
AMERICAN NATIONAL STANDARD

Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

ANSI/ASA S12.62-2012 /
ISO 9613-2:1996 (MOD)

Accredited Standards Committee S12, Noise

Standards Secretariat
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ANSI/ASA S12.62-2012 / ISO 9613-2:1996 (MOD)
(A Modified Nationally Adopted International Standard)

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Secretariat:

Acoustical Society of America

Approved on September 5, 2012 by:

American National Standards Institute, Inc.

Abstract

This modified Nationally Adopted International Standard specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level (as described in parts 1 to 3 of ISO 1996) under meteorological conditions favorable to propagation from sources of known sound emission.

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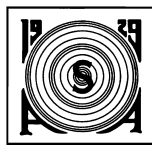
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Foreword

[This Foreword is for information only and is not a part of ANSI/ASA S12.62-2012/ISO 9613-2:1996 (MOD) American National Standard Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.]

This standard comprises a part of a group of definitions, standards, and specifications for use in noise. It was developed and approved by Accredited Standards Committee S12 Noise, under its approved operating procedures. Those procedures have been accredited by the American National Standards Institute (ANSI). The Scope of Accredited Standards Committee S12 is as follows:

Standards, specifications, and terminology in the field of acoustical noise pertaining to methods of measurement, evaluation, and control, including biological safety, tolerance, and comfort, and physical acoustics as related to environmental and occupational noise.

This standard is an editorially modified version of ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*, which was prepared by ISO/TC 43/SC 1, Noise. In conformance with ANSI and ISO rules, the words "this American National Standard" replace the words "this part of ISO 9613" where they appear in the ISO document, decimal points were substituted in place of the decimal commas used in ISO documents, and American English spelling is used in place of British English spelling. In addition, figures were added to help clarify geometry and some editorial changes were made to improve clarity. All editorial additions and modifications are shown in a **bold blue font within a blue box** and are identified as U.S. Modifications. Technically, there is no difference between this version and ISO 9613-2:1996.

Annexes A and B of ANSI/ASA S12.62-2012 / ISO 9613-2:1996 (MOD) are for information only.

At the time this Standard was submitted to Accredited Standards Committee S12, Noise for approval, the membership was as follows:

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Working Group S12/WG 31, Predicting Sound Pressure Levels Outdoors, which assisted Accredited Standards Committee S12, Noise, in the development of this standard, had the following membership.

R.J. Peppin, Chair

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Suggestions for improvements to this standard will be welcomed. They should be sent to Accredited Standards Committee S12, Noise, in care of the Standards Secretariat of the Acoustical Society of America, 35 Pinelawn Road, Suite 114E, Melville, New York 11747-3177. Telephone: 631-390-0215; FAX: 631-390-0217; E-mail: asastds@aip.org.

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1 Scope

This American National Standard specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level (as described in parts 1 to 3 of ISO 1996) under meteorological conditions favorable to propagation from sources of known sound emission.

These conditions are for downwind propagation, as specified in 5.4.3.3 of ISO 1996-2:1987 or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night. Inversion conditions over water surfaces are not covered and may result in higher sound pressure levels than predicted from this American National Standard.

The method also predicts a long-term average A-weighted sound pressure level as specified in ISO 1996-1 and ISO 1996-2. The long-term average A-weighted sound pressure level encompasses levels for a wide variety of meteorological conditions.

The method specified in this American National Standard consists specifically of octave-band algorithms (with nominal midband frequencies from 63 Hz to 8 kHz) for calculating the attenuation of sound which originates from a point sound source, or an assembly of point sources. The source (or sources) may be moving or stationary. Specific terms are provided in the algorithms for the following physical effects:

- geometrical divergence;
- atmospheric absorption;
- ground effect;
- reflection from surfaces;
- screening by obstacles.

Additional information concerning propagation through housing, foliage and industrial sites is given in annex A.

This method is applicable in practice to a great variety of noise sources and environments. It is applicable, directly or indirectly, to most situations concerning road or rail traffic, industrial noise sources, construction activities, and many other ground-based noise sources. It does not apply to sound from aircraft in flight, or to blast waves from mining, military or similar operations.

To apply the method of this American National Standard, several parameters need to be known with respect to the geometry of the source and of the environment, the ground surface characteristics, and the source strength in terms of octave-band sound power levels for directions relevant to the propagation.

NOTE 1 If only A-weighted sound power levels of the sources are known, the attenuation terms for 500 Hz may be used to estimate the resulting attenuation.

The accuracy of the method and the limitations to its use in practice are described in clause 9.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1996-1:1982, Acoustics – Description and measurement of environmental noise – Part 1: Basic quantities and procedures.

ISO 1996-2:1987, Acoustics – Description and measurement of environmental noise – Part 2: Acquisition of data pertinent to land use.

ISO 1996-3:1987, Acoustics – Description and measurement of environmental noise – Part 3: Application to noise limits.

ISO 9613-1:1993, Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere.

IEC 651:1979, Sound level meters, and Amendment 1:1993.

U.S. MODIFICATION: IEC 651:1979 has been superseded by IEC 61672-1 and IEC 61672-2, and the ISO 1996 series has been revised.

3 Definitions

For the purposes of this American National Standard, the definitions given in ISO 1996-1 and the following definitions apply. (See table 1 for symbols and units.)

3.1 equivalent continuous A-weighted sound pressure level, L_{AT} : Sound pressure level, in decibels, defined by equation (1):

$$L_{AT} = 10 \lg \left\{ \left[(1/T) \int_0^T p_A^2(t) dt \right] / p_0^2 \right\} \text{dB} \quad (1)$$

where

$p_A(t)$ is the instantaneous A-weighted sound pressure, in pascals;

p_0 is the reference sound pressure ($= 20 \times 10^{-6}$ Pa);

T is a specified time interval, in seconds.

The A-frequency weighting is that specified for sound level meters in IEC 651.

NOTE 2 The time interval T should be long enough to average the effects of varying meteorological parameters. Two different situations are considered in this American National Standard, namely short-term downwind and long-term overall averages.