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ACOUSTICS—AIRCRAFT NOISE INTRUSION—BUILDING SITING AND CONSTRUCTION

For referenced documents see Appendixes A + G

STANDARDS ASSOCIATION OF AUSTRALIA
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The following interests are represented on Committee AK/4:

Association of Australian Acoustical Consultants

Australian Acoustical Society

Confederation of Australian Industry

CSIRO, Division of Building Research

Department of Employment and Industrial Relations

Department of Housing and Construction

Institution of Engineers Australia

Public Works Department, N.S.W.

Public Works Department, W.A.

Royal Australian Institute of Architects

Royal Melbourne Institute of Technology

State Pollution Control Commission, N.S.W.

University of Adelaide

University of Sydney

Representatives of the following interests also participated in the drafting of this Australian standard:

Department of Aviation

Environment Protection Authority, Victoria

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AUSTRALIAN STANDARD

ACOUSTICS—AIRCRAFT NOISE INTRUSION—BUILDING SITING AND CONSTRUCTION

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PREFACE

This edition of this standard was prepared by the subcommittee on Building Siting and Construction Against Aircraft Noise Intrusion of the Association's Committee on Architectural Acoustics, to supersede AS 2021—1977, Code of Practice for Building Siting and Construction Against Aircraft Noise Intrusion. It provides guidance to regional and local authorities, organizations and others associated with urban and regional planning and building production on the location and construction of new buildings and on the acoustical adequacy of existing buildings in areas near airports.

The extent of aircraft noise intrusion within a building depends substantially on—

(a) the location and orientation of the site relative to the direction of the airport's runway(s);

(b) the type(s) of activity to be, or being, accommodated in the building(s); and

(c) the type(s) of layout, construction and ventilation utilized.

This standard includes guidelines for the assessment of potential aircraft noise exposure at a given site, which are based on the Australian Noise Exposure Forecast (ANEF) system (for details of this system refer to Appendix B) which now replaces the NEF system used in the previous edition of this standard. It also incorporates expanded aircraft noise tables and various associated amendments to the text.

Although most of the ANEF data currently available have been estimated for 1990 or 1995, it is necessary for the purposes of this standard to use noise level data from aircraft operating in Australia in 1985. These data, contained in the Aircraft Noise Level Tables (Tables 3.4 to 3.19), are based on actual measurement and are the arithmetic averages of the maximum levels emitted by the aircraft currently operating, taken over a large number of movements. The data will be amended as new aircraft are commissioned, and as otherwise necessary. This standard deals specifically with noise from take-off and landing operations at civil airports or military air bases.

Exposure prediction below 25 ANEF may be significantly inaccurate, and therefore caution should be exercised in the evaluation of locations outside the 25 ANEF contour. In addition, the extent of noise reduction required for a building will depend in part on the amount of noise from sources other than aircraft. Because of these factors and of the special acoustic requirements of certain types of building, it will sometimes be necessary to undertake supplementary noise measurements so that a sufficiently representative prediction of the noise exposure at the site under evaluation can be obtained. This is also true for aerodromes at which a significant amount of training circuits occur. Such measurements should be performed only by acoustically qualified personnel.

Human reaction to aircraft noise is known to depend not only on the amount of noise, but also on psychosocial factors such as personal sensitivity to noise, fear of aircraft crashing and attitudes towards aviation. Thus some individuals will be seriously disturbed by aircraft noise even when the building is sited and constructed according to this standard.

An example of the application of this standard is given in Appendix E.

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SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. This standard, together with the most appropriate Australian Noise Exposure Forecast (ANEF) plan or locality map available for the airport under consideration, provides guidelines for determining—

(a) whether the extent of aircraft noise intrusion makes indoor spaces unacceptable for the activities to be, or being, accommodated;

(b) the extent of noise reduction required to provide acceptable noise levels indoors for the types of activity to be, or being, accommodated; and

(c) the type of building construction necessary to provide the noise reduction required, provided that windows and doors are closed (see Note 1).

The acceptability of outdoor spaces is not covered by this standard.

NOTES:

1. The recommendations for building construction are based on the assumption that windows and doors are shut. If windows or doors are opened for ventilation or other purposes, the noise attenuation values for various components given in Clause 3.3 will not be achieved. Paragraph (c) above implies that mechanical ventilation must be installed when windows and doors are shut to provide adequate protection against aircraft noise intrusion. Whether or not sufficient ventilation can be achieved by mechanical or other means should be considered before the selection of building components described in Clause 3.3.
2. In certain circumstances it may be necessary to construct or upgrade buildings on sites that would normally be classed as unacceptable, e.g. a hotel in the immediate vicinity of an airport. However, the type of construction necessary to obtain an acceptable acoustic environment inside such buildings falls outside the scope of this standard and specialist acoustic advice should always be obtained.

1.2 APPLICATION. Application of this standard should be considered when a building site is located within certain distances from an airport as given below; however, these distances should be used as guidelines only, to indicate when the recommendations contained in this standard may be applicable.

(a) Within 15 km of an international airport, or major domestic airport, or major military air base.

(b) Within 5 km of a domestic airport with scheduled regular public transport services.

(c) Within 3 km of any other type of airport or airfield for which an ANEF map is available.

Section 2 of this standard gives guidelines for determining the acoustic acceptability of a particular site. Conversely, the standard could be used to assess the noise impact of a new airport or of altering an existing one.

Section 3, used in sequence with Section 2, gives guidelines for determining the extent of noise reduction and type(s) of construction required for a particular building.

Reference to the appropriate ANEF map will be necessary finally to determine the applicability of the recommendations of this standard.

NOTES:

1. A flow chart setting out the various steps contained in this standard is shown in Fig. 1.1.
2. A worked example of the application of the standard is given in Appendix E.

1.3 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 1259	Sound Level Meters
AS 1276	Methods for Determination of Sound Transmission Class and Noise Isolation Class of Building Partitions
AS 2107	Code of Practice for Ambient Sound Levels for Areas of Occupancy Within Buildings
ISO 717/3	Acoustics—Rating of Sound Insulation in Buildings and of Building Elements, Part 3—Airborne Sound Insulation of Facade Elements and Facades

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

1.4.1 Australian noise exposure forecast (*ANEF*)—a single number index for predicting the cumulative exposure to aircraft noise in communities near airports during a specified time period.

NOTE: The computation of this index includes—

(a) measurements of aircraft noise (expressed in Effective Perceived Noise Decibels, EPNdB), which take account of the spectral, temporal and spatial aspects of the noise;

(b) estimates and generalizations of aircraft type groups and mix, number of operations, runway utilization, flight paths and operational procedures; and

(c) time of day, i.e. whether daytime (0700 hours to 1900 hours) or evening/night-time (1900 hours to 0700 hours).

This single number index is useful for rating the compatibility of various land uses with respect to aircraft noise. For this purpose, equivalent *ANEF* values at individual positions around an airport are combined on a map to form *ANEF* contours. (See Appendix B for a description of the ANEF system and the method for its determination.)

1.4.2 Building site—the proposed location for a new building or the location of an existing building in which it is desired to reduce aircraft noise intrusion.

1.4.3 Aircraft noise level—the average maximum A-weighted sound level occurring during an aircraft fly-over measured in decibels(A) (dB(A)) using the S time-weighting of a sound level meter.

NOTE: The A-weighting frequency curve approximates the response of the human ear to sound at different frequencies (see AS 1259).

1.4.4 Relevant runway—the runway whose end is closest to the building site under consideration.