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Australian Standard AS 1055.1—1984

ACOUSTICS—DESCRIPTION AND MEASUREMENT OF ENVIRONMENTAL NOISE

Part 1—GENERAL PROCEDURES

STANDARDS ASSOCIATION OF AUSTRALIA
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The following interests are represented on Committee AK/5:

Australian Acoustical Society

Australian Institute of Health Surveyors

Australian Institute of Petroleum Limited

Australian and New Zealand Pulp Industry Technical Association

Australian Road Research Board

Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Council of the City of Sydney

CSIRO, Division of Building Research

CSIRO, Division of Mathematics and Statistics

Department of Defence

Department of Environment and Planning, S.A.

Department of Health, N.S.W.

Department of Public Works, W.A.

Electricity Supply Association of Australia

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National Acoustic Laboratories

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Royal Australian Institute of Architects

Royal Australian Planning Institute

Society of Automotive Engineers, Australasia

State Pollution Control Commission, N.S.W.

University of Adelaide

Victoria Police

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AUSTRALIAN STANDARD

ACOUSTICS—DESCRIPTION AND MEASUREMENT OF ENVIRONMENTAL NOISE
Part 1
GENERAL PROCEDURES

AS 1055.1—1984

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PREFACE

This standard was prepared by the Association's Committee on Community Noise, to supersede AS 1055—1978, Code of Practice for Noise Assessment in Residential Areas.

This standard is part of a series, the other parts of the series being as follows:

Part 2—Application to Specific Situations
Part 3—Acquisition of Data Pertinent to Land Use.

This Part is based on ISO 1996/1, Acoustics—Description and Measurement of Environmental Noise, Part 1—Basic Quantities and Procedures. Part 2 and Part 3 are based respectively on ISO 1996/3 and ISO 1996/2 which are in course of publication.

This series is intended to serve as a general guide to the evaluation of environmental noise, in order to meet the needs of public bodies and persons interested in the control of noise. It applies primarily to noise emitted from industrial, commercial and residential premises, and is intended for use in the evaluation of existing problems, as well as for planning purposes. It may be used for noises which include impulsive components, but it is not suitable for noise which consists solely of discrete impulses, e.g. shooting, blasting.

This standard is not a regulatory document and users should ascertain, from the relevant regulatory authority, details of specific requirements laid down in each State or Territory.

The original standard was widely used following its publication in 1973 and its subsequent revision in 1978. Whereas the 1978 revision was of an editorial nature, the new series contains significant changes. Although for simple problems, this series retains the concept that annoyance generated by a noise may be assessed by comparing the adjusted sound pressure level (based on the average of the maximum levels) and the background sound pressure level (measured as the average of the minimum levels) of a sound-level meter set on A-weighting and 'F' response, for more complex problems and for long-term planning purposes the equivalent continuous A-weighted sound pressure level or other descriptor(s) such as the percentile A-weighted sound pressure levels may be used as the basic quantity or as specified by the relevant regulatory authority.

Extensive research concerning the way in which human beings are affected by noise from a single kind of source such as rail or road vehicles, aircraft or industrial plants, has led to a variety of measures for assessment of different kinds of noise, many of which are in common use. Conversion from one measure to another is often beset with significant uncertainty.

If an acoustical environment were always dominated by a single kind of noise, the confusion caused by the existence of different measures would not be so serious. But often environmental noise is a composite of the sounds from many sources, and the distribution of the different kinds of noise is likely to change from moment to moment. The methods and procedures described in this standard are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site. For certain types of sources more detailed procedures may be used, e.g. reference is made to AS 1269, Hearing Conservation, for situations where the noise may cause hearing impairment. The measurement of road traffic noise is dealt with in AS 2702.

This standard aims at providing authorities with material for the description of noise in community environments. Based on the principles described in this standard, acceptable limits of noise can be specified and compliance with these limits can be controlled.

This standard does not specify limits for environmental noise.

It has been assumed that the user of this series will be adequately trained in the science of acoustics and thoroughly experienced in noise measurement and assessment, but to familiarize the user to some of the new terms introduced in this standard, an example of application has been included (see Appendix C).

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1 SCOPE. This standard sets out general procedures for the description and measurement of environmental noise other than road traffic noise or noise which consists solely of discrete impulses such as are encountered in shooting and blasting.

2 APPLICATION. This standard defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.

3 REFERENCED DOCUMENTS. The following documents are referred to in this standard.

AS 1055	Acoustics—Description and Measurement of Environmental Noise Part 2—Application to Specific Situations Part 3—Acquisition of Data Pertinent to Land Use
AS 1259	Sound Level Meters
AS 1269	Hearing Conservation
AS 1633	Glossary of Acoustic Terms
AS 2659	Guide to the Use of Sound Level Measuring Equipment Part 2—Portable Equipment for Integration of Sound Signals
AS 2680	Acoustics—Performance Requirements for Tape Recording Equipment for Use in Acoustical Measurement Systems
AS 2702	Acoustics—Methods for the Measurement of Road Traffic Noise
SAA MP44	Guide for the Use of Sound Level Measuring Equipment Part 1—Portable Sound Level Meters*
AS XXXX	Integrating Averaging Sound Level Meters†
ISO 3891	Acoustics—Procedures for Describing Aircraft Noise Heard on the Ground.

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

NOTE: For related definitions, see AS 1633.

4.1 A-weighted sound pressure (p_A)—the root-mean-square sound pressure determined by use of frequency-weighting network 'A' (see AS 1259).

4.2 Sound pressure level(L_p)—the level of the root-mean-square (r.m.s.) sound pressure in decibels given by—

$$L_p = 10 \log_{10}(p/p_o)^2 \quad \text{dB}$$

where p is the r.m.s. sound pressure in pascals. The reference sound pressure p_o is 20μPa and does not need to be stated.

4.3 A-weighted sound pressure level (L_{pA})—the level of A-weighted sound pressure given by—

$$L_{pA} = 10 \log_{10}(p_A/p_o)^2 \quad \text{dB(A)}$$

4.4 Percentile A-weighted sound pressure level ($L_{A\%,T}$)—the A-weighted sound pressure level obtained by using time-weighting 'F' (see AS 1259) that is exceeded for a percentage of the time interval considered, e.g. $L_{A95,1h}$ is the A-weighted sound pressure level exceeded for 95 percent of 1 h.

NOTE: Percentile sound pressure levels as determined over a certain time interval cannot generally be extrapolated to other time intervals.

4.5 Equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$)—the value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same mean square sound pressure as a sound under consideration whose level varies with time. It is defined as—

$$L_{Aeq,T} = 10 \log_{10}\left[\frac{1}{t_2 - t_1}\int_{t_1}^{t_2}\frac{p_A^2(t)}{p_o^2}dt\right] \quad \text{dB(A)}$$

where

p_o = reference sound pressure
= 20μPa

$P_{A(t)}$ = instantaneous A-weighted sound pressure of the sound signal at time t

t_1, t_2 = the start and finish times of the measurement time interval T

NOTES:

1. Equivalent continuous A-weighted sound pressure level during time interval T is also called time interval average A-weighted sound pressure level, $L_{A,t}$, in decibels, with the averaging time interval usually indicated in the format, e.g. 1-hour average A-weighted sound pressure level, $L_{A,1h}$.
2. Equivalent continuous A-weighted sound pressure level is also used for assessment of occupational noise exposure (see AS 1269).

Where discrete sampling methods are used, the value of $L_{Aeq,T}$ may be approximated as follows:

$$L_{Aeq,T} \approx 10 \log_{10}\left[\frac{1}{100}\sum_{i=0}^{100} f_i \, 10^{0.1 L_{pAi}}\right] \quad \text{dB(A)}$$

where

L_{pAi} = A-weighted sound pressure level corresponding to the class-midpoint of the class i

f_i = time interval for which the A-weighted sound pressure level is within the limits of class i, expressed as a percentage of the relevant time.

NOTE: Commonly the class interval is 5 dB.

*In course of preparation
†SAA MP44, Part 1 is to be revised and published as AS 2659, Part 1.