SECTION 27 51 19

NETWORKED SOUND MASKING, PAGING AND MUSIC SYSTEM

\*\* NOTE TO SPECIFIER \*\* LogiSon Acoustic Network; acoustics and sound masking electronic systems.  
This section is based on the products of LogiSon Acoustic Network, which is located at:3-1050 Pachino Ct.Burlington, ON, Canada L7L 6B9Toll Free Tel: 866-LOGISONTel: 905-332-1730Fax: 905-332-8480Email: [request info (info@logison.com)](https://arcat.com/rfi?action=email&company=LogiSon%252BAcoustic%252BNetwork&message=RE%253A%2520Spec%2520Question%2520(16820log)%253A%2520&coid=39557&spec=16820log&rep=&fax=905-332-8480)  
Web: <https://www.logison.com>   
 [ [Click Here](https://arcat.com/company/logison-acoustic-network-39557) ] for additional information.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Sound masking systems.
    2. Paging systems.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Add sections below relevant to this project specification.

* + 1. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. CE: Conformite Europeenne.
    2. CSA CMP 75C FT6: Communications cable intended for use within buildings in ducts or plenums or other spaces used for environmental air.
    3. EN 55103-1:1997: 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.
    4. EN 55103-2:1996: 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.
    5. FCC: Part 15, Subpart B, Class A - Unintentional Radiators.
    6. ICES-003 (Industry Canada): Interference-Causing Equipment Standard.
    7. IEC 60065: Standard for Audio, Video and Similar Electronic Apparatus - Safety Requirements.
    8. RoHS: Restriction of Hazardous Substances Directive 2002/95/EC.
    9. UL 1310: Standard for Class 2 Power Units.
    10. UL 2043: Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; 1996
    11. UL 6500: Standard for Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use.
    12. 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.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data: Manufacturer's data sheets on each product to be used, including:
        1. Preparation instructions and recommendations.
        2. Storage and handling requirements and recommendations.
        3. Installation methods.
     3. Shop Drawings: Provide schematics of the system design on a floor plan showing the quantity, type and location of components, cabling and accessories.
  2. 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.
  3. QUALITY ASSURANCE
     1. Obtain required permits. Follow applicable codes, including regulatory testing and certifications.
     2. Source all sound masking equipment from a single supplier. Source sound masking equipment from a manufacturer with a minimum of 10 years' experience manufacturing sound masking systems.
     3. Have the system design confirmed by an authorized manufacturer representative.
     4. Ensure the installation contractor has received instruction on the specified products.
     5. Have the system configured and commissioned by an authorized manufacturer representative or their approved contractor.
     6. Ensure supplementary materials meet applicable standards.
  4. PRE-INSTALLATION MEETINGS
     1. Convene minimum two weeks prior to starting work of this section.
  5. 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.
  6. PROJECT CONDITIONS
     1. 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.
  7. SEQUENCING
     1. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
  8. 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.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: LogiSon Acoustic Network, which is located at:3-1050 Pachino Ct.Burlington, ON, Canada L7L 6B9Toll Free Tel: 866-LOGISONTel: 905-332-1730Fax: 905-332-8480Email: [request info (info@logison.com)](https://arcat.com/rfi?action=email&company=LogiSon%252BAcoustic%252BNetwork&message=RE%253A%2520Spec%2520Question%2520(16820log)%253A%2520&coid=39557&spec=16820log&rep=&fax=905-332-8480);Web: <https://www.logison.com>

\*\* NOTE TO SPECIFIER \*\* List local manufacturer representative contact information if available.

* + - 1. Manufacturer Representative:

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Delete irrelevant sections.

* 1. 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. A masking signal volume control.
        6. An audio signal volume 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 volume and equalization.
        3. Audio signal volume 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, volume, 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

\*\* NOTE TO SPECIFIER \*\* Delete irrelevant sections.

* + 1. Provide system components conforming to and labeled for:
    2. United States:
       1. Safety and Electrical: UL 6500.

\*\* NOTE TO SPECIFIER \*\* For air-handling plenum installation. Delete if not required.

* + - 1. Plenum Rated Components: UL 2043.

\*\* NOTE TO SPECIFIER \*\* For air-handling plenum installation. Delete if not required.

* + - 1. Plenum Rated Cabling: UL CL3P/CMP 75C
      2. Electromagnetic Interference (EMI): FCC - Part 15, Subpart B, Class A.

\*\* NOTE TO SPECIFIER \*\* Voluntary best practice. Delete if not required.

* + - 1. Heavy Metals: RoHS.
      2. Low Voltage Power Supplies: UL 1310.
    1. Canada:
       1. Safety and Electrical: IEC 60065.
       2. Electromagnetic Interference (EMI): ICES-003.

\*\* NOTE TO SPECIFIER \*\* For air-handling plenum installation. Delete if not required.

* + - 1. Plenum Rated Cabling: CSA CMP 75C FT6.

\*\* NOTE TO SPECIFIER \*\* Voluntary best practice. Delete if not required.

* + - 1. Heavy Metals: RoHS.
      2. Low Voltage Power Supplies: UL 1310.
    1. Europe:
       1. Safety and Electrical: CE.
       2. Electromagnetic Interference (EMI): EN 55103-1:1997 and EN 55103-2:1996.
       3. Heavy Metals: RoHS.

\*\* NOTE TO SPECIFIER \*\* For air-handling plenum installation. Delete if not required.

* + - 1. Cabling: UL CL3P/CMP 75C.
      2. Low Voltage Power Supplies: UL 1310.
  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.

\*\* NOTE TO SPECIFIER \*\* Select one option below.

* + - 1. Design local control zones based on:

\*\* NOTE TO SPECIFIER \*\* Set as 1, 2, or 3 speakers.

* + - * 1. Common acoustical and installation conditions. Do not exceed \_\_\_ loudspeakers per zone.

\*\* NOTE TO SPECIFIER \*\* Set as 1, 2, or 3 speakers. If loudspeaker & zone plan is included in the specification.  
b.Attached plans with zones not exceeding \_\_\_ loudspeakers per zone.

* + 1. 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.

\*\* NOTE TO SPECIFIER \*\* Delete if unused.

* + - 1. Provide system control from computer software.

\*\* NOTE TO SPECIFIER \*\* Delete if unused.

* + - 1. Provide system control from in-room occupant controls.
      2. Provide a user interface on the control panel for:
         1. Addressing of networked devices.
         2. System startup and initialization.
         3. Masking volume and contour adjustment.
         4. Paging volume and contour adjustment.
         5. All system zoning.
         6. Masking timer programming.
         7. Security functions.
         8. System diagnostics and monitoring.
      3. Provide computer software for:
         1. Addressing of networked devices.
         2. System startup and initialization.
         3. Masking volume and equalization adjustment.
         4. Paging volume and equalization adjustment.
         5. All system zoning.
         6. Masking timer programming.
         7. Security functions.
         8. System diagnostics and monitoring.
      4. Provide centralized system management across the site via control of multiple control panel components from a central computer location.
      5. Provide Ethernet-enabled control panel components.
      6. Prevent simultaneous adjustment of the system from multiple user control interfaces.
    1. System Zoning:
       1. Provide independent digital zoning for timer, audio and in-room occupant control functions.
    2. Masking Sound Generation:
       1. Provide a sound masking generator for each local control zone.
       2. Provide a random masking sound generator.
    3. 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. A volume 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 masking volume each time power is applied.
    4. Timer Performance:
       1. Provide a timer in the control panel component to adjust masking volume 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 volume 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 masking volume 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.

\*\* NOTE TO SPECIFIER \*\* Remove if unused.

* + 1. 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. A volume 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 volume 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.

\*\* NOTE TO SPECIFIER \*\* Remove if unused.

* + 1. In-Room Occupant Control:
       1. Provide wall-mounted, in-room controls giving occupants manual control over masking and audio volumes for any user-programmed combination of local control zones.
       2. Provide independent control of masking and audio volume.
       3. Provide independent mute function for masking and audio volume.
       4. Provide a programmable limit on range of adjustment for each of masking and audio volume.
       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 masking volume, masking mute, audio volume, audio mute, audio channel selection, and IR functions.
       9. Provide an infrared remote control.
    2. 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.
    3. 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.
    4. 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.
    5. 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.
    6. 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.

\*\* NOTE TO SPECIFIER \*\* Remove if unused.

* + 1. 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.
    2. 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.

\*\* NOTE TO SPECIFIER \*\* Delete color not required.

* + - 1. Provide masking devices, loudspeakers and cabling in white.
      2. Provide masking devices, loudspeakers and cabling in charcoal.

1. 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:

\*\* NOTE TO SPECIFIER \*\* May be specified by Acoustical Engineer.

* + - 1. Set system to the appropriate overall volume.

|  |  |  |
| --- | --- | --- |
|  | Area | Overall Volume (DBA) |
|  | Open Office | 47.0 |
|  | Private Office | 43.0 |
|  | Meeting Room | 42.0 |
|  | Corridor | 47.0 |
|  | Reception Area | 47.0 |

\*\* NOTE TO SPECIFIER \*\* May be specified by Acoustical Engineer.

* + - 1. Set system to the sound masking curve.   
         Sound Masking Curve (45.0 dBA Overall Volume)

|  |  |  |
| --- | --- | --- |
|  | Band Center Frequency (Hz) | Target Band Level (dB) |
|  | 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 |

|  |  |
| --- | --- |
|  | Source: National Research Council of Canada sound masking curve from 100-5000 Hz. |

|  |  |
| --- | --- |
|  | For curves at different overall volumes, adjust target band levels by 1 dB for each 1 dBA change in overall volume. |

* + - 1. Commission the sound masking system with:
         1. Ceilings fully installed,
         2. All furnishings in place,
         3. Mechanical systems operating at normal daytime levels,
         4. No occupant noise during measurements.
      2. Select a commissioning location within each local control zone:
         1. Document the commissioning location precisely on a facility floor plan showing sound masking system design.
         2. Assign the commissioning location an alphanumeric ID.
      3. Conduct third-octave sound level measurements:
         1. Use an ANSI Type 1 or 2 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. Move the analyzer through a slow horizontal arc of at least 60 centimeters (2 feet) during the measurement period.
         6. Keep the analyzer at least 1 meter (3.3 feet) away from vertical or horizontal surfaces.
         7. Measure for at least 15 seconds.
      4. 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.
      5. Adjust the sound masking at each commissioning location to conform to the sound masking curve and overall volume for that location, such that:
         1. The volume in each third-octave band from 100 Hz and 5000 Hz inclusive is within plus or minus two decibels (+/- 2 dB) of the target band level.

Unless existing conditions exceed the maximum limit for the band.

* + - * 1. The overall volume is within plus or minus one half decibel (+/- 0.5 dBA) of the target overall volume.

Unless existing conditions cause overall volume to exceed tolerances.

* + - 1. If the sound masking curve and overall volume requirements are not met at a commissioning location, modify the system design, installation or commissioning, at the supplier's expense, until conformance is achieved.
         1. Unless deviation can be shown to be due to existing conditions.
    1. Provide an electronic report of testing and commissioning data, including:
       1. Floor plan(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 curve.
          2. Overall volume level.
          3. The sound masking curve, overall volume and tolerances specified for that location.
       3. Explanation of any sound masking measurements which exceed tolerances for the sound masking curve or overall volume 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 curve.
          2. Overall volume level.
  1. CLEANING AND WASTE MANAGEMENT
     1. Remove empty packaging and other material waste.
     2. Clean system components where required.
  2. 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.
  3. PROTECTION
     1. Protect installed products until completion of project.
     2. Touch-up, repair or replace damaged products before Substantial Completion.

\*\* NOTE TO SPECIFIER \*\* Delete if no system design schematic attached.

* 1. 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