

MASTERFORMAT™ 2020 EDITION SECTIONS
27 51 19 – SOUND MASKING SYSTEMS
27 51 16 – PAGING SYSTEMS

NOTE TO SPECIFIER

LOGISON® ACOUSTIC NETWORK – NETWORKED SOUND MASKING, PAGING AND MUSIC SYSTEM

The basis for this specification is the LogiSon Acoustic Network manufactured by K.R. Moeller Associates Ltd., and is distributed by **Environmental Acoustics Inc.**, located at:

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When a single-source specification is not possible, a generic specification that incorporates the necessary minimum performance levels is available for download at www.soundmaskingspecs.com.

.1 PART ONE – GENERAL

.1 SECTION INCLUDES

- .1 Sound masking systems
- .2 Paging systems

.2 REFERENCES

- .1 UL/CSA/EN/IEC 62368-1: Audio/video, information and communication technology equipment - Part 1: Safety requirements.
- .2 UL 6500: Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use.
- .3 IEC 60065: Standard for Audio, Video and Similar Electronic Apparatus - Safety Requirements.
- .4 CE: Conformité Européenne.
- .5 FCC: Part 15, Subpart B, Class A - Unintentional Radiators.
- .6 ICES-003 (Industry Canada): Interference-Causing Equipment Standard.
- .7 EN 55103-1: Product Family Standard for Audio, Video, Audio-Visual and Entertainment Lighting Control Apparatus for Professional Use, Part 1. Emission, Environment Category E2 - Commercial and Light Industrial (including theatres) Environment.
- .8 EN 55103-2: Product Family Standard for Audio, Video, Audio-Visual and Entertainment Lighting Control Apparatus for Professional Use, Part 2. Immunity, Environment Category E2 - Commercial and Light Industrial (including theatres) Environment.
- .9 UL 1310: Standard for Class 2 Power Units.
- .10 CSA CMP 75C FT6: Communications cable intended for use within buildings in ducts or plenums or other spaces used for environmental air.
- .11 UL CL3P/CMP 75C: Communications cable intended for use in Class 2 or Class 3 circuits within buildings in ducts or plenums or other spaces used for environmental air.
- .12 UL 2043: Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996

- .13 RoHS: Restriction of Hazardous Substances Directive 2011/65/EU.
- .14 ASTM E1573-18: The Measurement and Reporting of Masking Levels Using A-Weighted and One-Third-Octave-Band Sound Pressure Levels.

.3 SUBMITTALS

- .1 Product Data: Submit for each type of product specified.
- .2 Manufacturer Instructions: Provide manufacturer's manuals for installation, startup and commissioning.
- .3 Shop Drawings: Provide schematics of the system design on a floor plan showing the quantity, type and location of components, cabling and accessories.

.4 CLOSEOUT SUBMITTALS

- .1 Warranty Documentation. Provide warranty documentation, with start date(s) and service contact(s).
- .2 Record Documentation: Provide as-built schematics of the system design on a floor plan showing the quantity, type and location of components, cabling and accessories.
- .3 System Reports:
 - .1 Provide reports in electronic form.
 - .2 Report an inventory of electronic system components, including model number, serial number, and firmware version.
 - .3 Report the verified quantity of speakers installed per local control zone.
 - .4 Report all system settings.
 - .5 Report testing and commissioning data.
- .4 System Settings Backup: Provide an electronic backup file of all system settings.
- .5 Security Items:
 - .1 Provide one set of keys for each locked equipment enclosure.
 - .2 Provide passwords to access control functions for hardware and software user interfaces.

.5 QUALITY ASSURANCE

- .1 Obtain required permits.
- .2 Follow applicable codes, including regulatory testing and certifications.
- .3 Source all sound masking equipment from a single supplier.
- .4 Source sound masking equipment from a manufacturer with a minimum of 10 years experience manufacturing sound masking systems.
- .5 Have the system designed by an authorized manufacturer representative.
- .6 Ensure the installation contractor has received instruction on the specified products.
- .7 Have the system configured and commissioned by an authorized manufacturer representative or their approved contractor.
- .8 Ensure supplementary materials meet applicable standards.

.6 DELIVERY, STORAGE AND HANDLING

- .1 Protect equipment from moisture during shipping, storage and handling.
- .2 Deliver in manufacturer's original unopened and undamaged packages with manufacturer's labels legible and intact.
- .3 Inspect manufacturer's packages upon receipt.
- .4 Handle packages carefully.

.7 WARRANTY

- .1 Provide a written product warranty covering sound masking components for defects in parts or assembly for a 5-year period from date of system startup.
- .2 Provide a written 1-year installation warranty.

.2 PART TWO – PRODUCTS

.1 MANUFACTURERS

- .1 Basis of Design: LogiSon Acoustic Network (K.R. Moeller Associates Ltd.); 3-1050 Pachino Court, Burlington, Ontario L7L 6B9 Canada. Toll Free: 866 LOGISON (1-866-564-4766). Tel: (905) 332-1730. Fax: (905) 332-8480. Email: info@logison.com. Web: www.logison.com.
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.2 SYSTEM COMPONENTS

- .1 Overview: Provide a networked-decentralized sound masking system with fully digital, centralized control down to individually addressable primary networked masking devices. These devices output a masking signal to a small group of speakers, creating a local control zone. The system is comprised of a selection of distributed primary networked masking devices, distributed secondary masking devices, loudspeakers, one or more control panel components, computer software, in-room occupant controls, cable assemblies, audio input modules, ceiling mount adaptors, and one or more power supplies.
- .2 Provide primary networked masking devices with:
 - .1 Network connectivity.
 - .2 A random digital masking signal generator.
 - .3 A third-octave masking signal equalizer.
 - .4 A one-octave audio signal equalizer.
 - .5 An overall masking signal level control.
 - .6 An overall audio signal level control.
 - .7 Independent zone settings for masking, audio, and in-room occupant controls.
 - .8 A 5-Watt audio amplifier.
 - .9 Diagnostic functions.
 - .10 Connections to control panel, other masking devices, and loudspeakers.
 - .11 An overall diameter of 13.0 cm (5.1 in) and height of 4.5 cm (1.75 in).
- .3 Provide secondary masking devices with:
 - .1 A loudspeaker connection.
 - .2 Connections to other masking devices.
 - .3 An overall diameter of 13.0 cm (5.1 in) and height of 4.5 cm (1.75 in).
- .4 Provide loudspeakers with:
 - .1 A connection to a masking device.
 - .2 A suspension chain at least 51 cm (20 in) in length and tool-less length adjustment clip.
 - .3 An acoustically damped enclosure.
 - .4 Tool-less, on-site adjustment of loudspeaker orientation (up/down).
 - .5 An enclosure diameter of 16.5 cm (6.5 in) and height of 9.0 cm (3.5 in).
 - .6 A 10.0 cm (4.0 in), 25 Watt RMS, 16 Ohm loudspeaker driver with a frequency response of 100-10,000 Hertz (+/- 6 dB), sensitivity of 87 dBA at 1 Watt/1 meter and a magnet structure weight of 500 grams (17.6 ounces).
- .5 Provide a control panel component with:
 - .1 Network connectivity.
 - .2 A hardware user interface.
 - .3 Connections for audio input modules.
 - .4 Connections to primary networked masking devices, additional control panel components and a computer.
 - .5 A closed contact connection for priority page function.
 - .6 A serial connection for third-party control systems (optional model).

- .7 An Ethernet connection and IP addressability.
 - .8 An overall height of 23.8 cm (9.4 in), width of 28.0 cm (11.0 in) and depth of 8.0 cm (3.2 in).
- .6 Provide system control software (Acoustic Network Manager) for:
 - .1 System startup, including initialization and addressing of networked devices.
 - .2 Masking signal overall level and equalization.
 - .3 Audio signal overall level and equalization.
 - .4 Masking timer scheduling.
 - .5 All system zoning.
 - .6 In-room occupant control setup.
 - .7 Reporting of all system settings.
 - .8 System diagnostics.
 - .7 Provide audio broadcast zoning software (Page Director) for:
 - .1 Setup of user-defined audio zones.
 - .2 User zone selection via software interface.
 - .8 Provide monitoring/notification software (Acoustic Network Supervisor) for:
 - .1 Email notification of errors to user-defined addresses.
 - .2 Email notification of system status at user-defined periods.
 - .9 Provide in-room occupant controls with:
 - .1 Network connectivity.
 - .2 A display indicating function selection and settings.
 - .3 A keypad interface for controlling all functions, including masking/audio selection, overall level, increase/decrease, audio source selection, and masking/audio mute.
 - .4 An infrared remote control receiver.
 - .5 A single gang enclosure.
 - .10 Provide cable assemblies that:
 - .1 Carry power, audio and control signals over a single cable assembly.
 - .2 Provide overmolded micro-connectors with positive locking mechanisms.
 - .11 Provide audio input modules for:
 - .1 Audio input for microphone, telephone or auxiliary audio sources.
 - .2 Analog to digital (D/A) conversion of audio signals.
 - .3 Input sensitivity adjustment.
 - .12 Provide ceiling mount adaptors to:
 - .1 Attach on-site to convert plenum loudspeakers to ceiling plate loudspeakers.
 - .13 Provide power supplies to:
 - .1 Power the system components.

.2 REGULATORY TESTING AND CERTIFICATIONS

- .1 Provide system components conforming to and labeled for:
- .2 United States
 - .1 Safety and Electrical: UL 6500 or 62368-1
 - .2 Plenum Rated Components: UL
 - .3 Plenum Rated Cabling: UL CL3P/CMP 75C
 - .4 Electromagnetic Interference (EMI): FCC - Part 15, Subpart B, Class A
 - .5 Heavy Metals: RoHS
 - .6 Low Voltage Power Supplies: UL 1310 or 62368-1 Annex Q
- .3 Canada

- .1 Safety and Electrical: IEC 60065 or 62368-1
 - .2 Electromagnetic Interference (EMI): ICES-003
 - .3 Plenum Rated Cabling: CSA CMP 75C FT6
 - .4 Heavy Metals: RoHS
 - .5 Low Voltage Power Supplies: UL 1310 or 62368-1 Annex Q
- .4 Europe
 - .1 Safety and Electrical: CE, EN 62368-1
 - .2 Electromagnetic Interference (EMI): EN 55103-1:1997 and EN 55103-2:1996
 - .3 Heavy Metals: RoHS
 - .4 Cabling: UL CL3P/CMP 75C
 - .5 Low Voltage Power Supplies: UL 1310 or 62368-1 Annex Q

.1 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 System Architecture
 - .1 Provide a networked-decentralized system with addressable masking devices installed alongside the loudspeakers throughout the system area.
 - .2 Provide a multi-tiered network architecture with:
 - .1 Tier one being a network of primary networked masking devices and a control component on each floor.
 - .2 Tier two being a network connecting the control panel components and a computer.
- .2 Addressing
 - .1 Provide a system that detects all networked devices and automatically assigns them an address in sequence based on their location in the network on each floor.
- .3 System Design
 - .1 Design system in accordance with manufacturer's specifications.
 - .2 Design system to cover all occupant spaces.
 - .3 Design local control zones based on:
 - .1 Common acoustical and installation conditions. Do not exceed 3 loudspeakers per zone.
 - .2 Attached plans with zones not exceeding 3 loudspeakers per zone.
- .4 System Control
 - .1 Provide digital control for all system settings.
 - .2 Provide system control from a control panel component(s) with a hardware user interface.
 - .3 Provide system control from computer software.
 - .4 Provide system control from in-room occupant controls.
 - .5 Provide a user interface on the control panel for:
 - .1 Addressing of networked devices.
 - .2 System startup and initialization.
 - .3 Masking overall level and contour adjustment.
 - .4 Paging overall level and contour adjustment.
 - .5 All system zoning.
 - .6 Masking timer programming.
 - .7 Security functions.
 - .8 System diagnostics and monitoring.
 - .6 Provide computer software for:
 - .1 Addressing of networked devices.
 - .2 System startup and initialization.

- .3 Masking overall level and equalization adjustment.
 - .4 Paging overall level and equalization adjustment.
 - .5 All system zoning.
 - .6 Masking timer programming.
 - .7 Security functions.
 - .8 System diagnostics and monitoring.
 - .7 Provide centralized system management across the site via control of multiple control panel components from a central computer location.
 - .8 Provide Ethernet-enabled control panel components.
 - .9 Prevent simultaneous adjustment of the system from multiple user control interfaces.
- .5 System Zoning
- .1 Provide independent digital zoning for timer, audio and in-room occupant control functions.
- .6 Masking Sound Generation
- .1 Provide a sound masking generator for each local control zone.
 - .2 Provide a random masking sound generator.
- .7 Sound Masking Control
- .1 Provide each local control zone with independent control over the sound masking signal, including:
 - .1 A third-octave equalizer with 23 bands ranging from 63 to 10,000 Hertz
 - .2 An overall level control with 0.5 dBA increments over a range of 35 to 85 dBA, measured at a distance of 1 meter.
 - .3 A temporary mute function.
 - .4 An off setting.
 - .2 Provide a user enabled/disabled function to gradually ramp up the overall masking level each time power is applied.
- .8 Timer Performance
- .1 Provide a timer in the control panel component to adjust overall masking level according to a programmed schedule.
 - .2 Provide 9 individually programmable timer zones per control panel component.
 - .3 Allow each local control zone to be assigned to a timer zone.
 - .4 Allow unique schedules for each day of the week.
 - .5 Allow variable rates of overall level adjustment for each scheduled change.
 - .6 Provide calendar-based programming.
 - .7 Provide programmable daylight saving time (DST) adjustments.
 - .8 Provide the ability to program 30 exception dates per zone.
 - .9 Provide the ability to program 3 exception timer schedules.
 - .10 Provide an acclimatization function to gradually increase the overall masking level over a period of time, according to a programmed schedule and with independent schedules in each timer zone. Activate if system startup occurs post-occupancy.
- .9 Paging and Background Music ("Audio")
- .1 Provide ability to broadcast audio.
 - .2 Allow each local control zone to be individually assigned to an audio zone.
 - .3 Provide each masking device with independent control over the audio signal, including:
 - .1 An equalizer with at least 8 octave bands from 63 to 8,000 Hz.
 - .2 An overall level control with 0.5 dBA increments over a range of 35 to 85 dBA, measured at a distance of one meter.

- .3 A temporary mute function.
- .4 The ability to disable the audio output.
- .4 Provide a priority page override function temporarily setting all local control zones to a user-defined zone and overall level.
- .5 Provide priority page override activation via a closed-contact on the control panel component or software.
- .6 Provide option to broadcast audio with or without interruption of the masking sound.
- .7 Provide audio broadcast zoning software (Page Director) for:
 - .1 Setup of user-defined audio zones.
 - .2 User zone selection via software interface.

.10 In-Room Occupant Control

- .1 Provide wall-mounted, in-room controls giving occupants manual control of overall masking and audio levels for any user-programmed combination of local control zones.
- .2 Provide independent control of overall masking and audio levels.
- .3 Provide independent mute function for overall masking and audio levels.
- .4 Provide a programmable limit on range of adjustment for each of overall masking and audio levels.
- .5 Provide audio channel selection.
- .6 Provide an infrared remote control receiver.
- .7 Provide automatic reset functions to return in-room occupant controls to default settings.
- .8 Provide an enable/disable function for each of overall masking level, masking mute, overall audio level, audio mute, audio channel selection, and IR functions.
- .9 Provide an infrared remote control.

.11 Diagnostic Performance

- .1 Detect the quantity and type of networked devices connected to each control panel component.
- .2 Detect the number of loudspeakers connected to each primary networked masking device and, in total, per control panel component.
- .3 Verify that each networked device is communicating with the control panel component.
- .4 Identify networked devices not communicating with the control panel component.
- .5 Verify the system design, including required components, communication limits and power limits.
- .6 Provide a loudspeaker monitoring function that:
 - .1 detects deviations from the expected number of functioning loudspeakers connected to each networked device, whether due to incorrect installation or speaker/cabling malfunctions
 - .2 initiates notifications upon detecting a speaker count error
 - .3 is available over a wide range of masking settings
 - .4 be capable of being enabled/disabled
- .7 Provide continuous voltage metering that:
 - .1 Detects and reports on voltage at each networked device for ideal operation.
 - .2 Initiates notifications of insufficient voltage at a given networked device.
 - .3 May be enabled/disabled.
- .8 Provide a tone-burst function for locating loudspeakers from below the ceiling.
- .9 View diagnostics from a control panel component or computer software.
- .10 Provide monitoring/notification software that is capable of monitoring the status of all networked devices, including control panel components.
- .11 Provide software for email notification of errors and periodic system status updates to a user-defined contact list.

.12 System Reporting

- .1 Provide a user interface capable of reading and displaying all current system settings.
- .2 Generate detailed reports of all system settings.
- .3 Report control panel component settings.
- .4 Report the quantity and type of networked devices connected to each control panel component.
- .5 Report masking settings for each primary networked masking device.
- .6 Report Audio settings for each primary networked masking device.
- .7 Report zone assignments.
- .8 Report timer schedules.
- .9 Report in-room occupant control settings.
- .10 Report all networked device serial numbers and software/firmware versions, including control panel components.
- .11 Generate reports in printed and editable electronic formats.

.13 Physical Security

- .1 House the control panel component in a key-locked metal enclosure.
- .2 Make cable connections to the control panel component inside the locked enclosure.
- .3 Ensure no physical output controls are on the masking devices or loudspeakers.

.14 Electronic Security

- .1 Provide three levels of password protection for access to system control functions.
- .2 Provide user-definable programming for functions available at each password level.
- .3 Backup all settings to an electronic storage medium.
- .4 Provide continuous monitoring of communications with each networked device.
- .5 Provide loudspeaker monitoring.
- .6 Support internal and external alarm device activation upon detection of communication error.
- .7 Provide option for email notification upon detection of system error.
- .8 Provide 128-bit encrypted communication between control panel components and a PC.
- .9 Store system settings in non-volatile memory in each networked device and control panel component.
- .10 Provide relay modules for connection to third-party alarm devices or security monitoring equipment (optional).
- .11 Provide a priority page override function.
- .12 Provide exception date programming for the masking timer function.

.15 System Cabling

- .1 Connect networked devices using a single connector-based cable assembly providing power, control and audio signals.
- .2 Use cabling rated for air-handling plenums.
- .3 Use connectors with positive locking mechanisms.

.16 Failsafe Power Supply

- .1 Provide a power component that incorporates two independent power supplies designed to jointly power the system while both are in operation.
- .2 Provide automatic and uninterrupted power transition in the event of a single power supply failure.
- .3 Provide monitoring of power supply failure.

.17 Aesthetics for Open Ceiling Installation

- .1 Provide networked masking devices and loudspeakers designed for visible installation.

- .2 Provide cabling color-matched to the masking devices and loudspeakers.
- .3 Provide braided steel cable for loudspeaker suspension.
- .4 Provide connector-based cabling.
- .5 Provide masking devices, loudspeakers and cabling in white or charcoal

.3 PART THREE - EXECUTION

.1 EXAMINATION

- .1 Ensure that the site is at a stage suitable for the system installation.
- .2 Ensure that the site is constructed according to plans including wall locations, ceiling types and plenum barriers.
- .3 Ensure planned power sources have been provided.
- .4 Ensure planned space is available for centrally located components.
- .5 Ensure third-party components interfacing with the system have been provided.

.2 INSTALLATION

- .1 Follow manufacturer's installation manual.
- .2 Follow the system design for location of system components and wiring.
- .3 Record any necessary changes to the system design on the plan.

.3 SITE QUALITY CONTROL

- .1 Ensure plenum height meets manufacturer's minimum specifications.
- .2 Ensure the distance between the top of the loudspeaker and the deck meets manufacturer's minimum specifications.
- .3 Suspend loudspeakers in a level manner.
- .4 Minimize obstructions to loudspeakers.
- .5 Support cables properly in the ceiling.
- .6 Securely terminate cables.

.4 SYSTEM STARTUP AND COMMISSIONING

- .1 Follow manufacturer's manuals for system startup.
- .2 Follow manufacturer's manuals for configuration of system, according to system plan, including timer, audio, occupant controls, diagnostic, and security functions.
- .3 Sound Masking Commissioning

- .1 Set system to the appropriate overall level.

Area	Overall Level (dBA)
Open Office	47.0
Private Office	43.0
Meeting Room	42.0
Corridor	47.0
Reception Area	47.0

- .2 Set system to the sound masking spectrum.

Sound Masking Spectrum (45.0 dBA Overall Level)

Band Center Frequency (Hz)	Target Band Level (dB)
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100	46.9
125	45.9
160	44.7
200	43.9
250	42.7
315	41.4
400	40.4
500	38.9
630	37.4
800	35.4
1,000	33.7
1,250	31.4
1,600	29.4
2,000	27.4
2,500	24.9
3,150	22.4
4,000	19.4
5,000	16.4
6,300	13.0
8,000	9.0
10,000	5.0

Source: National Research Council of Canada SPMSoft Optimum Masking Spectrum (Report RR-266). For spectra at different overall levels, adjust target band levels by 1 dB for each 1 dBA change in overall level.

- .3 Commission the sound masking system with
 - .1 ceilings fully installed,
 - .2 all furnishings in place,
 - .3 mechanical systems operating at normal daytime levels, provided the existing sounds do not interfere with system commissioning
 - .1 In the event of interference, commission the sound masking system with the mechanical system off
 - .4 no occupant noise during measurements.
- .4 .4 Select a commissioning location within each local control zone that reflects the seated position of an occupant in open plan areas or that of the primary occupant in a closed room.
 - .1 Document the commissioning location precisely on a facility floor plan showing sound masking system design.
 - .2 Assign the commissioning location an alphanumeric ID.
- .5 Conduct third-octave sound level measurements as per ASTM E1573-18:
 - .1 Use an ANSI Type 1 third-octave sound level analyzer.
 - .2 Set analyzer for A-weighted equivalent average level (Leq).
 - .3 Set analyzer for fast response.
 - .4 Hold the analyzer microphone oriented upwards at a height between 1.2 to 1.4 meters (4 to 4.7 feet) from the floor.
 - .5 Keep the analyzer at least 1 meter (3.3 feet) away from vertical or horizontal surfaces, to the extent possible.
 - .6 Move the analyzer through a slow horizontal arc of approximately 1 meter (3.3 feet), if possible while conforming to .3.4.5.5, but in any event no less than 60 centimeters (2 feet) during the measurement period.
 - .7 Measure for at least 15 seconds.

- .6 Conduct a third-octave sound level measurement with the sound masking deactivated to document existing conditions at each commissioning location.
 - .1 Identify any third-octave band in existing conditions that exceeds the target band level for that location.
- .7 Using LogiSon Target software, adjust the sound masking at each commissioning location to conform to the sound masking spectrum and overall level for that location, such that:
 - .1 The level in each third-octave band from 100 Hz and 10,000 Hz inclusive is within plus or minus two decibels (+/- 2 dB) of the target band level.
 - .1 Unless existing conditions exceed the maximum limit for the band.
 - .2 The overall level is within plus or minus one half decibel (+/- 0.5 dBA) of the target overall level.
 - .1 Unless existing conditions cause overall level to exceed tolerances.
- .8 If the sound masking spectrum and overall level requirements are not met at a commissioning location, modify the system design, installation or commissioning, at the supplier's expense, until conformance is achieved.
- .2 Unless deviation can be shown to be due to existing conditions.
- .4 Provide an electronic report of testing and commissioning data, including:
 - .1 Floorplan(s) showing all commissioning locations with ID references and local control zones.
 - .2 A table and graph of commissioned sound masking measurements for each commissioning location, including:
 - .1 Third-octave levels for bands within the sound masking spectrum.
 - .2 Overall level.
 - .3 The sound masking spectrum, overall level and tolerances specified for that location.
 - .3 Explanation of any sound masking measurements which exceed tolerances for the sound masking spectrum or overall level with a table and graph of existing conditions measurements for each such commissioning location, including:
 - .1 Third-octave levels for bands within the sound masking spectrum.
 - .2 Overall level.

.5 CLEANING AND WASTE MANAGEMENT

- .1 Remove empty packaging and other material waste.
- .2 Clean system components where required.

.6 CLOSEOUT ACTIVITIES

- .1 Demonstrate operational system to Owner representative.
- .2 Review closeout submittals with Owner representative.
- .3 Train Owner representative to maintain system and use any occupant controls or interfaces, as required.
- .4 Review service and support contacts.

.7 ATTACHMENTS

- .1 System Design Schematic: Schematics of the system design on a floor plan showing the quantity and location of speakers and the size and location of local control zones.

END OF SECTION