provide patch panels for all cables installed plus eight (8) open ports in each telecommunication room for future use.
5. Patch panels shall have a rear strain relief bar to organize cables and maintain appropriate bend radius.
6. Separate patch panels shall be used for data, video surveillance, wireless access point, and IP paging locations.
7. Data cables shall be terminated sequentially. If terminated on the patch panels, cables installed for building systems (fire alarm phone line, security phone line, pay phones, etc.) shall be terminated together in the last patch panel positions and its use labeled on the patch panel.



## 2.7 FACEPLATES AND MODULE FRAMES

- A. Faceplates shall be sized to accommodate the raceway, back box, or floorbox for each location with adequate modules for the required jacks.
- B. All faceplates shall be Decora style stainless steel. Utilize smooth metal 302/304 stainless steel for all faceplates. Blank plates shall be sized to fit box without Decora cutout.
  - 1. Exception: Plastic module frames shall be used where necessary to match installation of other contractors.
- C. Faceplate labels shall be secured to the faceplate (loose or removable labels on the screw covers are not permanent and not acceptable).

## 2.8 PATCH CABLES

- A. Patch cables shall match the structured cabling type (i.e. Cat 6 patch cables for Cat 6 drops; Cat 6A patch cables for Cat 6A drops, etc.).
- B. Patch cable manufacturer shall be consistent with the patch panel and jack manufacturer.
- C. Patch cables shall NOT have boots.

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

### 3.2 INSTALLATION

- A. Review all closet layouts with Technology Designer prior to installation.
- B. 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.
- C. Contractor shall limit cable bundles for cable runs, cables in telecommunication rooms, and penetrations to:
  - 1. Cat 5e 52 cables
  - 2. Cat 6 64 cables
  - 3. Cat 6A 74 cables
- D. Contractor to provide additional cabling coiled above ceiling at both the workstation locations and in telecommunication rooms. The additional lengths of cable shall be included in distance

calculations. Cable routing within the telecommunication closet is to be approved by the Owner's Representative before beginning termination.

- E. At station locations, terminate all 8 conductors on all jacks, regardless of data or telephone use.
- F. 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.
- G. Service loops for Cat 6A cables are to be installed in an S-configuration and not a circular loop.
- H. All service loops are to be located in accessible ceiling, not in exposed visible locations.

### 3.3 IDENTIFICATION

- A. In addition to requirements in this Article, comply with TIA/EIA-606-A.
- B. Data cable patch panels shall be labeled sequentially with letter designations A, B, C, etc.
- C. Patch panel ports used for mounted devices (wireless access points, surveillance cameras, displays, etc.) will be labeled with the device name (e.g. WAP-09 for access point 9, CAM-07 for surveillance camera 7).
- D. Each termination module shall be labeled with a white, wrap-around self-adhesive label. Use Panduit MINI-COM® Module Port Identification Self-Adhesive Labels, or equivalent.
- E. Each label shall identify the telecommunication room, patch panel and patch panel port. For example: 1-A-34 would refer TR-1, patch panel A, port 34.
- F. In addition to the faceplate label, each cable is to be labeled behind the faceplate and patch panel with a machine generated wrap-around self-adhesive label that matches the port label on the patch panel and faceplate.

### 3.4 FIELD QUALITY CONTROL

- A. The installations must be tested and certified as compliant for Category 6 (or 6A as applicable) Gigabit connectivity. The installation is to be tested to the current EIA/TIA TSB Channel Performance Testing Standard, or equivalent as approved by the Technology Designer. For workstation locations without a patch cable, use a 10' cable at for testing purposes.
  - 1. Cables are to be tested with a Fluke Versiv Cable Certifier, or equivalent by Agilent or Wavetek, using the correct software version and adapter for the cable installation or as required for manufacturers warranty program.
  - 2. Cables are to be tested consistently with the tester in the telecommunication room, and the injector at the workstation termination locations.
  - 3. Testing will be performed after faceplates have been secured to the raceway/wall/floorbox.
- B. Document for each pair as well as the worst margin the following test results:
  - 1. Cable identification (Building and Circuit ID)
  - 2. Test date

3. Cable length (ft.)
4. Wiremap
5. Delay (ns)
6. Skew (ns)
7. Resistance (Ohms)
8. Attenuation
9. NEXT
10. ELFEXT
11. Return Loss
12. PSNEXT
13. PSELFEXT

- C. Any cables that do not meet the minimum performance criteria established by the standards or manufacturer shall be corrected or replaced at no additional cost to the Owner.

### 3.5 DEMONSTRATION

- A. Contractor shall train the Owner on the layout of the cabling system including the pathways, termination methods, and interconnections.

### 3.6 DOCUMENTATION

- A. As-Built Documentation:

1. Include scaled drawings reflecting 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 format. Handwritten drawings shall be accepted for draft or working copies only.

- B. Cable Testing

1. Cable test results are to be provided in hard copy format as well as a PDF organized by building and telecommunication room.

- C. Warranty

1. Provide certificate of manufacturer's extended warranty for the structured cabling system.

END OF SECTION 27 1500

## SECTION 27 5116 – IP PUBLIC ADDRESS AND EMERGENCY NOTIFICATION SYSTEMS

## 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
  - 3. 27 1500 – Data and Voice Horizontal Cabling

## 1.2 SUMMARY

- A. This Section includes the following related to the PA System
  - 1. PA equipment (console, zone controllers, amplifiers, etc.)
  - 2. Cabling
  - 3. Speakers
  - 4. Strobes or flashers
  - 5. Individual room controller
  - 6. Teacher/staff microphones
  - 7. Media player (located in main office)
  - 8. Paging microphone (located in main office)
  - 9. Paging kiosk (located in main office)
- B. PA system shall provide paging, emergency signal sounding, and time-event signals (bell system) to selectable zones within the building (interior and exterior).
- C. PA system is to be network-accessible allowing for administration from any computer on the Owner's network, paging at a remote-building, and multi-building pages for emergency announcements.
  - 1. System will provide paging to Emergency zone(s) that will initiate pre-recorded and live announcements across multiple buildings on the network such as buildings on the same campus based on user-initiated events or automatic events such as a building lockdown. Contractor to review building assignments with the Owner and Designer.
- D. Provide bell system schedule through browser-based system. Contractor to obtain the standard daily bell schedule and the bell schedule for pre-programmed non-standard days (e.g. half day, early release, etc.) and create the initial bell schedules in the system for each building.
- E. The system will play pre-recorded messages and tones when initiated from the administrative software or from an alert sent from an external system. Contractor to work with Owner to record all initial messages.
- F. The system will be configured to play recorded music (MP3) or music from other electronics through an aux port.

- G. The Contractor will provide a fully functional system that unifies classroom paging and classroom voice enhanced audio within the room, utilizing the existing classroom speakers where noted on the drawings, and providing new equipment where identified on the drawings.
- H. The Contractor will remove the existing Audio Enhancements sound field amplifier within each classroom. Contractor will then install a new IP amplifier capable of initiating an emergency notification, reworking the existing audio cabling from the classroom AV systems to be incorporated into the paging system as necessary.
- I. Provide a digital console system in the main office to initiate notifications for tornado alert, emergency alert, and lockdown. Coordinate specific district needs with the Owner and implement as required.
- J. When the emergency zone is initiated strobes are to flash along with the message being played.
- K. Configure system to synchronize time with the master clock system.
- L. The system will work alongside the existing master clock system. Speakers are to include clocks where noted on the drawings.
- M. PA system shall allow for talkback from each instructional space (classroom, lab, elementary gym, etc.). Provide a preannounce tone over speakers before two-way communication is enabled.
- N. PA system shall provide individual room controllers (TS on the drawings) in the locations indicated on the drawings.
- O. PA system shall be integrated with the phone system allowing announcements from authorized users to be made from any handset. Announcements shall be active until the user terminates the session by hanging up the handset.
- P. Provide a master station kiosk in the main office for paging administration including zone pages, all-call announcements, and emergency announcements, in addition to the phone system integration (Mitel).
- Q. Provide a push-to-talk microphone in the main office or where shown on the drawings for all-call announcements in addition to the phone system integration. The district's utilizes **Mitel** for their phone system.
- R. Provide an media player in the main office for playing audio from devices (e.g. music from a mobile phone).
- S. PA system will have separate zones for the following areas. Speakers in support spaces can be part of the zone associated with that space (e.g. kitchen, server, kitchen office, food storage areas, etc. can all be included in the cafeteria zone).
  - 1. All Inside Speakers (generally referred to as "all call")
  - 2. All Outside Speakers
  - 3. All Inside + Outside Speakers
  - 4. Emergency (all inside + outside with strobes flashing)
  - 5. Each Instructional Space (classrooms, computer labs, media center, gross motor room, etc.)

### 1.3 DEFINITIONS

- A. PA: Public Address

### 1.4 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. PA equipment (console, zone controllers, amplifiers, etc.)
  - 2. Cabling
  - 3. IP speakers
  - 4. Analog paging speakers
  - 5. Analog classroom speakers
  - 6. Strobes or flashers
  - 7. Individual room controller
  - 8. Teacher/staff microphones
  - 9. Media player
  - 10. Paging microphone
  - 11. Paging kiosk
- B. Shop Drawings: For each drawing indicated, provide electronic (PDF) format.
  - 1. Include a composite floorplan identifying speaker locations and zone assignments.
  - 2. Include composite floor plan of each building indicating equipment locations, cable paths, workspace requirements, access for equipment connections, and all rack/cabinet layouts.
- C. Qualification Data: Include written confirmation from the manufacturer that the Contractor is an authorized factory agent or distributor for the submitted products.

### 1.5 QUALITY ASSURANCE

- A. Comply with the requirements of NFPA 70.
- B. The Contractor shall install in accordance with all applicable codes and standards, including federal, state, and local codes and authorities.

### 1.6 COORDINATION

- A. 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.
- B. For new-wall construction, provide speaker backboxes to the contractor identified by the Construction Manager for installation.
- C. Coordinate the telephone integration with the telephone contractor or with the Owner's telephone service company.

## PART 2 - PRODUCTS

## 2.1 SYSTEM REQUIREMENTS

- A. The PA system equipment shall be rack-mounted in each building's telecommunications rooms unless noted otherwise. If not shown on drawings Contractor and Technology Designer will review locations after contract award. Contractor to provide fire-rated backboard sized for their installation. Coordinate layout requirements with Technology Designer before installation.
- B. The system is to be designed using a server-based architecture. In the event that a building loses connection with the district-wide server, a server installed local to the building will provide localized paging for that site. Once the connection is restored, the systems will resynchronize.
- C. Locate administration kiosk, microphone, and media player in main office. Coordinate location with building administration and/or district technology staff.
- D. Integrate with existing Mitel IP telephone system to allow paging from existing handsets.
  - 1. Provide SIP trunk to SIP Station handoff as required for interconnection.
  - 2. Coordinate interface and connection with Owner's telephone system service provider
  - 3. PA system Contractor is responsible for installing the cable between the 2 systems.
- E. Provide bell system schedule through a browser-based system. Provide and configure the initial school year bell calendar including holidays and non-typical days.
- F. Synchronize time with the Master Time System. System shall automatically adjust for daylight savings time.
- G. Provide and configure emergency alert system for email and text alerts. Coordinate with the Owner for a list of individuals and contact information for individuals that will receive alerts.
- H. The PA system shall provide a minimum of four (4) distinct tones for emergency alerts. Each tone shall be programmable for volume, pitch, and duration. Emergency alerts should be distributed to all speakers unless directed otherwise by the Owner or Technology Designer.
- I. System shall be addressable to allow each speaker to be assigned to one or multiple zones.
  - 1. If analog speakers are used for coverage (e.g. hallways, one-way paging zones such as cafeterias, etc.) the group of speakers must be addressable to be assigned to one or multiple zones.
- J. System shall contain adequate number of zone controllers to meet zone requirements at each building.
- K. Amplifiers shall be sized to accommodate all speaker locations defined in the plans and specifications. The system shall also allow for additional speakers to be added (allow for 20% growth).
- L. Include programming software and programming to provide a fully functional turnkey solution.
- M. Provide a preannounce tone over each speaker for each page type.
- N. The Contractor is to use plenum rated cabling and accessories throughout the project. All cables shall be **shielded**, continuous and free from splices.

## 2.2 MANUFACTURERS

- A. The owner has not had a chance to test all manufacturers therefore bidders may propose solutions not listed below. The Owner will evaluate proposed solutions and select the solution that best serves the districts goals based on cost, features, functionality, sound quality, etc.
- B. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any deviations must be approved in writing by the Technology Designer before installation.
  - 1. Audio Enhancement (basis of design)
  - 2. Advanced Network Devices (for IP speakers)
  - 3. Approved equivalent

## 2.3 MICROPHONE (in office)

- A. Provide desk-type low impedance microphone with push-to-talk switch.
- B. The microphone is to be an IP device.

## 2.4 PAGING KIOSK (in office)

- A. General Requirements
  - 1. Include a touch screen device (minimum 23") specifically designed to function as the administrative console for the system at each building.
  - 2. The display must be multi-touch capable.
  - 3. Must be full HD color capable.
  - 4. Must include an integrated paging microphone for initiating pages on the system.
- B. Manufacturers:
  - 1. Audio Enhancements EPIC System Kiosk
  - 2. Approved Equal

## 2.5 MEDIA PLAYER (in office)

- A. General Requirements
  - 1. Provide desk stand and full color touch screen display capable of playing music throughout selected portions of the campus or an individual building.
  - 2. Device is to be IP enabled.
  - 3. Device will be able to initiate an emergency alert via the touch screen, or other types of events as required by the Owner.
  - 4. The touch screen will also control source volume.
- B. Manufacturers:
  - 1. Audio Enhancements Front Office CLAUDIA
  - 2. Approved Equal



## 2.6 SOUND-FIELD AMPLIFICATION

### A. Standard System Minimum Requirements

1. DECT transmission utilizing a receiver with LED indicators.
2. Must be IP enabled and PoE powered.
3. Page-mute function
  - a. System must mute when the overhead paging system is active.
  - b. Overhead paging system will announce through the classroom speakers.
4. Speakers. Provide the following:
  - a. Four (4) recessed ceiling speakers with white grilles plenum-rated cabling (min 60' per speaker)
  - b. Speakers may also be 2'x2' lay in speakers. Contractor to cut tiles and provide tile bridge for installations in ceilings with 2'x4' tiles.
5. Solutions must include common speakers shared between the paging and sound field.
6. Must have direct connectivity with the classroom touch screens, door sensors, and pull stations.
7. Two (2) wireless microphones with rechargeable batteries and neck strap. Wireless microphones must be capable of triggering an emergency alert through the paging/emergency notification system.
8. Two (2) auxiliary stereo inputs.
9. Individual volume control for microphones and sources.
10. For areas with windows between rooms, contractor is to order system with varied channels as required to avoid interference and/or install sensors to avoid interference.
11. Minimum 5-year manufacturer's warranty

### B. Accessories:

1. Include ten (10) additional teacher and ten (10) additional student wireless microphones in the base bid

### C. Manufacturers:

1. Audio Enhancement (MS-500 and/or MS-700 as noted on the drawings)
2. Approved Equal

## 2.7 ZONE CONTROLLER

### A. General Requirements

1. Provide an I/O module that allows control of zone paging locations that do not require a microphone receiver (i.e. Outdoor analog paging horns, inside analog speakers)
2. Must be IP enabled and PoE powered.

### B. Manufacturers:

1. Audio Enhancements (MS-300)
2. Approved Equal

## 2.8 POWER AMPLIFIER (FOR USE WITH **ALL** ZONE CONTROLLERS)

### A. General Requirements

1. Provide a commercial power amplifier

2. Must be sized appropriately for the quantity of speakers in the zone, allowing for 20% headroom for future growth.
3. Must carry a 5-year warranty consistent with the requirements of the overall project.
4. The amplifier must be a 2-channel amplifier, one channel will be used for the outdoor zone, one for the indoor zone.

B. Manufacturers

1. Audio Enhancements
2. Ashley
3. Crown
4. Extron
5. Q-Sys
6. Approved Equal

## 2.9 CLASSROOM TOUCH SCREEN

A. General Requirements

1. The touch screen is the interface that connects to the classroom system to allow adjustments to the classroom sound-field system and access to emergency notification functions within the space.
2. Must have a built-in microphone to provide 2-way communication with the main office.
3. Must allow for custom configurations to be provided by the manufacturer and/or the Contractor. Contractor to work with the Owner to establish programming requirements. Contractor and/or manufacturer to implement requirements.

B. Manufacturers:

1. Audio Enhancements (ITC-2)
2. Approved Equal

## 2.10 SPEAKERS

- A. Where possible, speakers shall be recessed-mounted in suspended ceiling tiles and protected with white grilles.
- B. Ceiling PA speakers and grilles are to be rust-resistant with load bearing tile support bridge.
- C. Wall/open-ceiling PA speakers are to be vandal resistant horn loudspeaker assemblies with durable powder coat finish, integrated clock, and integrated strobe/flasher.
- D. Wall/open-ceiling PA speakers are to be vandal resistant horn loudspeaker assemblies with durable powder coat finish, integrated clock, and integrated strobe.
1. Basis of design single-sided:   Advanced Network Devices IPSWD-RWB (base bid)  
Advanced Network Devices IPSWDHD-MW (alternate)
  2. Basis of design double-sided:   Advanced Network Devices IPCDS-RWB-U (base bid)  
Advanced Network Devices IPCSHD-DS-MB (alternate)
  3. Basis of design IP speaker (no clock):   Advanced Network Devices IPSCM-RMe

- E. Outdoor horns shall be analog, weather resistant, and vandal resistant. Verify mounting methods with Technology Designer prior to installation. Use outdoor-rated horns in natatoriums.
- F. Any non-recessed speakers must match the surrounding architectural finishes. Speaker selection requires Technology Designer and Architect approval.
- G. Appropriate mounting accessories (grilles, enclosures, baffles, etc.) shall be provided and installed with each speaker. Accessories shall be chosen to accommodate installation location.
- H. All speakers to be equipped with appropriately sized transformers.

#### 2.11 SPEAKER CABLING

- A. Wiring shall be done per manufacturer's recommendation.
- B. All terminal connections to be on barrier strips.
- C. All cables to be labeled by room.
- D. All speaker cabling is to be **shielded** and **plenum** rated.
- E. Contractor to install conduit between speakers / backboxes where cabling is not concealed above accessible ceiling.

#### 2.12 STROBE / FLASHER (FOR USE WHERE NOT INTEGRATED INTO CLOCK/SPEAKER)

- A. Strobe lights shall be installed in all large spaces as shown on the drawings.
- B. Strobe light color shall be red, blue, green, clear, amber, purple or shall be multi-color and have the ability to be programmed to light up different colors based on type of announcement, bell schedule, or emergency tone.
- C. Strobe light shall be round or rectangle.
- D. Minimum Dimensions:
  - 1. Round: 3.5 inches tall by 3 inches in diameter
  - 2. Rectangle: 4.5 inches tall by 3 inches wide
- E. Include all necessary mounting accessories for a complete installation, including wire guards in spaces with the possibility of incidental damage.
- F. Strobe lights shall be outdoor rated including rated to withstand areas with high concentrations of chemicals in areas such as natatoriums.
- G. Strobe lights shall have the capability to show different flash patterns and be programmed to flash differently based on type of announcement, bell schedule, and emergency tone.
- H. Strobe lights shall meet all ADA requirements.
- I. Strobe lights shall have the capability to be programmed individually and independently from other strobes and from their corresponding PA speakers.

1. Review programming for strobe use with owner (i.e. strobe use in varying situations and zones).
2. Strobe lights, however, shall be configured to turn on during all announcements the rooms corresponding speakers receive (excluding bells).

J. Manufacturers

1. Advanced Network Devices
2. Approved Equal

## 2.13 DOOR SENSORS

A. General Requirements

1. Magnetic door sensor switch that alerts through the system if an opening has been breached.
2. In each location shown on the drawings, each door leaf on a given opening is to be provided a door sensor and wired in series back to a networked appliance.
  - a. Classroom door sensors get wired to an input on the classroom sound-field amplifier.
  - b. Exterior doors not attached to a classroom will be wired to an input on the door sensor interface located within a network closet (MDF/IDF) at each building.
3. Provide surface mounted raceway from the nearest accessible ceiling to conceal cabling into the door frame or to the installed location. Exposed wiring will not be accepted.

B. Manufacturers:

1. Audio Enhancements (AC-2152) Magnetic Door Sense Switch
2. Approved Equal

## 2.14 DOOR SENSOR INTERFACE

A. General Requirements

1. IP Enabled relay device.
2. Communications via an integrated API.
3. Ability to receive dry contact inputs from the door sensors.

B. Manufacturers:

1. Barix (Barionet-50)
2. Approved Equal

## 2.15 EMERGENCY PULL STATION

A. General Requirements

1. Decora style emergency button with an RJ45 connection.
2. Integrated omnidirectional microphone to provide two-way communication with the office.
3. 24V DC powered from remote power source.

B. Manufacturers:

1. Audio Enhancements (WPA-705)

## 2. Approved Equal

## PART 3 - EXECUTION

## 3.1 EXAMINATION AND PRE-INSTALLATION

- 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. Provide all cabling, equipment, and devices to ensure the system will properly function. Any issues with the systems, design, or installation must be brought to the attention of the Technology Designer before the bid is submitted.
- C. Examine pathway elements intended for cabling to verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with manufacturer requirements.
- D. Verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.
- F. Prior to installation, verify and record the decibel reading from each existing speaker at the average seated adults height in classrooms, and the average standing height of a student in corridors and common areas, including outdoor areas. The readings are to be recorded on a building floorplan and provided to the Owner.
- G. Review the decibel readings with the Owner and Technology Designer, discuss areas with deficient sound levels and provide recommendations to remediate, in order to ensure the new solution meets intelligibility goals and generally accepted guidelines.

## 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 protect equipment and components during installation and clean all equipment before Owner acceptance, using methods and materials recommended by the manufacturer.
- 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. Contractor to provide 16-gauge (min) metal cover plate for any PA openings that will not be completely covered by new speakers. Paint to match surrounding surface or provide with powder coat finish in color approved by Owner. Sheet metal coverings will not be accepted.

- E. Contractor shall review zone speaker assignments, zone numbering scheme, and tone designations with the Owner and Technology Designer before beginning installation. Configure according to Owner requirements.
  - 1. Zone assignments will be consistent for similar spaces across buildings. For example, each building is to have the same assignment for all-call, emergency zones, gymnasiums, cafeterias, etc.
- F. Update all hardware and software with the latest firmware and software versions.
- G. Configure all aspects of the system and components according to manufacturer best practices and input given by the Owner. This includes the servers, main office kiosks, the media players, classroom touch screens, and the door sensor interfaces.
- H. Reconnect audio from existing classroom flat panels in each space.
- I. In locations where the classroom audio system is new (as noted on the drawings), provide analog audio cabling from the existing classroom flat panel to the new classroom sound-field system.
- J. After balancing the system, Contractor shall mark all components with variable sound levels indicating the levels recommended.
- K. Splice cable only in accessible junction boxes or at terminal block units. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.
- L. Leave 24" excess cable at each termination at microphone, volume pad, speaker, or other system outlet. Leave 6 feet of excess cable at each termination at the system cabinet. Service loop to be arranged and secured.

### 3.3 TESTING AND VERIFICATION

- A. After installation, verify and record the decibel reading from each speaker at the average seated adults height in classrooms, and the average standing height of a student in corridors and common areas, and outdoor areas. The readings are to be recorded on a building floorplan and turned over as part of the close out package.
- B. Review the decibel readings with the Owner and Technology Designer, discuss and adjust speaker sound levels according to Owner preference while following generally accepted intelligibility guidelines.

### 3.4 IDENTIFICATION

- A. Cable runs shall be machine labeled within 1" of each termination. All cabling is to be tagged in a consistent manner, approved by the Technology Designer.
- B. Zone paging modules, tone generators, etc. shall be labeled to designate their configuration.

### 3.5 FIELD QUALITY CONTROL

- A. Document functionality performs properly in all rooms.

1. Verify correct speakers assigned to each paging zones
2. Call initiation
3. Talk back
4. Emergency tones
5. Door sensors
6. Emergency pull stations
7. Emergency alerts via lanyard microphones.
8. Emergency alerts via the classroom touch screens.

### 3.6 DEMONSTRATION

- A. Contractor must test system to make sure all call, zoning, talkback, lockdown initiation, and lock down drills work properly prior to demonstration. District personnel must be present for an all call and lock down drill test.
- B. Demonstrate all system functions (timed events, emergency tones, telephone and clock interfaces, etc.) to Technology Designer.
- C. End user training to be scheduled at Owner's convenience. Contractor to provide site-specific documentation on the basic operation, programming, bell schedules (standard and holidays). Contractor to record training sessions.
- D. Administrative training will be scheduled with staff identified by the Technology Designer in conjunction with the Owner. The training will cover all administrative functions of the system including but not limited to making programming changes, basic troubleshooting, software updates, device wiring overview, bell schedules, and custom zone possibilities and limitations.

### 3.7 SYSTEM ADJUSTMENTS

- A. After initial setup, contractor to include additional site visits throughout the first year of operation (as set forth from date of substantial completion) to adjust speaker volumes for individual speakers or zones and make minor changes to programming as requested.

### 3.8 DOCUMENTATION

- A. As-Built Documentation:
  1. Include composite drawing for each building indicating paging zones, paging zone numbers, and paging instructions.
  2. Provide test results log of all systems and zones with date and time of test, the db reading, and who performed the test.
  3. Include scaled drawings reflecting all changes between the bid documents and the final installation including cable routing, location of all equipment, speakers, remote volume controls, etc.
  4. Schematic drawing indicating equipment models, interconnections, and naming conventions. Include interconnections to other systems.
  5. Spreadsheet with make, model, serial numbers, MAC address, and installed locations for all IP-based components and the analog amplifiers required for zone paging.
  6. Spreadsheet indicating call and talkback functionality has been tested in each room.

END OF SECTION 27 5116