

MASTERFORMAT™ 2004 EDITION SECTIONS
27 51 19 – SOUND MASKING SYSTEMS

NOTE TO SPECIFIER: This section is based on the products manufactured by Soundmask Australia Pty Ltd:

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1. PART 1 – GENERAL

1.01. SUMMARY

This specification covers the supply, installation and operation of a sound masking system manufactured by Soundmask Australia Pty Ltd. Unlike other sound masking systems, Soundmask Australia's sound masking systems contain a number of modular components. Consequently the sound masking system shall comprise modular components that are arranged and installed to satisfy the project requirements. All components can then be easily upgraded or replaced as necessary to take advantage of any future advances in sound masking technology.

Modular components include the noise generator, digital equalizer, digital distributor, digital amplifier, multiple in ceiling, in floor or surface mounted transducers, as appropriate and cabling.

Paging systems have quite different acoustic and operational requirements. Paging systems should not be integrated into the sound masking system. Paging systems are to be provided by others.

The client is to provide:

- a. Power for the operation of the system.
- b. Sufficient space for equipment and equipment rack.

Soundmask's installer provides:

- a. Lockable equipment rack.
- b. All components, cabling for interconnecting components, cabling to and between transducers (speakers) and transducers (speakers).
- c. Expertise needed to design and install the sound masking system.
- d. Setup and adjustment of the sound masking system.
- e. Final calibration of the sound masking system.

1.02. PRICE AND PAYMENT PROCEDURES

Not included.

1.03. REFERENCES

- A. Standards

1. ASTM E1374-06 – 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 E 1130-08 - Standard Test Method for Objective Measurement of Speech Privacy in Open Offices Using Articulation Index.

B. Regulatory documents

Canada

1. Safety and Electrical
 - a. IEC 60065 – Standard for Audio, Video and Similar Electronic Apparatus - Safety Requirements. Products shall be labelled accordingly.
2. Electromagnetic Interference (EMI)
 - a. ICES-003 (Industry Canada) – Interference-Causing Equipment Standard
3. Cabling [**Spec Note – Include if system components will be installed in an air-handling plenum.**]
 - a. UL CL3P/CMP 75C. Products shall be labelled accordingly.
4. Heavy Metals [**Spec Note – Voluntary, but best practice**]
 - a. RoHS – Restriction of Hazardous Substances (voluntary)
5. Low Voltage Power Supplies [**Spec Note – Include if system is low-voltage.**]
 - a. UL1310, Standard for Class 2 Power Units. Products shall be labelled accordingly.

C. Abbreviations and Acronyms

Not Used.

D. Definitions

Not Used.

1.04. ADMINISTRATIVE REQUIREMENTS

1.05. SUBMITTALS

- A. Product Data: Manufacturer’s specifications and installation instructions.
- B. Sound Mask Design: Schematics of the sound mask system showing quantity and location of components and related cabling.
- C. Warranty Documents: Warranty documents covering the system components.
- D. Regulatory Testing and Certifications – Provide proof of compliance with certifications and standards identified in Section 1.03.
- E. Specification Compliance Statement – A signed compliance statement from an executive officer of the manufacturer stating that the system **as proposed to the customer** will meet the design and performance requirements outlined in Section 1.06. The statement shall indicate compliance/non-compliance for each individual section and subsection of this specification.

1.06. PERFORMANCE REQUIREMENTS

- A. Sound Masking Signal Generation

1. The masking sound shall be random and provide no noticeable repetitive pattern.

B. Sound Masking System Control

1. The system shall be arranged into groups of transducers (zones) based on common installation and localized acoustical conditions.
2. The system shall provide a spectrum shaping using more than 20 filters adjustable in the frequency range 20Hz to 20kHz at the equalizer for each output of the analyser of the masking signal.
3. The masking volume shall be digitally adjustable in 0.5 dBA increments over a range of 35 to 85 dBA @ 1m.
4. The system shall be capable of independently adjusting masking volume and frequency shaping (via no less than 20 filters with selectable centre frequencies within the range 20Hz to 20kHz) for each zone of transducers.
5. The system shall be capable of individually muting the masking output in each zone or of the entire system.
6. At each transducer there shall be a 6 or 7 stage rotary switch including off position, to enable trimming or minor adjustment of sound level, if necessary.

C. Measured Performance Requirements

1. Measure and document sound masking performance as per Section 3.09.
2. The sound masking system shall provide a spatial uniformity of +/-2dB for the masking volume with furnishings in place.
3. The sound masking system shall provide an overall sound level as required for the particular area (typically around 45dBA) and a spectral performance again as required for the particular area. A typical third-octave spectral performance follows:

Octave Band Frequency (Hz)	Sound Level (dB)
125	46
160	45
200	44
250	43
315	41
400	40
500	39
630	37
800	35
1,000	34
1,250	31
1,600	29
2,000	27
2,500	25
3,150	22
4,000	19
5,000	16

Note: Must be tailored for the individual areas and applications.

4. Measured sound masking levels in each third-octave band shall vary no more than +/-2dB from the target level.

5. Measured deviations of the masking sound exceeding the tolerances identified shall be corrected by the vendor at no additional charge, including any requirement to add further zones.

1.07. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum of 20 years manufacturing sound masking systems.
- B. Installer Qualifications: Approved by manufacturer representative and are trained with the specified products or have demonstrated experience with the installation of similar products.
- C. Uses industry standard network switches and cabling and methodology.

1.08. 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.
- D. Handle packages carefully.

1.09. WARRANTY AND MAINTENANCE

- A. Provide a written warranty that products installed shall be free from defects in parts or assembly for a one year period from date of installation.

2. PART TWO – PRODUCTS

2.01. MANUFACTURERS

- A. Acceptable Manufacturer: Soundmask Australia Pty Ltd, PO Box 4068, Balwyn VIC 3103, Australia. Telephone 1300 734 168, International +61 3 9879 5355, Facsimile +61 3 9879 2266, Website www.soundmask.com.au.
- B. Substitutions: Are not allowed unless they comply with the operational requirements.

2.02. SOUND MASKING SYSTEM COMPONENTS

- A. General System Overview: The sound masking system shall be the following components:
 1. rack mounted sound masking generator (SM-GR-3100),
 2. rack mounted digital equalizer (SM-EQ-2000),
 3. rack mounted digital distributor (SM-DX-4800),
 4. rack mounted digital amplifier SM-DA-8000),
 5. transducers:
 - a. in ceiling SM-T-1200 with or without reflector SM-TD-1300, or
 - b. in ceiling SM-T-1650 with or without reflector SM-TD-1300, or
 - c. ceiling suspended SM-T-1200 with reflector SM-TD-1300, or
 - d. ceiling suspended SM-TH-1650, or
 - e. surface mounted for cavities where space is limited SM-T-1265, or
 - f. surface mounted SM-TC-1265, or
 - g. under floor SM-T-2200, or
 - h. under floor SM-TU-1650, and
 6. cable assemblies.
- B. Each Sound Masking Generator (Type SM-GR-3100) shall provide:

1. A microcontroller based digital random noise generator.
2. Frequency response from 20Hz to 20kHz.
3. DSP configurable low pass and high pass filters.
4. Output via XLR connector or banana plug sockets.
5. The output must have the capacity to power as many as 100 transducers.
6. Alternative output via XLR connector for input to equalizer.
7. Device start up must be configurable to ramp up when switched on for a more acoustically comfortable startup.
8. User interface via two buttons with response display LCD. This is to allow volume control and ramping adjustment.
9. Dimensions: 483mm x 155mm x 45mm.
10. Weight: 2kg.
11. Device shall be ETL listed to conform to UL60065, UL2043.

C. Each Digital Equalizer (Type SM-EQ-2000) shall provide:

1. Two (2) inputs via XLR connectors or 6.35mm connector.
2. Two (2) output via XLR or 6.35mm connector.
3. Adjustable filtering at 20 centre frequencies in the range 20Hz to 20kHz for each channel.
4. Ability to be controlled from front panel with response display via LCD.
5. Ability to be controlled by computer using an RS232 connection.
6. Dimensions: 483mm x 155mm x 45mm.
7. Weight: 2kg.
8. Device shall be ETL listed to conform to UL60065, UL2043.

D. Each Digital Distributor (Type SM-DX-4800) shall provide:

1. Four (4) audio inputs via XLR connector.
2. Adjustable filtering at 32 centre frequencies for spectrum shaping for each of the four (4) inputs separately in the range 20Hz to 20kHz.
3. Eight (8) audio outputs via XLR connectors.
4. Adjustable filtering at 10 centre frequencies for secondary spectrum shaping for each of the eight (8) outputs.
5. Ability to be controlled from front panel with response display via LCD.
6. Ability to be controlled remotely up to 1000m by computer via an RS485 cable connection.
7. Dimensions: 483mm x 155mm x 45mm.
8. Weight: 2.45kg.
9. Device shall be ETL listed to conform to UL60065, UL2043.

E. Each Digital Amplifier (Type SM-DA-8000) shall provide:

1. Flip up/down cover panel to provide access to 8 individual level controls – one for each channel.
2. Eight (8) input channels via XLR connector.
3. Eight (8) corresponding speaker output channels via banana plugs.
4. Each output must have the capacity to power as many as 100 transducers.
5. Ability to be controlled from front panel with response display via LCD.
6. Ability to be controlled by computer using an RS485 connection.
7. Dimensions: height: 483mm x 155mm x 45mm.
8. Weight: 2.5kg.
9. Device shall be ETL listed to conform to UL60065, UL2043.

- F. Each Ceiling Transducer SM-T-1200 speaker assembly (for installation in ceiling cavities) shall provide:
1. A six (6) step rotary switch including off position to enable trimming or minor adjustment of sound level if necessary.
 2. Built-in crossover and transformer.
 3. Heat proof enclosure.
 4. A connection to the speaker controller with strain relief.
 5. An acoustically damped enclosure.
 6. Eye-bolt for single point suspension and upward facing speaker orientation.
 7. Overall dimensions: Diameter 180mm x 115mm.
 8. Weight: 100g.
 9. Speaker diameter: 4.0 inches.
 10. Speaker sensitivity: 91 dBA@1Watt, 1 meter.
 11. Speaker power rating: 3 watts RMS.
 12. Speaker frequency response: 100-10,000 Hz.
 13. Magnet size: 0.9 oz.
 14. Speaker impedance: 7.2 ohms.
 15. Device shall be ETL listed to conform to UL1480, UL2043, CSA C22.2 60065.
- G. Each Ceiling Transducer SM-T-1650 speaker assembly (for installation in ceiling cavities) shall provide:
1. A seven (7) step rotary switch including off position to enable trimming or minor adjustment of sound level if necessary.
 2. Built-in crossover and transformer.
 3. Heat proof enclosure.
 4. A connection to the speaker controller with strain relief.
 5. An acoustically damped enclosure.
 6. Eye-bolt for single point suspension and upward facing speaker orientation.
 7. Overall dimensions: Diameter 230mm x 145mm.
 8. Weight: 1.27kg.
 9. Speaker diameter: 6.5 inches.
 10. Speaker sensitivity: 88 dBA@1Watt, 1 meter.
 11. Speaker power rating: 20 watts RMS.
 12. Speaker frequency response: 100-12,000 Hz.
 13. Magnet size: 5.3 oz.
 14. Speaker impedance: 7.2 ohms.
 15. Device shall be ETL listed to conform to UL1480, UL2043, CSA C22.2 60065.
- H. Each Ceiling Transducer SM-T-1200 speaker assembly with reflector SM-TD-1300 (per section 2.02.M) shall provide:
1. A six (6) step rotary switch including off position to enable trimming or minor adjustment of sound level if necessary.
 2. Built-in crossover and transformer.
 3. Heat proof enclosure.
 4. A connection to the speaker controller with strain relief.
 5. An acoustically damped enclosure.
 6. Eye-bolt for single point suspension and upward facing speaker orientation.
 7. Overall dimensions: 180 x 115mm.
 8. Speaker diameter: 4.0 inches.
 9. Weight: 100g.
 10. Speaker sensitivity: 91 dBA@1Watt, 1 meter.
 11. Speaker power rating: 3 watts RMS.
 12. Speaker frequency response: 100-10,000 Hz.

13. Magnet size: 0.9 oz.
 14. Speaker impedance: 7.2 ohms.
 15. Device shall be ETL listed to conform to UL1480, UL2043, CSA C22.2 60065.
- I. Each Ceiling Transducer SM-T-1650 speaker assembly with reflector SM-TD-1300 (per section 2.02.M) shall provide:
1. A seven (7) step rotary switch including off position to enable trimming or minor adjustment of sound level if necessary.
 2. Built-in crossover and transformer.
 3. Heat proof enclosure.
 4. A connection to the speaker controller with strain relief.
 5. An acoustically damped enclosure.
 6. Eye-bolt for single point suspension and upward facing speaker orientation.
 7. Overall dimensions: Diameter 230mm x 145mm.
 8. Weight: 1.27kg.
 9. Speaker diameter: 6.5 inches.
 10. Speaker sensitivity: 88 dBA@1Watt, 1 meter.
 11. Speaker power rating: 20 watts RMS.
 12. Speaker frequency response: 100-12,000 Hz.
 13. Magnet size: 5.3 oz.
 14. Speaker impedance: 7.2 ohms.
 15. Device shall be ETL listed to conform to UL1480, UL2043, CSA C22.2 60065.
- J. Each Ceiling Transducer SM-T-1265 speaker assembly (surface mounted where ceiling cavity space is limited, or for installation where there is no ceiling cavity) shall provide:
1. A six (6) step rotary switch including off position to enable trimming or minor adjustment of sound level if necessary.
 2. A connection to the speaker controller with strain relief.
 3. Overall dimensions: Diameter 240mm x 150mm.
 4. Weight: 1.02kg.
 5. Speaker driver diameter: 6.5 inches.
 6. Speaker sensitivity: 85 dBA@1Watt, 1 meter.
 7. Speaker power rating: 40 watts RMS.
 8. Speaker frequency response: 100-10,000 Hz.
 9. Speaker impedance: 8 ohms.
 10. Device shall be ETL listed to conform to UL1480, UL2043, CSA C22.2 60065.
- K. Each Under floor Transducer SM-T-2200 speaker assembly (for installation where there are raised floors) shall provide:
1. A six (6) step rotary switch including off position to enable trimming or minor adjustment of sound level if necessary.
 2. An acoustically damped enclosure.
 3. Three (3) feet attached to speaker to elevate speaker 35mm from floor.
 4. Overall dimensions: Diameter 180mm x 150mm.
 5. Weight: 100g.
 6. Speaker diameter: 4.0 inches.
 7. Speaker sensitivity: 91 dBA@1Watt, 1 meter.
 8. Speaker power rating: 3 watts RMS.
 9. Speaker frequency response: 100-10,000 Hz.
 10. Magnet size: 0.9 oz.
 11. Speaker impedance: 7.2 ohms.

12. Device shall be ETL listed to conform to UL1480, UL2043, CSA C22.2 60065.
- L. Each Under floor Transducer SM-TU-1650 speaker assembly (for installation where there are raised floors) shall provide:
 1. A seven (7) step rotary switch including off position to enable trimming or minor adjustment of sound level if necessary.
 2. An acoustically damped enclosure.
 3. Three (3) feet attached to speaker to elevate speaker 35mm from floor.
 4. Overall dimensions: Diameter 230mm x 145mm.
 5. Weight: 1.27kg.
 6. Speaker diameter: 6.5 inches.
 7. Speaker sensitivity: 88 dBA@1Watt, 1 meter.
 8. Speaker power rating: 20 watts RMS.
 9. Speaker frequency response: 100-12,000 Hz.
 10. Magnet size: 5.3 oz.
 11. Speaker impedance: 7.2 ohms.
 12. Device shall be ETL listed to conform to UL1480, UL2043, CSA C22.2 60065.
- M. Each Acoustic Disc (reflector) SM-TD-1300 shall provide:
 1. A reflective surface for installation by suspension from the ceiling where either there is no ceiling cavity or the plenum does not offer adequate acoustic reflection.
 2. Width of sound 1 meter wider than normal "flat" flat surface reflection.
- N. Cable assemblies:
 1. Provide power, audio and control signals over standard plenum rated CAT-5 with RJ-45 connectors.
 2. Provide speaker connections to speaker controllers with two conductors, 18 A.W.G. copper stranded, plenum rated wire.

3. PART THREE – EXECUTION

3.01. SOUND MASKING SYSTEM DESIGN

- A. Design Sound Masking System according to manufacturer's specifications.

3.02. SITE CONDITIONS

- A. Verify facility conditions are suitable for the system installation.
- B. Verify the facility is constructed according to plans including wall locations, ceiling types, plenum barriers and plenum heights.
- C. Ensure sufficient space and power for centrally located components is available as per plan and manufacturer's specifications.

3.03. PERMITS

- A. Obtain necessary permits for installation work.

3.04. INSTALLATION

- A. Follow all applicable codes for the area.
- B. Follow manufacturer's recommendations regarding installation.
- C. Follow the system design for location of speakers and wiring.

- D. Record any necessary changes to the system design on the plan.
- E. Ensure that supplementary materials used meet applicable safety standards.

3.05. FIELD QUALITY CONTROL

- A. Ensure that plenum heights meet the minimum recommended by the manufacturer for the transducers.
- B. Ensure that distance between the top of the transducer and the deck meets manufacturer's minimum specifications.
- C. Ensure that transducers are suspended in a level manner.
- D. Ensure that transducers are not obstructed.
- E. Ensure cables are properly supported and securely terminated.

3.06. SOUND MASKING SYSTEM CONFIGURATION AND ADJUSTMENT

- A. Follow manufacturer's recommendations for system settings as found in the installation guide.

3.07. CLEANING

- A. Ensure that empty packaging is removed.
- B. Ensure that any material waste is removed.
- C. Ensure the product is clean and presentable where required.

3.08. DEMONSTRATION AND TRAINING

- A. Demonstrate operational system to customer by walking the space.
- B. Demonstrate functionality of the system to the customer or customer's representative.

3.09. TESTING AND REPORTING

- A. Test covered areas for desired spectrum and spatial uniformity.
- B. Verify that all system audio functions are correctly configured per plan.

3.10. AS-BUILTS AND DOCUMENTATION

- A. Provide detailed drawings showing location and installation of all equipment including transducers.
- B. Provide a printed report detailing system settings.
- C. Provide all instruction and installation documents.
- D. Provide all close-out and warranty information.