Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, including *MasterFormat, SectionFormat,* and *PageFormat,* as described in *The Project Resource Manual—CSI Manual of Practice, Fifth Edition.*

This section must be carefully reviewed and edited by the Architect or Engineer to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the Drawings. Delete all "Specifier Notes" after editing this section.

Section numbers are from *MasterFormat 2010 Update.*

SECTION 28 39 00
Mass Notification Systems

Specifier Notes: Delete any information below in Parts 1, 2 or 3 which is not required or relevant for the project.

PART 1 – GENERAL

1.01 SUMMARY

A. Audio Mass Notification System for [Project Name] including products, performance criteria, testing, and installation of the system.

B. This specification includes all components required for a networked-based Audio MNS/EC Mass Notification Emergency Communications (MNEC) System including, but not limited to, digital signal processors, noise generators, paging interfaces, amplifiers, loudspeakers, microphones, pre-recorded announcements, text to speech modules, telephone inputs for announcements, field pop, supervised digital inputs and outputs, and servers including the associated wiring and controls and components to generate, amplify, distribute and reproduce emergency voice pages;
    1. MNEC system is to work with LED display signs, digital signage, strobes, text to speech, SMS and desktop alert for Life safety, security and notification.
    2. Additional Audio and stabilized background sound masking are optional, and if implemented, should reference the n.FORM Sound Masking Specification for Section 27.51.19

C. Related Sections:
    1. Division 00 - Procurement and Contracting Requirements
    2. Division 01 - General Requirements
    3. Division 02 - Existing Conditions
    4. Division 21 - Fire Suppression
    5. Division 26 - Electrical
    6. Division 27 - Communications
    7. Division 28 - Electronic Safety and Security

1.02 RELATED DOCUMENTS

A. The General Conditions and Requirements, Special Provisions of any larger body of specifications, of which this specification may be a part, are hereby made a part of this specification.

1.03 DEFINITIONS AND REFERENCES

A. ACU - Autonomous Control Unit
B. ADA American Disabilities Act
C. ANSI 709.1/ISO/IEC standard for Open Platform
D. ANSI S1.4 American Standard Specification for Sound Level Meters
E. FCC – EN 55103-1&2 – Audio, Video and Entertainment Lighting Contro
F. MNEC - Mass Notification Emergency Communications
G. NFPA 72 – Fire Alarm and Signaling Code
    1. National Fire Protection Association (NFPA 72) specifies the application, installation, location, performance, inspection, testing, and maintenance of fire alarm systems, fire warning equipment, emergency warning equipment, and their components.
H. NFPA 101 – Life Safety Code
I. RoHS – Restriction of Hazardous Substances
J. UL 1480- Approved for use as speakers for use in a fire alarm, emergency, and commercial/professional use.
K. UL 2043 – Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996
L. UL 2572 – Standard for Mass Notification Systems
M. UL 6500 – Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use
N. UL 60065 – Approved for use as Audio/Video Equipment

1.04 APPROVALS

A. The system shall have the proper listing and/ or approval from the following Nationally Recognized Testing Laboratories (NRTL):
    a. UL – Underwriters Laboratories, Inc.
    b. ULC – Underwriters Laboratories Canada
    c. ETL – Intertek

1.05 Quality Assurance

A. Head-End Must be UL 2572 Listed
B. Networked Amplifiers Must be UL 2572
C. Control Protocol Must meet ANSI 709.1B
D. THD for Audio Must be less than 5%
E. System Must Allow for Proper UPS and Batteries to provide secondary power supply for emergency purposes

1.06 Codes and Permits

A. Install all work in full accordance with the requirements of all local and governmental departments having jurisdiction over these matters, as well as, with any requirements of the NFPA, NEC, MEA, BSA, UL, ADA or other applicable codes

1.07 PERFORMANCE and DESIGN REQUIREMENTS

A. System Architecture
    a. The system shall be of a networked architecture with addressable audible and/or visible devices distributed throughout the installation area and be complete with redundant signaling
    b. The system shall be connected to the Fire Alarm Control Panel (FACP) for controls, faults and audio reinforcement per NFPA 72 and UL 2572 standards
    c. The MNEC systems must use one control unit for the entire system. Multiple control units are not acceptable.
    d. The MNEC system must be capable of separately and independently configuring zones for audio notification, paging, and other audio via the networked UI and Keypad Controls
    e. The MNEC, Audio systems must be able to reproduce and distribute audio from a minimum of 65Hz through 16,000Hz with THD less than 5%
    f. The MNEC, Audio system must contain a minimum of 10 programmable zones for each speaker channel respectively for notification, paging and, audio and relays
    g. The Head-End control System must meet ANSI 709.1 / ISO / IEC standards for open platform (i.e Lon, BACnet or Modbus).
    h. The system must meet the US Army Corp.'s Unified Facilities Guide Specifications standard, UFGS 25 10 10, "Utilities Monitoring and Control System" and UFGS 23 09 23, "Direct Digital Control for HVAC and Other Local Building Controls".
    i. The head-end and networked amplifiers must have individual LCD identifiers.
    j. The system must be capable of reporting entire settings for the system, including zones and zone assignments
    k. The system must be capable of performing a complete diagnostics.
    l. The system must be capable of RS232, TCP/IP and contact closure for communicating with other systems.
    m. System must be capable of inputting a minimum of 6 audio sources.
    n. System must be capable of having a 1/1 octave band Eq for each individual Audio source.
    o. Each speaker channel must be capable of source switching to any inputted audio source.
    p. System must be capable of producing a minimum volume level for Audio @ 83dB.
    q. The MNEC system must be tied to the Fire Alarm Control Panel (FACP) in the event of a fire or non-fire emergency and must be capable of shunting sound maskingand non-essential audio and paging for safety notification purposes when required.
    r. System Shutdown through the interface with the Fire Alarm Control Panel (FACP) and Control System must meet NFPA 72 and UL2572 standards for supervision and robustness. Non UL listed Notification, Audio, Sound Masking Control panels are not acceptable.
    s. System Must Allow for Proper UPS and Batteries to provide secondary power supply for emergency purposes
    t. System must be capable of having redundant monitored structured cable for audio and data between audio amplifiers
    u. System must have 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.
    v. System must have integrated password protected keypad on head-end for controls.

B. System Components
    a. ACU - G8220
        i. Rack Mounted – 3RU's

ii. System control unit must have supervised and monitored digital input/output relays
iii. System control unit must have TCP IP and serial port
iv. Control unit must be able to control entire building without any additional controls or head-end
v. System UI must be able to be connected via IP using off the shelf software
vi. System control unit must be capable of providing email faults and reports
vii. System control unit must be capable of programming alarms, alarm triggers
viii. System control unit must be capable of creating data logs for faults
ix. System control unit must have Phone paging capability for local, in building, paging with the option for Global, campus paging.
x. System control unit must be able to generate pre-recorded messages 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.
xi. System control unit must have 5 audio input sources for zone-based paging and/or music and 1 additional input for all call paging.
xii. System control unit must have 6 contact closure Push to talk inputs. One for all call paging and 5 for zone paging.
xiii. System control unit must contain preamps with configurable AGC (Automatic Gain Control) for 2 external microphones and one built in microphone.
xiv. System control unit must have built-in dry contact relay outputs and supervised digital inputs to connect to FACP for fire panel control as per UL 2572.
xv. System control unit must have 4 dry contact relay outputs, controlled by zone paging, for external zone controlled devices.
xvi. System control unit must have an RS232 port with hardware handshake lines to communicate to 3rd party products.
xvii. System control unit must contain 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.
xviii. System control unit must be viewable via a standard web browser from outside the firewall, with no custom configuration of the firewall.
xix. System control unit must have the ability to trigger Pre-recorded messages from the front of the unit, via digital IO, as well as via the telephone.
xx. System control unit must have front panel override for microphone paging to allow a built in microphone to override a default paging zone for the mic.
xxi. System control unit must have LEDs that show the signal strength of all audio sources.
xxii. System control unit must have a front panel LCD and Keypad for local control and configuration.
xxiii. System must be capable of having a 1/1 octave band EQ for each individual audio source.
1.

b. The ACU G8220 control panel component shall provide controls for:
i. Networked device addressing
ii. n.FORM OP G7225
iii. IP setup for controller
iv. Administration for User profiles
v. Controller must be able to capture, log and report all changes any user makes to the system

vi. Must have admin and user profiles uniquely password protected
vii. System must be able to work with third party controllers
viii. System must be capable of setup and configuration for:
    1. Initialization
    2. Harvesting and uploading all settings
    3. Audio Source equalizer adjustment
    4. Labeling all nodes, channels, zones, and custom EQ settings
    5. System independent zoning for audio
    6. Security functions
    7. System diagnostics and monitoring
    8. Graphical User Interface address books for multiple buildings on a campus
    9. Interfacing with the Fire Alarm Control Panel (FACP)

c. The ACU controller shall allow for system control for the entire building or buildings by providing operation of multiple system components from a single central location.
d. The system shall provide lockouts preventing simultaneous adjustment of the system from multiple users.
e. The system shall defer control to the Fire Alarm Control Panel (FACP) in the event of a fire emergency for muting the masking through the Sound Masking Shutdown Sequence when required
f. Integrated Networked Amplifier and DSP Unit
g. Must be rack mounted with removable rack mounting brackets
h. 3 RU to fit a 19" rack
i. Each unit must have integrated keypad control
j. Must have LCD Display for control and identification
k. Must have apparatus and indication for amp temperature and faults
l. Non-volatile memory for one year without power
m. LED Fault Indicators
n. Head-End Must Allow for Proper UPS and Batteries to provide secondary power supply for emergency purposes
o. UL 2572 Listed
p. Network Device Discovery
    i. The system shall identify all networked devices via an automatic addressing process such that devices that are numbered in sequence based on their location in the network on each floor.
    ii. 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
    iii. System should leverage analytic software, working in real time, to manage and monitor system performance.
q. Zoning
    i. The networked devices shall be zone capable for notification and external audio.
    ii. Zoning of networked devices shall be performed digitally.
    iii. Assignments to each type of zone shall be independent of each other.
    iv. The networked masking devices shall be capable of individual rezoning without rewiring.
    v. Each zone must be capable of holding, at a minimum of up to 10 programmable zone assignments.

r. Paging, Audio and Sound Masking Shunting, when required
    i. The FACP shall be connected 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.
    ii. The FACP and associated supervised lines shall meet UL 2572 to ensure that the shutdown mechanism is properly supervised and is reliable and will in no way damage the FACP or ACU
    iii. The FACP and associated relays shall not introduce any noise into the sound masking, audio, notification or paging system.
    iv. Muting ambient sound during an emergency is necessary to meet ADA suggested guidelines and NFPA acoustic requirements
    v. Non-UL 2572 listed ACU or Head-End is not acceptable
    vi. Refer to Section 28 31 00 (Fire Alarm and Detection)

s. Diagnostic
    i. Upon initial configuration, the system shall:
        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

C. OP (Operating Platform) G7225
    a. Rack Mounted - 3 RU Height
    b. Quad Amplifiers
    c. DSP and FPGA
    d. 16 4 Ohm Monitored and Zone Configurable Speaker Channel Outputs
        i. Each speaker channel must be capable of source switching to any inputted source via user configuration and control
    e. Full Keypad Control
    f. Meets ANSI 709.1 / ISO / IEC standards for open platform (i.e Lon, BACnet on Modbus).
    g. Meets UL 2572
    h. Programmable for Groups and Zones of Speaker Channels
    i. Integrated LCD display for Node ID and Controls
    j. Monitored Amplifiers for Temperature with full Fault reporting
    k. Monitored Temperature for Ambient Temperature Inside OP Enclosure
    l. Monitored and Addressable Digital Input

D. Cabling
    a. Cabling shall be via a single Category-based cable assembly providing, control signals for connections between:
        i. a control panel component and a networked device

ii. networked devices
iii. Networked devices and speakers from speaker to speaker connections.
iv. Monitored and Supervised Line meeting UL 2572
v. Connection to Fire Alarm Control Panel (FACP) from a single Sound Masking Control Panel (SMCP)
vi. Power for the system shall be run on a separate dedicated cable.
vii. The system shall use cabling rated for air-handling plenums for any wiring that occurs in a plenum
viii. Cabling connections shall be made using connectors with positive locking mechanisms.
ix. Any and all cables must be non-proprietary off the shelf cables. Single source or proprietary cables are unacceptable

E. Loudspeaker
i. Size: 5 ¼ inch wide dispersion
ii. Power Rating: 10 Watts Root Mean Squared (RMS)
iii. Frequency Response: 65-12,000 Hz
iv. Pressure Sensitivity: SPL - at 1 Watt/m - 90 dB
v. Impedance: 32 Ohms
vi. Magnet Weight: 10 oz. (283.5 grams)
vii. Meet UL 1480

F. The system must use bi-directional, redundant output signal for audio, messaging, and paging.

G. The systems must monitor status and function of the system at all times and notify of any faults detected for Speakers, amplifiers and wiring.

H. The systems must be able to offer supplemental announcement support of voice notification of fire alarm systems with audio output and audio monitoring.

1.08 DESCRIPTION OF SYSTEM

A. The MNEC/MNS system provides a fully functional audio mass notification system that consists of head-end control, networked DSP's, FPGA's, and audio amplifiers that meets UL 2572 requirements for control, robustness, reliability, software and power.

B. The MNEC system is to interface with the Fire Alarm Control Panel (FACP) so that in the event of a fire emergency the MNEC/MNS UL 2572 system can appropriately reinforce the FACP audio signal.

C. In addition, the FACP must mute all non-essential audio, paging, ambient background sound and sound masking in accordance with the NFPA and ADA rules for muting ambient sound systems.

D. The system must have the ability to assist in creating a safer, more intelligible environment in a life safety situation.

1.09 Scope

A. The terms Mass Notification System Design-Builder or Design-Builder refer to the organization that will provide and install the mass notification emergency communications system.

B. The Mass Notification System Design-Builder is required to furnish all components of the system, install them in the building within space provided by others, to make the system operational, to demonstrate by appropriate test data that the completed system and all components meet the performance specifications.

C. It is the obligation and responsibility of the Design-Builder to obtain and be totally familiar with the drawings and details for the mass notification system. As indicated on these drawings, the Design-Builder shall furnish and install the following:
    a. All wiring and cabling.
    b. All mass notification equipment and materials according to the layout as described in the performance specifications.
    c. All supporting brackets necessary for the suspension of loudspeakers as described in the performance specifications, including speaker seismic bracing as building code necessary.
    d. This performance specification indicates the basic components and equipment items. Minimum quantities of mounting, terminating, matching and connecting elements are reflected in the system design; additional units required to meet system requirements including the labor to install them, shall also be supplied by the Design-Builder. Design-Builder shall furnish and install all 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 shall perform the functions listed herein in compliance with all the specified requirements.
    e. In general, the performance specifications outline the basic functions and equipment parameters that are required for each system. It is recognized that each bidding Design-Builder will desire to perform all final engineering based on their proposed equipment.
    f. All assembly and sub‐assembly fabrication, construction, wiring, etc., is to be performed in the Design-Builder's shop. All assemblies and sub‐assemblies shall be thoroughly tested and made to operate perfectly in the Design-Builder's shop prior to delivery to the job site.
    g. The general and special conditions of the contract and these performance specifications shall be binding upon the Design-Builder and all employees directly or indirectly by him/her.
    h. All mass notification and audio equipment installed in the ceiling must be UL listed for use in a ceiling plenum.

D. Network communications for site-wide and multi-site mass notifications.

E. The system must be manufactured in the USA.

F. Remote access from anywhere to activate messages and monitor the system.

G. All equipment and associated hardware shall be fabricated and installed in accordance with the manufacturer's specified recommendations.

H. Location of grounding points shall be determined carefully to ensure minimizing of system hum and elimination of ground loops. In addition, all connections of shields and conductors to equipment shall be in accordance with manufacturer's instructions and best professional practices.

I. Sound Quality: No audible hum or noise, should be heard from the systems audio speakers.

J. Each Speaker channel must be zone programmable and must carry a MINIMUM of 10 programmable zones per channel. Up to 100 zones of control. Cross Zoning capability must be present in the system.

K. All power supplies must be on dedicated outlets for the system and have secondary power back up.

1.10 DESIGN-BUILDER QUALIFICATIONS

A. The work specified under this section shall be accomplished by a specialty Design-Builder experienced in the design, fabrication, installation, checkout, and warranty contract management of systems such as is described in this section. This specialty Design-Builder shall have complete responsibility for the system described herein, and shall be the single contact point for the Architect, Consultant, Fire Protection Engineer (FPE) and/or the Owner with respect to all work specified herein as required by the channel.

B. 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.

C. System Adjustment – Performed by an approved manufacturer representative or trained contractor and holder of CIT completion certificate.

D. The Design-Builder will coordinate with the Fire Protection Engineer in order to assemble / connect the mass notification system to the Fire Alarm Control Panel (FACP). It is the responsibility of the Design-Builder to provide the connection but NOT make the connection. It is the responsibility of the installation company of the FACP to make the connection with the FACP and then, in conjunction with the Design-Builder, test the system.

E. Upon completion, the Design-Builder shall provide:
    a. As- built drawings.
    b. Manuals of operation and maintenance literature (3 copies).
    c. 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.
    d. Record of final field tests and measurements include final adjustment of system.
    e. 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.

F. 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.

1.11 PROJECT ENGINEERS RESPONSIBILITIES

A. Obtain and be totally familiar with all drawings that have a bearing on the location and installation of electronic equipment, loudspeakers, or any special components

1.12 SCHEDULE OF WORK AND SUBMITTALS

A. All submittals shall be in accordance with the general conditions.

B. The contractor shall submit three (3) complete sets of documentation within thirty (30) calendar days after award of the purchase order. Indicated in the document will be the type, size, rating, style, catalog number, manufacturer's names, photos, and /or catalog data sheets for all items proposed to meet these specifications. The proposed equipment shall be subject to the approval of the Architect/Engineer and no equipment shall be ordered or installed on the premises without that approval.

C. NOTE: DOCUMENTATION - Submittal of shop drawings shall contain at least three (3) copies of original manufacturer specification and installation instruction sheets. Subsequent information may be copies. All equipment and devices on the shop drawings to be furnished under this contract shall be clearly marked in the specification sheets.

D. All shop drawings shall be submitted in DWG format, all data sheets shall be submitted in PDF format. Equipment data sheets shall be identified with device IDs that reference drawings and equipment used.

E. Accompanying the bid proposal the prospective Design-Builder shall submit the following for approval:
    a. 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.
    b. A copy of the product certification showing that it meets the UL 2572 standard by a nationally recognized testing laboratory.

F. Shop drawings shall be submitted, in DWG format, for approval on all items that require assembly by the Design-Builder, including, but not limited to:
    a. Head/End Rack panel layouts.
    b. Rack OP's
    c. Loudspeaker enclosures
    d. Wiring and installation diagrams showing quantity and location of system components and related cabling and accessories
    e. Each shop drawing shall contain job title and reference(s) to the applicable drawing(s) and/or specification article(s)
    f. Loudspeaker system locations.
    g. Plenum or Rack mounted networked components.
    h. Equipment rack layouts.
    i. Connection between the rack headend and the Fire Alarm Control Panel

G. Maintenance Data: For system equipment and components (if needed) to include in maintenance manuals specified in Division 1. Include data for each type of product, including all features and operating sequences. Both automatic and manual.

H. 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.

1.13 SYSTEM ASSURANCE

A. All equipment and associated hardware shall be fabricated and installed in accordance with the manufacturer's specified recommendations.

B. All materials and products shall be new and of the finest quality. No used materials shall be installed.

C. System Design to be performed by an approved manufacturer representative.

D. System adjustment to be completed by an approved manufacturer representative or trained contractor.

E. All system components for mass notification must carry a minimum of a 3 year warranty. Warranty statements must be submitted prior to notice to proceed.

1.14 REGULATORY TESTING AND CERTIFICATIONS

A. The relevant system components shall conform to:

a. Speakers used in the MNEC System
   i. Shall meet UL 1480- Approved for use as speakers for use in a fire alarm, emergency and commercial/professional use.
   ii. UL 60065 – Approved for use as Audio/Video Equipment

b. Safety and Electrical
   i. Shall meet UL 6500 – Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use. Products shall be labelled accordingly.

c. Air-Handling Plenum Installation
   i. Shall meet UL 2043 – Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996. Products shall be labeled accordingly.

d. Plenum Rated Cabling
   i. Shall meet CSA CMP 75C FT6. Products shall be labelled accordingly.

e. Electromagnetic Interference (EMI)
    i. Shall meet CSA CMP 75C FT6. Products shall be labelled accordingly.

f. Heavy Metals
    i. Shall meet RoHS – Restriction of Hazardous Substances.

g. Low Voltage Power Supplies
    i. Shall meet UL1310, Standard for Class 2 Power Units. Products shall be labeled accordingly.

h. Mass Notification
    i. Shall meet UL 2572 Standard for Mass Notification Systems

1.15 DELIVERY, STORAGE AND HANDLING

A. Protect from moisture during shipping, storage and handling

B. Deliver in manufacturer's original unopened and undamaged packages with manufacturer's labels legible and intact.

C. Inspect manufacturer's packages upon receipt.

1.16 WARRANTY

A. At project closeout, provide to Owner or Owner's Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

B. The Mass Notification and Audio System shall be warranted to be free from defects in materials, workmanship, and performance for a minimum of 3 years from date of installation.

C. Installer to warranty all labor for one year.

D. 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.

PART 2 – PRODUCTS

2.01 GENERAL

A. Insofar as possible, the specifications for all components of the system are written as performance specifications. These performance specifications are intended to promote competition and the development of superior new components for high MNEC control and audio systems.

B. All mass notification equipment shall be UL 2572 listed. All equipment installed above ceiling shall be UL listed plenum rated.

C. All electronic and electrical equipment and components shall be capable of sustained proper operation when supplied from a nominal 120 VAC +- 10%, 60 Hz +- 10% power source. There shall be no exposed, unprotected 120 VAC potential inside or outside any enclosure. All exterior metal surfaces shall be grounded.

D. All electronic and electrical equipment shall be capable of sustained proper operation within an ambient temperature range of 0 to 40 degrees C.

E. Unless otherwise stated, all electrical and electronic equipment and components shall be products of established manufacturers. Quality of workmanship and fabrication of all 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.

F. Unless otherwise stated, all electronic and electrical equipment shall be designed or adaptable for standard front panel rack mounting.

G. All manufacturers' stock equipment and component labeling and console designations shall be in English. All systems nomenclature, signage and custom labeling pertaining to routine system operation shall be on the equipment itself and on descriptive drawings, charts or diagrams.

2.02 MANUFACTURERS

A. Acceptable Manufacturers:

Lencore Acoustics Corp.
1 Crossways Park Dr W
Woodbury, NY 11797
PH: 516-682-9292
Website: www.lencore.com
Email: info@lencore.com
Products: n.FORM® Mass Notification System

2.03 MASS NOTIFICATION SYSTEM

A. n.FORM Head-End G8220 - Required (1)
B. n.FORM OP - Required (SPECIFIER PLEASE PUT AMOUNT NEEDED)
C. n.FORM INDOOR SPEAKERS:
    a. G655 - Required (SPECIFIER PLEASE PUT AMOUNT NEEDED)
    b. G654 - Required (SPECIFIER PLEASE PUT AMOUNT NEEDED)
D. WIDE AREA SPEAKER SYSTEMS
    a. MagnaCast
    b. OmniCast

PART 3 – EXECUTION

3.01 INSTALLATION

A. Design system according to manufacturer’s specifications.

B. The following installation requirements shall govern the design, fabrication and installation of the system(s) specified herein. In case of a discrepancy between these overall system standards and the individual equipment item specifications, the latter shall govern.

C. The equipment specified in this section shall be installed according to standards of good engineering practice and the conditions specified herein.

D. The equipment enclosure shall be installed according to standards of good human engineering. Equipment installed shall be selected within the criteria of operational simplicity and ease of maintenance.

E. 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.

F. The General or Electrical Contractor shall be responsible for supplying any conduit, which may be required to complete the system installation in accordance with the specifications.

G. All requirements for the metallic conduit specified in the electrical specifications shall apply to the work described herein.
    a. Follow all applicable codes for the area

H. Follow manufacturer's recommendations regarding installation as found in the MNEC systems installation manual. Record any necessary changes to the system design on the plan.

I. Ensure that supplementary materials used meet applicable safety standards.

J. The Equipment Enclosure Layout and Assembly:
    a. Install equipment in Rack Mounted Units or wall location with the UL Listed Enclosure as shown in the drawings.
    b. Interconnecting cabling shall 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.
    c. Great care shall be exercised to 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.

K. Wiring and Cabling:
    a. Wiring shall be executed in accordance with the equipment manufacturer's wiring recommendations. Should the Design-Builder desire variations from these requirements, the Design-Builder shall first receive the approval of the Consultant/Engineer.
    b. Wiring Method: Install wiring in accordance with all local electrical codes.
    c. 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.

d. Cables shall be grouped and bundled by type and level and routed from source to termination in a uniform manner throughout all equipment housings. Care shall be taken not to break the insulation or deform the cable by harness supports. Cables shall not change relative position in a cable group throughout a cable route.
e. Power distribution wiring shall not be installed adjacent to signal cables. Power distribution cabling shall be on the opposite side from signal wiring in equipment enclosures and shall be uniformly located throughout an installation.

L. The connection to the Fire Alarm Control Panel (FACP) will be provided by the Design-Builder to the Fire Protection Engineer (FPE). The FP Installation team will be responsible for the physical connection to the FACP.

M. 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.

3.02 EXAMINATION

A. Ensure that facility build out is at a stage suitable for the system installation.

B. Ensure that facility is constructed according to plans including wall locations, ceiling types and plenum barriers.

C. Ensure that the plenum height is appropriate as per manufacturer's recommendations and as per plan.

D. Ensure power requirements have been provided as per plan.

E. Ensure sufficient space for centrally located components is available as per plan and manufacturer's specifications.

F. Ensure any third-party components required to be interfaced with the system have been provided.

3.03 PERMITS

A. Obtain Necessary permits for installation work.

B. Install all work in full accordance with the requirements of all local and governmental departments having jurisdiction over these matters, as well as with any requirements of the NFPA, NEC, MEA, BSA, UL, ADA, and other applicable Codes.

3.04 CLEANING

A. All debris resulting from the system's installation shall be continuously removed during and after the installation. All equipment shall be thoroughly dusted and cleaned after installation.

END OF SECTION