AS 2377—1980

Australian Standard®

METHODS FOR THE MEASUREMENT OF AIRBORNE SOUND FROM RAILBOUND VEHICLES

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The following scientific, industrial and governmental organizations and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Acoustical Society
Australian Sugar Producers Association
Confederation of Australian Industry
CSIRO, Division of Building Research
Environment Protection Authority, Victoria
Melbourne Metropolitan Tramways Board
Railways of Australia Committee
Royal Australian Institute of Architects

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PREFACE

This standard was prepared by a subcommittee of the Association's Committee on Noise from Railbound Vehicles. It is based on ISO 3095, Acoustics—Measurement of Noise Emitted by Railbound Vehicles.

This standard sets out the methods for the measurement of airborne sound for the determination of A-weighted sound pressure level and of the sound spectrum emitted by all kinds and combinations of vehicles operating on rails or other types of fixed track while in motion and while stationary. It includes technical provisions which may be specified in contracts for various categories of railbound vehicles.

This standard requires reference to the following documents.

AS 1259	Sound Level Meters Part 2—Type 2, Precision
AS 1469	Criteria Curves for Rating Noise and Establishing Acoustic Environment
AS 1633	Glossary of Acoustic Terms
AS Z33	Preferred Frequencies and Band Centres for Acoustical Measurements
AS Z41	Octave, Half Octave and One-third Octave Band Pass Filters Intended for the Analysis of Sound and Vibrations
SAA MP44	Guide for the Use of Sound Measuring Equipment Part 1—Portable Sound Level Meters

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METHODS FOR THE MEASUREMENT OF AIRBORNE SOUND FROM RAILBOUND VEHICLES

1 SCOPE. This standard sets out the methods for the measurement of airborne sound for the determination of the A-weighted sound pressure level and of the sound spectrum emitted by all kinds and combinations of vehicles operating on rails or other types of fixed track while in motion and while stationary.

NOTE: Appendix A describes procedures for additional optional measurements of airborne sound which may be used, where required, for stationary vehicles.

2 APPLICATION. These methods are intended to apply both to type tests and monitoring tests of railbound vehicles in motion and when stationary, and includes technical provisions which may be specified in contracts for various categories of railbound vehicles.

3 DEFINITIONS. For the purpose of this standard, the following definitions apply:

Type tests—tests performed to prove that the airborne sound emitted by the vehicle delivered by the manufacturer complies with the purchaser's specification.

Monitoring tests—tests performed to check that the airborne sound emitted by the vehicles is within specified limits or that no noticeable changes have occurred since initial delivery or after modification, as applicable, or between individual units in a consignment of vehicles.

NOTE: For definitions of acoustic terms see AS 1633.

4 MEASURING EQUIPMENT.

4.1 Sound Level Meter. A sound level meter complying with AS 1259, Part 2 shall be used. A microphone windshield recommended by the manufacturer of the sound level meter shall be used for all measurements.

The sound level meter including any extension cable shall be calibrated in accordance with AS 1259, Part 2 once every 2 years.

4.2 Recorders.

4.2.1 *General requirements.* Graphic level recorders and magnetic tape recorders may be used to facilitate data collection and analysis. Such recorders shall be calibrated for frequency response every 2 years. For magnetic tape recorders, the calibration shall relate to the same make and type of tape as used in the measurement.

The frequency response of the recorder shall be such that when combined with that of the sound level meter (each as determined at the last calibration) the combined frequency response shall not lie outside the tolerance limits specified in Table 1 of AS 1259, Part 2, in the frequency range 50 Hz to 10 kHz inclusive.

4.2.2 *Requirements for magnetic tape recorders.* Magnetic tape recorders shall comply with the following additional requirements:

(a) Total harmonic distortion shall not exceed 1 percent at 1 kHz nor 2 percent at 50 Hz when a signal is recorded and played at levels normally used for analysis.

(b) Stability of the transfer velocity shall be better than 1 percent over the portion of tape to be used.

(c) Wow and flutter shall not exceed 1 percent peak-to-peak.

(d) Total hum and internal noise levels shall be more than 16 dB below the signal at normal analysis level, for any weighting network or spectral band used.

4.3 Frequency Spectrum Analyser. A frequency spectrum analyser fitted with filters complying with AS Z41 shall be used over bands of interest which should be in accordance with AS Z33.

5 QUANTITIES TO BE MEASURED. For both type tests and monitoring tests, A-weighted sound pressure levels expressed in dB(A) shall be measured.

The sound level meter shall be set on A-weighting. 'Slow' response shall be used, unless otherwise required.

Spectral analysis may be performed for type tests or monitoring tests as required. For spectral analysis, the values to be measured are octave band or one-third octave band sound pressure levels expressed in decibels (dB).

Octave band pressure levels may be used for calculating NR number values in accordance with AS 1469.

6 ACOUSTICAL ENVIRONMENT AND METEROLOGICAL CONDITIONS.

6.1 Test Site. The preferred test site should consist of a substantially level open area, free of large sound-reflecting objects and obstructions, such as barriers, hills, walls, bridges or buildings, within 50 m radius of the microphone.

The area between the vehicle under test and the microphone shall be as free as possible from sound-absorbing covering such as grass, snow or ballast from other tracks.

No observer shall be between the microphone and the vehicle, and the observer(s) should preferably be at least 2 m away from the microphone.

In some cases the above requirements may not be attainable. In all cases, the details of the features of the test site shall be stated (see Clause 10).

6.2 Wind Speed. Measurements of sound shall not be performed when the wind speed exceeds 10 m/s. In any case, the background A-weighted sound pressure level due to wind shall comply with the requirements of Clauses 6.3.1 and 6.3.2.