



SECTION 16821

MASS NOTIFICATION SYSTEMS

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mass Notifications Systems: Performance based specification and components required for networked based MNS/EC Mass Notification Emergency Communications (MNEC) systems including but not limited to the following:
1. Digital signal processors.
 2. Noise generators.
 3. Paging interfaces.
 4. Amplifiers.
 5. Loudspeakers.
 6. Microphones.
 7. Pre-recorded announcements.
 8. Text to speech modules.
 9. Telephone inputs for announcements.
 10. Field pop controls.
 11. Desktop notification.
 12. Social media (Twitter, Skype).
 13. Wide area or loud voice.
 14. Email.
 15. SMS / text.
 16. Digital signage.
 17. Strobes and other visual light bars.
 18. Supervised digital inputs and outputs.
 19. Two Way Talk Back Communication Units
 20. LOCs
 21. Servers.
 22. Associated wiring, controls, supervised signals, lines, and components to generate, amplify, distribute and reproduce emergency voice pages.

1.2 RELATED SECTIONS

- A. Section 16060 - Common Work Results for Electrical.
- B. Section 16050 - Basic Electrical Materials and Methods: Electrical systems and components.
- C. Section 16130 – Telecommunications Surface Raceway.

- D. Section 16700 - Communications: Data and voice communications systems and components.
- E. Section 13850 - Fire Alarm and Detection.

1.3 DEFINITIONS

- A. ACU: Autonomous control unit.
- B. ETL: Intertek.
- C. FACU: Fire alarm control unit.
- D. LOC: Local Operating Console.
- E. MNS: Mass notification systems.
- F. MNEC: Mass notification emergency communications.
- G. RoHS: Restriction of Hazardous Substances.
- H. UL / ULC: Underwriters Laboratories / Underwriters Laboratories Canada

1.4 REFERENCES

- A. American Disabilities Act (ADA).
- B. American National Standards Institute (ANSI):
 - 1. ANSI S1.4 - American National Standard Specification for Sound Level Meters.
 - 2. ANSI S1.6 - American National Standard Specification for Preferred Frequencies and Band Numbers for Acoustical Measurements.
 - 3. ANSI S1.11 - American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters.
 - 4. ANSI 709.1 - ISO / IEC Standards for Open Platform.
- C. CSA
 - 1. CSA CMP 75C FT6.
- D. European Standard (EN):
 - 1. EN 55024 - Information technology equipment - Immunity characteristics - Limits and methods of measurement.
 - 2. EN 55103-1 and 2: Audio, Video and Entertainment Lighting Controls.
 - 3. EN 60950 - Information Technology Equipment.
 - 4. EN 61000 - Electromagnetic Compatibility.
 - 5. ENV50204 - Radiated electromagnetic field from digital radio telephones - Immunity test.
- E. Federal Communications Commission (FCC):
 - 1. FCC-EN 55103-1 and 2: Audio, Video and Entertainment Lighting Controls.
- F. Intertek (ETL).
- G. International Code Council (ICC):
 - 1. International Building Code (IBC)
 - 2. International Fire Code (IFC)

- H. International Electrotechnical Commission (IEC):
 1. IEC 60268-16 - Objective rating of speech intelligibility by speech transmission index.

- I. National Fire Protection Association (NFPA):
 1. NFPA 101 - Life Safety Code.
 2. NFPA 72 - Fire Alarm and Signaling Code.

- F. Restriction of Hazardous Substances (RoHS).

- G. Underwriters Laboratories (UL):
 1. UL 864 – Standard for Control Units and Accessories for Fire Alarm Systems.
 2. UL 1310 - Standard for Class 2 Power Units.
 3. UL 1480 - Speakers for Fire Alarm and Signaling Systems, Including Accessories.
 4. UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.
 5. UL 2572 - Standard for Mass Notification Systems.
 6. UL 6500 - Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use.
 7. UL 60065 - Standard for Audio, Video and Similar Electronic Apparatus - Safety Requirements.
 8. UL 60950 - Information Technology Equipment – Safety.

- H. Underwriters Laboratories Canada (ULC).
 1. ULC S576 – Standard for Mass Notification (Canada).

- I. US Army Corp.'s Unified Facilities Guide Specifications(UFGS):
 1. UFGS 25 10 10 - Utilities Monitoring and Control System.
 2. UFGS 23 09 23 - Direct Digital Control for HVAC and Other Local Building Controls.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.

- B. Proposal:
 1. A preliminary listing of proposed major components, in the order and format listed in the products section of these performance specifications, along with the manufacturer's detailed technical data sheets. Advertising literature shall not be accepted.

- C. Product Data:
 1. Manufacturer's data sheets on each product to be used.
 - a. Submit in PDF format.
 - b. Equipment data sheets will be identified with device IDs that reference drawings and equipment used.
 2. Preparation instructions and recommendations.
 3. Storage and handling requirements and recommendations.
 4. Typical installation methods.

- D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.
 1. Submit in DWG format for approval on all items that require assembly by the Design-Builder, including, but not limited to:
 - a. Headend Rack panel layouts.

- b. Rack operating platforms (OPs)
 - c. Rack accessory component panel layouts.
 - d. Loudspeaker enclosures.
 - e. Supporting brackets for the suspension and/or support of loudspeaker enclosure and equipment enclosure.
 - f. Flow diagram showing connections between rack headends, operating platforms (Ops), and speakers
 - g. Wiring and installation diagrams showing quantity and location of system components and related cabling and accessories.
 - h. Each shop drawing shall contain job title and reference(s) to the applicable drawing(s) and/or specification articles.
 - i. Loudspeaker system locations.
 - j. Plenum or Rack mounted networked components.
 - k. Equipment rack layouts.
 - l. Connection between the rack headend and the Fire Alarm Control Panel.
2. Layouts shall be submitted for approval on the following:
- a. Loudspeaker system locations.
 - b. Plenum mounted networked components.
 - c. Equipment rack layouts.
 - d. Connection between the rack headend and the Fire Alarm Control Unit.
- E. Within the scheduled amount of days after receipt of Notice to Proceed, the Design-Builder will submit the following for approval:
- 1. Complete components list, in order and format in the contract documents. For proposed substitutions to components listed in this performance specification, manufacturer's independent test data to demonstrate performance specification compliance will be provided.
 - 2. Advertising literature is not acceptable.
 - 3. Product Certifications: Mass Notification Systems (MNS) must meet UL 2572 standard by nationally recognized testing laboratory. No Exceptions.
- F. For Installation Acceptance:
- 1. Complete and final list of components furnished, in same order and format as the specifications. Furnish data sheets of each item.
 - 2. As-built drawings.
 - 3. System geographical layout and block diagram to be provided in a hard copy format as well as retained electronically for the Owner and on file with the Design-Builder.
 - 4. Record of final field tests and measurements include final adjustment of system.
 - 5. Maintenance Data: For system equipment and components (if needed) to include in maintenance manuals specified in Division 1.
 - 6. Equipment operation and service maintenance manuals shall be provided for the equipment employed in the systems. This shall include wiring diagrams. The information in the manuals and on the drawings shall be sufficiently detailed to allow a technician of normal competence to understand, install, operate, maintain, calibrate and repair the equipment.
 - a. Operation manuals to be completed prior to instruction sessions.

1.6 SYSTEM DESCRIPTION

- A. Network-based, mass notification emergency communications (MNEC) systems: Assists in creating a safer, more intelligible environment in a life safety situation.
- 1. Communication Interfaces: For life safety, security, and notification.
 - a. LED display signs.

- b. Digital signage.
 - c. Strobes.
 - d. Text to speech.
 - e. SMS and texts.
 - f. Desktop notification.
 - g. Voice communication – live or pre-recorded.
 - h. Social media (i.e., Twitter, Skype).
 - i. Email.
 - j. Overhead paging.
 - k. Loud voice / wide area paging.
2. Consists of the Following Items Meeting UL 2572 Requirements:
 - a. Head-end control.
 - b. Networked Audio Amplifiers
 - c. I/O Expanders
 - d. Audio Interface with FACU
 3. Interface with Fire Alarm Control Unit (FACU). During a fire emergency the MNEC/MNS UL 2572 system appropriately reinforces the FACU audio signal.
 - a. The FACU must mute all non-essential audio, paging, ambient background sound in accordance with the NFPA and ADA rules for muting ambient sound systems. All connections between systems must be supervised.
 4. Bi-directional, redundant output signal for audio, messaging, and paging.
 5. Monitors status and function of system at all times and notify of any faults detected for speakers, amplifiers and wiring.
 6. The systems must be able to offer supplemental announcement support of voice notification of fire alarm systems with audio output and audio monitoring.

1.7 SCOPE:

- A. The terms 'Mass Notification System Design-Builder' or 'Design-Builder' refer to the organization providing and installing the mass notification emergency communications system as specified.
- B. Mass Notification System Design-Builder will be Responsible for the following:
 1. Making system operational.
 2. Furnishing and installing system components within space provided by others.
 3. Demonstrating, by appropriate test data, that the system meets performance specifications.
- C. Network communications for site-wide and multi-site mass notifications.
- D. Manufactured in USA.
- E. Remote Access: From anywhere to activate messages and monitor the system.
- F. Equipment and Associated Hardware: Fabricated and installed per manufacturer's specifications and instructions.
- G. Grounding Point Locations: Determined carefully ensuring minimizing of system hum and elimination of ground loops. Connections of shields and conductors to equipment to be per manufacturer's instructions and best professional practices.
- H. Sound Quality: No audible hum or noise, should be heard from the systems audio speakers.

- I. Each Speaker Channel: Zone programmable, must carry a maximum of 10 programmable zones per channel with cross zoning capability. The system at a minimum must have the capability of 100 individual zones for control.
- J. Power Supplies: Dedicated outlets for system and have secondary power back up.
- K. Design-Builder Responsibilities:
 - 1. Obtain and be familiar with drawings and details for the mass notification system.
 - 2. Furnish and Install the following:
 - a. Wiring and cabling.
 - b. Mass notification equipment and materials per contract documents.
 - c. Support brackets for suspension of loudspeakers.
 - d. Seismic bracing per applicable building codes.
 - e. Furnish items for mounting, terminating, matching and connecting elements per the contract documents. Additional items required to meet system performance requirements including installation labor, to be supplied by the Design-Builder.
 - f. Furnish and install equipment, solid state devices, power supplies, transformers, matching networks, signal indicators, controls, mounting brackets, painting, devices, and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system, so that the system performs the functions as specified in compliance with the contract documents.
 - g. This specification outlines the basic functions and equipment parameters required for each system. Each bidding Design-Builder will perform final engineering based on their proposed equipment.
 - h. Assembly and sub-assembly fabrication, construction, wiring, etc., to be performed in Design-Builder's shop, thoroughly tested and made to operate perfectly prior to job site delivery.
 - i. General and special conditions of the contract and these specifications are binding upon the Design-Builder and their employees.
 - j. Mass notification and audio equipment installed in ceiling plenum must be UL listed for use in a ceiling plenum.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
- B. Design-Builder: Totally responsible for the system specified.
 - 1. Qualifications:
 - a. Experienced in design, fabrication, installation, checkout, and warranty contract management of systems such as is described in this section.
 - b. Function as single contact point for Architect, Consultant, Fire Protection Engineer (FPE) and Owner with respect to work specified as required by the channel.
 - c. Must be manufacturer approved and certified to install the products listed in this performance specification.
 - 2. Responsibilities:
 - a. Responsible for system specified and be the single contact point for the Architect, Consultant, Fire Protection Engineer (FPE) and/or the Owner with respect to work specified.

- b. Coordinate with Fire Protection Engineer (FPE) to assemble / connect the mass notification system to the fire alarm control unit (FACU). Provide the connection but do not make the connection.
 - 1) It is the responsibility of the FACU installation company to make the connection to the FACU.
 - 2) System Testing: Design-Builder in conjunction with the Fire Protection Engineer (FPE).
- C. Manufacturer's Project Engineer:
 - 1. Qualifications: Five years' experience with similar electronic specialty systems, or other educational experience background as approved by Architect and Consultant.
 - 2. Responsibilities: Obtain and be totally familiar with drawings that have a bearing on the location and installation of electronic equipment, loudspeakers, or any special components.
 - a. Technical liaison between the Design-Builder, the Architect, the General Contractor, Fire Protection Engineer (FPE), and Consultant.
 - b. Participate in meetings and conferences.
 - c. Be present at job site for final inspection.
 - d. Approve operating and maintenance manuals.
 - e. Provide the specified instruction to designated members of Owner's staff.
 - f. Supervise the technical work which is part of the contract which includes:
 - 1) Preparation of construction drawings from information within performance specifications.
 - 2) Shop fabrication and field installation work assuring conformance with the performance specifications, and approved shop drawings.
 - 3) Oversee testing of assemblies and sub-assemblies prior to job site delivery.
 - 4) Specified testing of completed installation assuring performance specifications are met.
 - 5) Final testing for approval and acceptance of the system.
- CI. Equipment and Associated Hardware: Fabricated and installed per manufacturer's specified recommendations.
- CII. Quality of Workmanship: Equipment and components which are custom fabricated to be comparable to professional equipment as produced by specialized manufacturers of electronic apparatus. Only skilled craftsmen of the profession required are to be utilized for all aspects of system fabrication and installation.
- CIII. Manufacturers' equipment and component labeling and console designations to be in English.
- CIV. Systems nomenclature, signage and custom labeling pertaining to routine system operation shall be on the equipment itself and on descriptive drawings, charts or diagrams.
- CV. Materials and Products: New and of the finest quality. No used materials to be installed.
- CVI. System Design: By an approved manufacturer representative. Designed so that individual component failure will have no impact on the balance of the system.
- CVII. Installer Qualifications: Approved by manufacturer representative and are trained with the specified products or have demonstrated experience with the installation of similar products

to those specified. A Certified Installer Training (CIT) certificate for at least one installer is required.

- K. System Adjustment: Completed by an approved manufacturer representative or trained contractor, and holder of CIT completion certificate.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene a conference approximately two weeks before scheduled commencement of the work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in manufacturer's original unopened and undamaged packages with manufacturer's labels legible and intact.
- B. Store and handle in strict compliance with manufacturer's written instructions and recommendations. Protect from moisture during shipping, storage and handling.
- C. Protect from damage due to weather, excessive temperature, and construction operations.
- D. Inspect manufacturer's packages upon receipt.

1.11 WARRANTIES: ALL EQUIPMENT

- A. Warranted to be free from defects in materials, workmanship, and performance for minimum of 3 years from date of installation.
 - 1. Installer to warranty labor for one year.
 - 2. At Closeout, provide to Owner an executed copy of manufacturer's standard limited warranty against manufacturing defects, outlining terms, conditions, and exclusions from coverage.
- B. It is the responsibility of the final owner to test, operate and maintain the system per the minimum requirements of NFPA or other life safety codes.

1.12 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Mercury Notifications LLC which is located at: 130 Crossways Park Drive, Suite 103, Woodbury, NY 11797; ASD Tel: 516 802 0011; Email: info@mercuryN.com; Web: www.mercurynotifications.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600. Mass Notification Systems (MNS), at a minimum, must meet UL 2572 standards and ANSI 709.1B

- D. This specification for system components is written as performance specifications intended to promote competition and development of superior new components for high quality mass notification systems.

2.2 MASS NOTIFICATION SYSTEMS

- A. Basis of Design: n.FORM as manufactured and supplied by Mercury Notifications LLC. for mass notification, paging and audio.
 - 1. Head-End G8220: Quantity of one.
 - 2. OP: Quantity of _____.
 - 3. Indoor Speakers:
 - a. G655: Quantity of _____.
 - b. G654: Quantity of _____.
 - 4. Talk Back Communicator: Quantity of _____.
 - 5. I/O Expander: Quantity of one (if necessary).
 - 6. FACU Audio Interface: Quantity of one.
 - 7. Wide Area Speaker Systems:
 - a. MagnaCast: Quantity of _____.
 - b. OmniCast: Quantity of _____.
- B. Design of the mass notification system will be customized and supplied as required to meet the performance and design requirements per this specification.
- C. All mass notification equipment to meet the UL 2572 standard as provided by a Nationally Recognized Testing Laboratory. Equipment installed above ceiling to be UL listed plenum rated.
- D. Electronic and Electrical Equipment and Components:
 - 1. Capable of sustained proper operation when supplied from a nominal 120 VAC plus or minus 10 percent, 60 Hz plus or minus 10 percent power source. No exposed, unprotected 120 VAC potential inside or outside any enclosure. All exterior metal surfaces shall be grounded.
 - 2. Capable of sustained proper operation within an ambient temperature range of 32 to 104 degrees F (0 to 40 degrees C).
 - 3. Products of established manufacturers. Quality of workmanship and fabrication of equipment and components, which are custom fabricated, shall be comparable to that of professional audio or fire alarm equipment as produced by specialized manufacturers of electronic apparatus.
 - 4. Designed or adaptable for standard front panel rack mounting unless otherwise specified.
- E. Manufacturers' stock equipment and component labeling, and console designations shall be in English. Systems nomenclature, signage and custom labeling pertaining to routine system operation shall be on the equipment itself and on descriptive drawings, charts or diagrams.

2.3 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Compliance Listings or Approvals from a Nationally Recognized Testing Laboratory (NRTL):
 - 1. Entire System:
 - a. UL - Underwriters Laboratories, Inc.
 - b. ULC - Underwriters Laboratories Canada.
 - c. ETL - Intertek.

- B. Components and Sub-Systems Standards Compliance:
1. Entire System:
 - a. All Mass Notification Equipment: UL 2572 Standard.
 - b. UFGS 25 10 10 and UFGS 23 09 23.
 - c. System Shutdown per NFPA 72: Through interface with fire alarm control unit (FACU) and control system. Non UL listed Notification, Audio, Control panels are not acceptable.
 2. Head-End:
 - a. UL 2572 Standard.
 - b. Meet ANSI 709.1 / ISO / IEC standards for open platform (i.e. Lon, BACnet or Modbus).
 3. Networked Amplifiers per UL 2572.
 4. Control Protocol per ANSI 709.1B.
 5. Equipment Installed Above Ceiling:
 - a. UL listed plenum rating.
 - b. Meet UL 2043 and labelled accordingly.
 - c. Plenum rated cabling per CSA CMP 75C FT6 and labelled accordingly.
 6. Speakers used in MNEC System:
 - a. Approved for use for fire alarm, emergency and commercial/professional use per UL 1480 and labelled accordingly.
 - b. Approved for use as audio/video equipment per UL 60065.
 7. Safety and Electrical per UL 6500 and labelled accordingly.
 8. Electromagnetic Interference (EMI) per CSA CMP 75C FT6 and labelled accordingly.
 9. Heavy Metals per Restriction of Hazardous Substances (RoHS).
 10. Low Voltage Power Supplies per UL 1310 and be labeled accordingly.
- C. System Architecture:
1. MNEC System: Capable of the following:
 - a. Networked with addressable audible and/or visual devices distributed throughout the installation area, complete with redundant signaling.
 - b. Tied to Fire Alarm Control Unit (FACU) for controls, faults and audio reinforcement per NFPA 72 and UL 2572 standards. In event of a fire or non-fire emergency, capable of shunting non-essential audio and paging for safety notification purposes when required.
 - c. One control unit.
 - d. Separately and independently configure zones for audio notification, paging, and other audio via the networked UI and Keypad Controls.
 - e. Reporting entire settings for the system, including zones and zone assignments
 - f. Performing complete diagnostics.
 - g. Connections: RS232, TCP/IP and contact closure for communicating with other systems.
 - h. Inputting a minimum of 6 audio sources.
 - i. Capable of having a 1/1 octave band EQ for each individual Audio source.
 - j. Allow proper UPS and Batteries to provide secondary power supply for emergency purposes.
 - k. Redundant monitored structured cable for audio and data between audio amplifiers.
 - l. Integrated pre-recorded announcements (minimum 6 announcements), paging zone pushbuttons, emergency control pushbutton, text to speech module, telephone input, mic input and attached CB microphone.
 - m. Integrated password protected keypad on head-end for controls.
 2. Audio System:

- a. Contain up to 10 programmable zones for each speaker channel respectively for notification, paging, audio and relays.
 - b. Reproduce and distribute audio from a minimum of 65 Hz through 16,000 Hz with THD less than 5 percent.
 - c. Head-End and Networked Amplifiers: Individual LCD identifiers.
 - d. Capable of producing a minimum volume level for Audio at 83 dB.
 - e. Speaker channels to be capable of source switching to any inputted audio source.
- D. System Components: include but are not limited to the following:
1. Autonomous Control Unit (ACU): G8220.
 - a. Rack mounted.
 - b. Supervised and monitored digital input/output relays.
 - c. Serial Port: TCP IP.
 - d. Able to control entire building without any additional controls or head-end.
 - e. User interface: Connected via IP using off the shelf software.
 - f. Email faults and reports.
 - g. Capable of programming alarms and alarm triggers.
 - h. Capable of creating data logs for faults.
 - i. Phone paging capability for local, in building, paging with the option for Global, campus paging.
 - j. Generate pre-recorded messages via text, email, audible, direct dial or other as well as accepting text-based messages and converting them to audio pages. A library of prerecorded messages must live on the device and be selectable by the user.
 - k. Audio Input sources: 5 for zone-based paging and/or music and 1 additional input for all call paging.
 - l. Contact Closure Push to Talk Inputs: 6. One for all call paging and 5 for zone paging.
 - m. Contain preamps with configurable Automatic Gain Control (AGC) for 2 external microphones and one built in microphone.
 - n. Built-in dry contact relay outputs and supervised digital inputs to connect to FACU for fire panel control as per UL 2572.
 - o. Dry Contact Relay Outputs: 4. Controlled by zone paging, for external zone controlled devices.
 - p. Communication Connections: RS232 port with hardware handshake lines to communicate to 3rd party products.
 - q. A device to provide redundancy of the control network and paging audio at the physical layer, in the case of a break in the control cable.
 - r. Viewable via a standard web browser from outside the firewall, with no custom configuration of the firewall.
 - s. Ability to trigger Pre-recorded messages from the front of the unit, via digital IO, as well as via the telephone.
 - t. Front panel override for microphone paging to allow a built in microphone to override a default paging zone for the mic.
 - u. LEDs that show the signal strength of all audio sources.
 - v. Front panel LCD and Keypad for local control and configuration.
 - w. Capable of having a 1/1 octave band EQ for each individual audio source.
 - x. Control Panel Component: Provides controls for the following.
 - 1) Networked device addressing.
 - 2) n.FORM OP G7225.
 - 3) IP setup for controller.

- 4) Administration for user profiles.
- 5) Controller must be able to capture, log, and report all changes any user makes to the system.
- 6) Admin and user profiles uniquely password protected.
- 7) Able to work with third party controllers.
- 8) Capable of setup and configuration for:
 - a) Initialization.
 - b) Harvesting and uploading all settings.
 - c) Audio Source equalizer adjustment.
 - d) Labeling all nodes, channels, zones, and custom EQ settings.
 - e) System independent zoning for audio.
 - f) Security functions.
 - g) System diagnostics and monitoring.
 - h) Graphical User Interface address books for multiple buildings on a campus.
 - i) Interfacing with the Fire Alarm Control Unit (FACU).
- y. ACU Controller: Allow system control for entire building or buildings by providing operation of multiple system components from a single central location.
- z. Lockouts preventing simultaneous adjustment of the system from multiple users.
- aa. Defer control to the Fire Alarm Control Unit (FACU) in event of a fire emergency for muting non-essential audio & paging as required.
- bb. Integrated networked amplifier and DSP unit.
- cc. Rack mounted with removable rack mounting brackets. 3 RU to fit a 19 inch (483 mm) rack.
- dd. Integrated keypad control for each unit.
- ee. LCD Display for control and identification.
- ff. Apparatus and indication for amp temperature and faults.
- gg. Non-volatile memory for one year without power.
- hh. LED fault indicators.
- ii. Head-End: Allow for proper UPS and batteries to provide secondary power supply for emergency purposes.
- jj. UL 2572 Standard.
- kk. Network Device Discovery:
 - 1) System to automatically identify networked devices.
 - 2) Each identified networked device must have an LCD screen display in addition to labels for ID of the device. LCD screen must work with network controller to ensure proper display of ID. LCD screen must work in real time to display any changes.
 - 3) System should leverage analytic software, working in real time, to manage and monitor system performance.
- ll. Zoning:
 - 1) Networked Devices: Zone capable for notification and external audio.
 - a) Zoning to be performed digitally.
 - b) Assignments to each zone type to be independent of each other.
 - c) Networked Devices: Capable of individual rezoning without rewiring.
 - d) Each zone capable of holding, at a maximum of 10 programmable zone assignments.
- mm. Paging & Audio Shunting, When Required:

- 1) Connect the FACU to the ACU G8220 utilizing a supervised line and addressable relays, per NFPA 72, to shut down and effectively mute all sound masking, audio and paging systems.
 - 2) FACU and associated supervised lines to meet UL 2572 to ensure the shutdown mechanism is properly supervised, reliable and will in no way damage the FACU or ACU.
 - 3) The FACU and associated relays will not introduce any noise into the audio, notification or paging system.
 - 4) Muting ambient sound during an emergency is necessary to meet ADA suggested guidelines and NFPA acoustic requirements.
 - 5) Non-UL 2572 listed ACU or Head-End is not acceptable.
 - 6) Refer to appropriate sections in Division 28 for fire alarm and detection.
- nn. Diagnostic: Upon initial configuration:
- 1) Automatically detect the number and type of networked devices connected.
 - 2) Automatically detect the number of speakers per channel for each OP.
 - 3) Monitor temperature for each individual amplifier.
 - 4) Monitor ambient temperature for each individual amplifier enclosure.
 - 5) Verify that each networked device is communicating to other devices on the network.
 - 6) Verify that each networked device is initialized.
 - 7) Identify networked devices that are not communicating.
 - 8) Verify the integrity of the system design.
 - 9) Capable of Field Pop to work with maintenance programs.
- oo. OP (Operating Platform) G7225:
- 1) Rack Mounted: 3 RU height.
 - 2) Quad amplifiers.
 - 3) DSP and FPGA.
 - 4) Speaker Channel Outputs: 16, 4 ohms monitored and zone configurable.
 - a) Each speaker channel capable of source switching to any inputted source via user configuration and control.
 - 5) Full keypad control.
 - 6) Meets ANSI 709.1 / ISO / IEC standards for open platform (i.e Lon, BACnet on Modbus).
 - 7) Meets UL 2572.
 - 8) Programmable for groups and zones of speaker channels.
 - 9) Integrated LCD display for node ID and controls.
 - 10) Monitored amplifiers for temperature with full fault reporting.
 - 11) Monitored temperature for ambient temperature inside OP enclosure.
 - 12) Monitored and addressable digital input.
- E. Cabling: Single category-based cable providing, control signals for connections between:
1. Control panel components and networked devices.
 2. Networked devices.
 3. Networked devices and speakers from speaker to speaker connections.
 4. Monitored and Supervised Line per UL 2572 and NFPA 72.
 - a. Connection to Fire Alarm Control Unit (FACU) from a single Mass Notification Head-End Control Unit (MNCU).
 5. System Power: Run on a separate dedicated cable.
 6. Cabling: Rated for air-handling plenums.
 7. Cabling Connections: Made using connectors with positive locking mechanisms.

8. Cables: Non-proprietary off the shelf cables. Single source cables are unacceptable.
- F. Loudspeaker Systems:
1. Product Specifications: Meet or exceed.
 - a. Size: 5-1/4 inch (133 mm) wide dispersion.
 - b. Power Rating: 10 Watts Root Mean Squared (RMS).
 - c. Frequency Response: 65 to 12,000 Hz.
 - d. Pressure Sensitivity: SPL at 1 Watt per m: 90 dB.
 - e. Impedance: 32 Ohms.
 - f. Magnet Weight: 10 oz (283.5 grams) minimum.
 - g. Sound Volume from 1 Watt Input at Meter: 86 dB
 - h. Meets: UL 1480.
- G. Regulatory Testing and Certifications:
1. Relevant System Components Conforming to Following: Products are to be labelled accordingly.
 - a. Safety and electrical per UL.
 - b. Air-handling plenum installation per UL 2043.
 - c. Plenum rated cabling per CSA CMP 75C FT6.
 - d. Electromagnetic interference (EMI) per FCC - Part 15, Subpart B, Class A - Unintentional Radiators.
 - e. Heavy metals per RoHS restrictions.
 - f. Low voltage power supplies per UL1310. Products labeled accordingly.
 - g. Mass Notification per UL 2572.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed and prepared.
 1. Facility build out is at a stage suitable for system installation.
 2. Facility is constructed according to plans including wall locations, ceiling types and plenum barriers.
 3. Plenum height is appropriate per manufacturer's recommendations and as per plan.
 4. Power requirements have been provided as per plan.
 5. Sufficient space for centrally located components is available as per plan and manufacturer's specifications.
- B. Third-party components required to be interfaced with the system have been provided.
- C. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Obtain necessary permits for installation work.

3.3 INSTALLATION

- A. Install MNEC system in full accordance with requirements of local and governmental departments having jurisdiction, and requirements of the NFPA, NEC, MEA, BSA, UL, ADA or other applicable codes.
- B. Obtain Necessary permits for installation work.

- C. General: Install in accordance with manufacturer's instructions approved submittals and in proper relationship with adjacent construction.
 - 1. The following installation requirements shall govern the design, fabrication and installation of the systems specified. In case of a discrepancy between these overall system standards and the individual equipment item specifications, the latter shall govern.
 - a. Workmanship on the installed system shall be of professional quality, best commercial practice and accomplished by persons experienced in the techniques and standards of the particular crafts involved.
 - 2. Equipment items shall be provided and installed to allow fully normal operation in the anticipated ambient temperature range of 60 to 90 degrees F (15 to 32 degrees C).
 - 3. Any work called for on the Drawings and not mentioned in the specifications, or vice versa, will be performed as though fully set forth in both.
 - a. In Case, of Differences Between the Drawings and Specifications: The decision of the Mass Notification Emergency Communications (MNEC) Professional responsible for the MNEC equipment and installation will govern.
 - 4. Ensure that supplementary materials used meet applicable safety standards.

- CI. General Contractor: Responsible for supplying any conduit, which may be required to complete the system installation in accordance with the specifications.
 - 1. Requirements for the metallic conduit specified in the electrical specifications and Division 16 shall apply to the work described herein. Follow all applicable codes for the area.

- CII. Equipment Enclosure Layout and Assembly:
 - 1. Install equipment in Rack Mounted Units or wall location with the UL Listed Enclosure as shown in the drawings.
 - a. Equipment Enclosures: Installed in the equipment room. Install as shown in the drawings.
 - 1) Constructed to easily accommodate interconnecting cables entering from above or below.
 - 2) Provide approved terminal blocks. Other suitable means of terminating or connecting incoming and outgoing cables may be used if approved by the MNEC professional responsible for the equipment.
 - 2. Interconnecting Cabling: Will be led laterally from each component to the vertical rack member opposite from the AC power strip and then run vertically, remaining as exposed and accessible as possible. Wherever corners in cabling occur a strain relief spiral covering should be used. All cable clamps shall be non-conducting or have soft insulating covers.
 - 3. Keep low level signal lines separated from the AC power lines and high level signal lines. This must be observed in rack layout and mechanical support or passage within the equipment room.
 - 4. Connections of Lines at Terminal Strips: Mechanically secured and soldered. No unsoldered connections permitted. Lines approach enclosure and terminal strips to be mechanically anchored at enclosure with sufficient slack length to avoid strain, abrasion or wear.

- CIII. Wiring and Cabling:
 - 1. Wiring: Executed per equipment manufacturer's wiring recommendations. Variations from these requirements, require the prior approval of the Engineer.
 - 2. Wiring Method: Per local electrical codes. Conceal cable in accessible ceilings, walls and floors. No exposed cable is allowed.

3. Pulling Cable: Do not exceed manufacturers recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between normal termination points. Remove and discard cable where damaged during installation and replace it with new cable.
 4. Cables to be grouped and bundled by type and level then routed from source to termination in a uniform manner throughout equipment housings. Do not break the insulation or deform the cable by harness supports. Cables are not to change relative position in a cable group throughout a cable route.
 5. Power distribution wiring will not be installed adjacent to signal cables. Power distribution cabling will be on the opposite side from signal wiring in equipment enclosures and uniformly located throughout an installation.
 6. Edge protection material ("cat track") installed on the edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edges.
 7. Audio and control cable ends to be neatly formed and shrinkable tubing applied where necessary to secure the insulation against graying or raveling.
 8. Conductors, including spare conductors, which are entering or leaving the above listed components, to be directly terminated on terminal blocks without intermediate splices. Terminals to be properly and completely labeled.
 9. Cable Shields: Terminated in the same manner as other conductors. The shields of cables shall be kept well separated from each other and from ground.
- G. Plenum Loud Speakers:
1. Mount loudspeakers at locations shown on approved shop drawing.
 2. Mountings and Loudspeakers:
 - a. Concealed above the acoustical ceiling.
 - b. Suspend from slab above by chain. Where possible, the bottom, of speakers to be 6 to 8 inches (150 to 200 mm) above the acoustical ceiling tile.
 - c. Hang at a uniform height insuring sound uniformity when system is on.
 - d. Safety cable attached to the deck above at each loudspeaker location.
 - e. In the event that the alternate to furnish exposed loudspeaker cables in the ceiling plenum is exercised, locate cables approximately 12 inches below the metal deck and attach cables by approved J-Hook fasteners.
 - f. Loudspeaker cables shall not be permitted to lay on ceiling suspension members or the ceiling tile.
- H. Power Distribution Throughout the System: Per applicable codes:
1. Unless otherwise specified, Design-Builder will supply and install the rack mounted power distribution panel, specified elsewhere, in each equipment console/rack/enclosure.
 2. Power cords from individual equipment to power outlet strips to be shortened to proper length and neatly dressed into the rack or console. Use cradle clamps with removable rubber retainers to secure power cords to the side of the rack supports. Do not secure power cords using non-reusable supports.
- I. Labeling:
1. Equipment Markings: Present only needed information and be readable from the operator's or service personnel's normal work position. Markings to be designed to avoid ambiguous interpretation.
 2. Networked devices must have an LCD screen that works directly with the network in real time displaying the correct node number.
 3. A descriptive title shall be assigned to each piece of equipment.

- a. Apply an engraved designation title plate to both the front and rear panels of rack-mounted equipment, and to the outside case or enclosure of equipment mounted within a rack.
- b. These same titles will also be indicated on block diagrams, wiring drawings, and installation drawings.
- c. Use plain English (example: Power Amplifier No. 2-1).
- 4. Signal and Control Cabling: Individually identified. A unique number located approximately 1.5 inches (38 mm) from cable termination connector at both ends of a cable.
 - a. Cable Identification Number: Impressed on a fixed length of white shrinkable tubing with a heat impression stamping machine.
 - b. Lettering: Filled with a black filler and covered with a protective coating after shrinking that will not crack, peel or yellow.
 - c. After installation, cover labels with clear heat shrinkable tubing.
 - d. Letters to be 0.25 inches (6 mm) in height.
 - e. These unique numbers to appear on "as built" documentation to be supplied at the completion of the project.
 - f. Markers pre-shrunk to approximate size before installing.
 - g. Orient for cable markers for ease in viewing before installation.
- J. The connection to the Fire Alarm Control Panel (FACP) will be provided by the Design-Builder to the Fire Protection Engineer (FPE) / Fire Integrator. The FP Installation team will be responsible for the physical connection to the FACP.
- K. Grounding: As recommended by manufacturers, unless more stringent requirements are indicated. Ground equipment and conductors to eliminate shock hazard and to minimize ground loops. Common mode returns, noise pickup, cross talk and other impairments. Install 5-Ohm ground at main equipment location. Measure, record and report ground resistance.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.
- C. Overall system Performance Requirements and Qualifications:
 - 1. Validate System as Specified. Fully document work performed with a neat copy presented for acceptance by sound masking consultant and included in the system manual. Costs for tests to be borne by the Design-Builder.
 - 2. Tests Required: To greatest extent possible, pre-assemble and test system component sub-assemblies, including consoles, rack assemblies, interconnections, and system assemblies (excluding, of course, input and output transducers) in Design-Builder's own facility.
 - a. By Design-Builder at Design-Builder's Facility

3.5 ACCEPTANCE DOCUMENTATION

- A. Acceptance: Official acceptance of the system covered by this specification will occur when the Design-Builder receives the following written documents:

1. A letter from the MNEC Consultant to the Architect acknowledging Final Acceptance of the system stating compliance with all articles of the specifications.
 2. A letter from the Architect to the Design-Builder stating that all related work has been completed to his satisfaction. Until these documents are received, the installation is not formally complete. The official date of acceptance shall be the date of the letter.
- B. Design-Builder will supply complete system documentation with installed system.
1. Furnish a complete instruction manual as provided by the manufacturer containing an operation description, schematic diagrams, parts layout drawings, as-built drawings, and parts list with each component time supplied by the Design-Builder.
 2. A list of all instruments, including accessories by manufacturer and type number used by the Design-Builder to obtain test data to be submitted to the Owner with maintenance recommendations for equipment furnished under this contract.
 3. System geographical layout and block diagram under a plastic cover on the inside of the equipment enclosure front door.
 4. Record of final field tests and measurements include final adjustment of system.
- C. Design-Builder will supply complete manufacturers instruction manuals (operation and service) for each purchased system component.
1. Instruction manuals to contain an operational description of components, schematic diagrams, parts layout, parts list, and maintenance instructions; preventive and corrective.
 2. Organize manuals by system and present in bound volumes, one volume for each system. Provide three copies of each volume.

3.6 DEMONSTRATION AND TRAINING

- A. After required approvals have been issued, and at a time designated by the Owner, the Design-Builder will demonstrate to the Owner's maintenance personnel the operation and maintenance of items installed under the work in this section.
- B. Instruction:
1. After the system is totally installed and in proper operating condition as directed, the Design-Builder shall provide instruction sessions as necessary to describe and demonstrate the entire system to the Owner's engineering staff, and those others who will be in charge of or otherwise related to the system operation.
 2. The session shall be scheduled by the Owner and shall be held at a time convenient to the Owner, and shall be at least 4 man-hours.
 3. The operation manuals described above shall be completed at the time of the instruction session and at this time supplied to the Owner to aid in the system description.

3.7 CLEANING AND PROTECTION

- A. Clean products in accordance with the manufacturer's recommendations.
1. Debris resulting from system's installation must be continuously removed during and after installation.
 2. Equipment shall be thoroughly dusted and cleaned after installation.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION