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## PART 1 GENERAL

### 1.1 REFERENCES

- .1 ASTM International Inc.
  - .1 ASTM E1374-06 (2011), Standard Guide for Open Office Acoustics and Applicable ASTM Standards.
  - .2 ASTM E1573-09, Standard Test Method for Evaluating Masking Sound in Open Office Using A-Weighted and One-Third Octave Band Sound Pressure Levels.
  - .3 ASTM E1130-08, Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index.

### 1.2 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 System Architecture:
  - .1 The system shall be of a networked-decentralized architecture with addressable masking devices distributed throughout the installation area.
- .2 Masking Sound Generation:
  - .1 The system shall provide an independent sound masking generator for each masking control zone in Section 1.2.3.4.
  - .2 The masking sound shall be random and provide no noticeable repetitive pattern. Pseudo-random generation cycles shall exceed 24 hours.
- .3 System Control:
  - .1 The system must include a PC control interface capable of making and displaying all sound masking, paging and sound masking timer settings.
  - .2 All system settings shall be digital and adjusted via the PC control interface or control panel.
  - .3 The PC control interface shall be capable of monitoring and reporting on all system settings affecting masking/paging performance.
  - .4 The sound masking system shall be arranged into groups of loudspeakers (zones) based on common installation conditions and each zone shall not exceed 2 loudspeakers in size in open office areas, 3 speakers zones permitted in corridors. Individual zones in all enclosed offices and meeting rooms as per attached layouts.
    - .1 Each zone shall be individually addressable and controllable for fine tuning of the system.
  - .5 The system shall use digital signal processing (DSP) technology for masking sound generation and adjustment of masking and paging signals.
  - .6 Each zone shall be independently controllable through a network device with the following capabilities:
    - .1 A third-octave band equalizer with adjustment capabilities for a minimum 21 third-octave bands for the masking signal, capable of equalizing the masking signal output to the loudspeakers within the corresponding zone.
    - .2 Equalizers shall provide a minimum adjustment range of 100 to 10,000 Hz.

- .3 The masking volume shall be adjustable within each zone in 0.5 dBA increments over a range of 35 dBA to 85 dBA at a distance of 1m.
- .4 All output adjustments shall be implemented via control panel or PC control interface.
- .4 Acoustical Performance Requirements:
- .1 Prior to commissioning the system, with mechanical system operating at normal daytime levels and with all furnishings in place, third-octave sound measurement samples shall be taken throughout the facility every 1000 sq. ft. in the open office areas, and a measurement in every pair of like offices and meeting rooms.
- .1 Special care should be taken to identify any building noise that exceeds the preferred spectrum identified below.
- .2 Provide a report of these measurements to the Departmental Representative.
- .2 With the exception of those areas identified in 1.2.4.1.1, all other areas shall conform to the masking sound levels defined in 1.2.4.6 and the sound spectrum defined in 1.2.4.8 below.
- .3 Uniformity in third-octave bands between 200Hz and 5000Hz shall vary no more than +/-2dB.
- .4 Uniformity in third-octave bands between 100Hz and 160Hz shall not exceed the maximum target level by more than 2dB.
- .5 Variations that exceed levels defined in Section 1.2.4.3 and 1.2.4.4 shall be the basis for additional zones to be provided at the vendor's expense.
- .6 Masking sound level shall be 42 dBA in meeting rooms, 43 dBA in private offices and 47 dBA in open plan areas.
- .7 After adjustment, the system shall provide spatial uniformity of +/-0.5dBA for the overall sound level. Areas where excessive mechanical noise prevents this target from being achieved shall be noted and included in system report as per 1.2.4.1.2.
- .8 The reference masking sound spectrum shall be:

**NRC Canada Optimum Spectrum - 45.0dBA Overall**

<i>Band Center Frequency (Hz)</i>	<i>Decibels (dB)</i>
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

<b>Band Center Frequency (Hz)</b>	<b>Decibels (dB)</b>
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

\* The Articulation Index (which defines speech intelligibility) uses only the frequencies noted above

\*\* Levels in these bands shall be lower than the specified volume for 5,000Hz.

.5 Timer Performance:

- .1 The system shall provide a timer function allowing masking volume levels to be automatically adjusted according to a programmed schedule.
- .2 The system shall provide a calendar-based programmable timer function.
- .3 Each masking zone shall be individually assignable to a timer zone.
- .4 The system shall provide automatic daylight saving time adjustments.
- .5 The system shall provide an acclimatization process that automatically increases the masking volume over a period of time according to a programmed schedule. The system should allow for independent acclimatization schedules for each timer zone.
- .6 The system shall allow for up to 9 independent timer zones.
- .7 The system shall allow independent timer schedules for each day of the week.
- .8 The system shall allow variable rates of volume adjustment.

.6 Paging/Background Music Performance:

- .1 The system shall be capable of providing overhead paging or background music simultaneously with, and without, interruption of the masking sound.
- .2 Paging/music volume adjustment shall be independent of masking volume adjustment.
- .3 Each masking device shall provide independent paging/music volume control.
- .4 Each masking device shall provide a minimum one-octave, 8-band equalizer for paging/music.

.7 Diagnostic Performance:

- .1 The system shall be capable of identifying electronic components that are not functioning.

.8 Reporting Performance:

- .1 The PC control interface shall be capable of reading and displaying the current settings for all masking, paging and timer zones.
- .2 The system shall be capable of generating detailed reports of all system settings down to the level of each zone.

- .9 Security Performance:
  - .1 Below-ceiling electronic components shall be contained in a locked metal enclosure or cabinet.
  - .2 Access to the control functions shall be password protected.
  - .3 The system shall allow for all settings to be backed up on an electronic storage medium.

### 1.3 SUBMITTALS

- .1 Product Data: Manufacturer's specifications and installation instructions.
- .2 System Summary Details: Including a) total number of loudspeakers, b) total number of masking zones as per 1.2.3, c) average number of loudspeakers per zone, d) maximum number of loudspeakers per zone and e) minimum number of loudspeakers per zone.
- .3 Warranty Documents: Warranty documents covering the system components.
- .4 Specification Compliance Statement: A signed compliance statement from an executive officer of the manufacturer stating that the system *as proposed to the Departmental Representative* will meet the design and performance requirements outlined in Section 1.2 and the certification requirements in Section 1.5 herein.

### 1.4 QUALITY ASSURANCE

- .1 System Design: Performed by an approved manufacturer representative.
- .2 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.
- .3 System Adjustment: Done by an approved manufacturer representative or trained Contractor.
- .4 Single Source Responsibility: Source electronic masking components, loudspeakers, wall controls and cables from a single vendor.

### 1.5 REGULATORY TESTING AND CERTIFICATIONS

- .1 The system components shall conform to:
  - .1 Safety and Electrical
    - .1 IEC 60065:2014 – Standard for Audio, Video and Similar Electronic Apparatus - Safety Requirements. Products shall be labelled accordingly.
  - .2 Electromagnetic Interference (EMI)
    - .1 ICES-003 (Industry Canada), 2016 – Interference-Causing Equipment Standard, Information Technology Equipment (Including Digital Apparatus) - Limits and Methods of Measurement.
  - .3 Cabling

- .1 UL CL3P/CMP 75C. Products shall be labelled accordingly.
- .4 Heavy Metals
  - .1 RoHS – Restriction of Hazardous Substances (voluntary).
- .5 Low Voltage Power Supplies
  - .1 UL1310-2011, Standard for Class 2 Power Units. Products shall be labelled accordingly.

## 1.6 DELIVERY, STORAGE AND HANDLING

- .1 Protect 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.

## 1.7 WARRANTY AND MAINTENANCE

- .1 A 12 month warranty period for the work of this section.

## PART 2 PRODUCTS

### 2.1 NOT USED

- .1 Not used.

## PART 3 EXECUTION

### 3.1 SYSTEM DESIGN

- .1 Design system according to manufacturer's specifications.

### 3.2 EXAMINATION

- .1 Ensure that facility build out is at a stage suitable for the system installation.
- .2 Ensure that facility is constructed according to plans including wall locations, ceiling types and plenum barriers.
- .3 Ensure that the plenum height is appropriate as per manufacturer's recommendations and as per plan.

- .4 Ensure power requirements have been provided as per plan.
- .5 Ensure sufficient space for centrally located components is available as per plan and manufacturer's specifications.
- .6 Ensure any third-party components required to be interfaced with the system have been provided.

### 3.3 PERMITS

- .1 Obtain necessary permits for installation work.

### 3.4 INSTALLATION

- .1 Follow all applicable codes for the area.
- .2 Follow manufacturer's recommendations regarding installation as found in the manufacturer's installation manual.
- .3 Follow the system design for location of loudspeakers and wiring.
- .4 Record any necessary changes to the system design on the plan.
- .5 Ensure that supplementary materials used meet applicable safety standards.

### 3.5 FIELD QUALITY CONTROL

- .1 Ensure that distance between the top of the loudspeaker and the deck meets manufacturer's minimum specifications.
- .2 Ensure that loudspeakers are suspended in a level manner.
- .3 Ensure that loudspeakers are not obstructed as much as possible.
- .4 Ensure cables are properly supported in the ceiling.
- .5 Ensure cables are securely terminated.

### 3.6 NETWORK CONFIGURATION AND ADJUSTMENT

- .1 Follow manufacturer's recommendations for system setup as found in the system's user manual.
- .2 Follow masking tuning requirements as per Section 1.2.3.
- .3 Set up paging and sound masking timer functions as per Departmental Representative requirements.

3.7            CLEANING

- .1     Ensure that empty packaging is removed.
- .2     Ensure that any material waste is removed.
- .3     Ensure the product is clean and presentable where required.

3.8            DEMONSTRATION AND TRAINING

- .1     Demonstrate operational system to Departmental Representative by walking the space.
- .2     Demonstrate functionality of the system to the Departmental Representative or Departmental Representative's representative.
- .3     Train Departmental Representative employee to maintain system as required.

3.9            FINAL REPORTING

- .1     Provide a printed report as per the requirements in Section 1.2.4.