

.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 system component specified.
- .2 Manufacturer Instructions: Provide manufacturer's manuals for installation, startup and commissioning.
- .3 Shop Drawings: Provide the system design on an architectural floor plan showing the quantity, type and location of components, cabling and accessories.
- .4 Compliance Statement: Provide a signed document from an executive officer of the supplier stating that the system *as proposed* meets the Design and Performance Requirements.
- .5 System Overview: Provide a system summary including a) the total number of loudspeakers, b) the total number of local control zones, and c) the mean, maximum and minimum number of loudspeakers per local control zone.

.4 CLOSEOUT SUBMITTALS

- .1 Warranty Documentation. Provide warranty documentation, with start date(s) and service contact(s).

- .2 Record Documentation: Provide the as-built system design on an architectural 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 LogiSon Acoustic Network or approved equivalent.

.2 REGULATORY TESTING AND CERTIFICATIONS

- .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

.3 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 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 Attached system design with zones not exceeding [3] loudspeakers per zone.
- .3 System Control
 - .1 Provide digital controls for all system settings.
 - .2 Provide a networked user interface for controlling and reviewing all system settings.
- .4 Masking Sound Generation
 - .1 Provide a sound masking generator for each local control zone.
 - .2 Provide a random masking sound generator. Alternatively, provide a pseudo-random generator with a cycle exceeding 24 hours and no noticeable repetitive pattern.
- .5 Sound Masking Control
 - .1 Provide each local control zone with independent control over the sound masking signal, including:
 - .1 An equalizer with at least 21 third-octave bands from 100 to 10,000 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.
- .6 Sound Masking Commissioning and Tuning
 - .1 Provide automated field tuning of overall and one-third octave band levels
 - .1 Adjust each local control zone in real time and based on site measurements to meet performance targets set out in Section 3.4.3.
- .7 Sound Masking Timer
 - .1 Provide a timer to adjust the overall sound masking level according to a programmed schedule.
 - .2 Provide 8 individually programmable timer zones.
 - .3 Allow each local control zone to be individually 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 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.

- .7 System Diagnostics
 - .1 Include the capability of identifying masking devices that are not functioning.
- .8 System Reporting
 - .1 Provide a user interface for reading and displaying all current system settings.
 - .2 Include the ability to generate detailed reports of all system settings.
- .9 Physical and Electronic Security
 - .1 House below-ceiling electronic components in a locked metal enclosure.
 - .2 Password protect access to system control functions.
 - .3 Allow all settings to be backed up to an electronic storage medium.

.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 Owner requirements, including timer, audio, occupant controls, diagnostic, and security functions.
- .3 Sound Masking Commissioning
 - .1 Set each control zone to the appropriate overall level.

Area	Overall Level (dBA)
Open Office	45.0

Private Office	43.0
Meeting Room	42.0
Corridor	45.0
Reception Area	45.0

- .2 Set each control zone to the sound masking spectrum.

Sound Masking Spectrum (45.0 dBA Overall Level)

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
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 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 Mark the commissioning location precisely on the as-built 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 automated field tuning, 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 decibel (+/- 1 dB) of the specified 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.
 - .1 Unless deviation can be shown to be due to existing conditions.
- .4 Provide an electronic report of testing and commissioning data, including:
 - .1 As-built system design(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