

**ANSI/ASA S12.9-2007 / Part 5**  
(Revision of ANSI S12.9-1998/Part 5)

---

---

---

## AMERICAN NATIONAL STANDARD

### **Quantities and Procedures for Description and Measurement of Environmental Sound – Part 5: Sound Level Descriptors for Determination of Compatible Land Use**

---

---

---

ANSI/ASA S12.9-2007/Part 5

Accredited Standards Committee S12, Noise

---

Standards Secretariat  
Acoustical Society of America  
35 Pinelawn Road, Suite 114 E  
Melville, NY 11747-3177

The American National Standards Institute, Inc. (ANSI) is the national coordinator of voluntary standards development and the clearinghouse in the U.S.A. for information on national and international standards.

The Acoustical Society of America (ASA) is an organization of scientists and engineers formed in 1929 to increase and diffuse the knowledge of acoustics and to promote its practical applications.



**ANSI/ASA S12.9-2007 / Part 5**  
(Revision of ANSI S12.9-1998/Part 5)

AMERICAN NATIONAL STANDARD

**Quantities and Procedures for  
Description and Measurement  
of Environmental Sound —  
Part 5: Sound Level Descriptors for  
Determination of Compatible Land Use**

**Secretariat:**

**Acoustical Society of America**

**Approved November 14, 2007:**

**American National Standards Institute, Inc.**

**Abstract**

This Standard provides guidance on the compatibility of various human uses of land with the acoustical environment. This Standard uses the annual average of the total day-night adjusted sound exposure or the annual average of the adjusted day-night average sound level to characterize the acoustical environment. The annual average of the total day-night adjusted sound exposure and annual average of the adjusted day-night average sound level are explained in Part 4 of ANSI S12.9. An informative annex provides guidance for designation of land uses compatible with existing or predicted annual averages of the total day-night adjusted sound exposure or annual average of the adjusted day-night average sound level. Ranges of the annual average of the total day-night adjusted sound exposure or annual average of the adjusted day-night average sound level are outlined within which a specific region of compatibility may be drawn. These ranges take into consideration the transmission loss in sound level from outside to inside buildings as commonly constructed in that locality and living habits there.

## AMERICAN NATIONAL STANDARDS ON ACOUSTICS

The Acoustical Society of America (ASA) provides the Secretariat for Accredited Standards Committees S1 on Acoustics, S2 on Mechanical Vibration and Shock, S3 on Bioacoustics, and S12 on Noise. These committees have wide representation from the technical community (manufacturers, consumers, trade associations, organizations with a general interest, and government representatives). The standards are published by the Acoustical Society of America as American National Standards after approval by their respective Standards Committees and the American National Standards Institute.

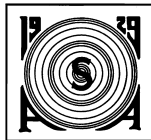
These standards are developed and published as a public service to provide standards useful to the public, industry, and consumers, and to Federal, State, and local governments.

Each of the Accredited Standards Committees [operating in accordance with procedures approved by American National Standards Institute (ANSI)] is responsible for developing, voting upon, and maintaining or revising its own Standards. The ASA Standards Secretariat administers Committee organization and activity and provides liaison between the Accredited Standards Committees and ANSI. After the Standards have been produced and adopted by the Accredited Standards Committees, and approved as American National Standards by ANSI, the ASA Standards Secretariat arranges for their publication and distribution.

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered and that a concerted effort be made towards their resolution.

The use of an American National Standard is completely voluntary. Their existence does not in any respect preclude anyone, whether he or she has approved the Standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the Standards.

NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this Standard.



Acoustical Society of America  
ASA Secretariat  
35 Pinelawn Road, Suite 114E  
Melville, New York 11747-3177  
Telephone: 1 (631) 390-0215  
Fax: 1 (631) 390-0217  
E-mail: [asastds@aip.org](mailto:asastds@aip.org)

© 2007 by Acoustical Society of America. This standard may not be reproduced in whole or in part in any form for sale, promotion, or any commercial purpose, or any purpose not falling within the provisions of the U.S. Copyright Act of 1976, without prior written permission of the publisher. For permission, address a request to the Standards Secretariat of the Acoustical Society of America.

## Contents

1	Scope .....	1
2	Normative references .....	1
3	Definitions.....	1
	Annex A (informative) Land Use Compatibility with Annual Average of the Total Day-Night Adjusted Sound Exposure and Annual Average of the Adjusted Day-Night Average Sound Level .....	3
	A.1 Land uses.....	3
	A.2 Land use compatibility .....	3
	A.3 Compatibility for common construction techniques .....	4
	A.4 Compatibility for special sound insulation.....	4

## Figures

Figure A.1 — Land use compatibility with annual average of the total adjusted day-night sound exposure (DNSE) or annual average of the adjusted day-night average sound level (DNL) at a site for buildings as commonly constructed. At specific receiver locations, it may be appropriate to use sound exposure and sound exposure level without inclusion of some of the adjustments from Part 4 of ANSI S12.9. The # symbol is placed in front of the description of such land uses. For example, none of the land uses marked with a # symbol would typically require a nighttime or weekend adjustment..... 5

## Foreword

*[This foreword is for information only and is not an integral part of ANSI/ASA S12.9-2007 / Part 5 American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound — Part 5: Sound Level Descriptors for Determination of Compatible Land Use.]*

This American National Standard supplements the other five Parts of this series of Standards. Part 1 presents definitions of quantities for description and measurement of outdoor environmental sounds. Part 2 describes methods to measure long-term environmental sounds over wide areas. Part 3 presents methods to measure short-term environmental sound when an observer is present to operate the instruments. Part 4 presents methods to assess noise and predict the long-term community response to noise. Part 6 presents methods to estimate awakenings associated with aircraft noise events heard in homes. This Part 5 of ANSI S12.9 supersedes and replaces ANSI S12.9-1998/Part 5, which in turn replaced ANSI S12.40-1990 and its predecessor, ANSI S3.23-1980.

The revisions contained in this 2007 edition of ANSI/ASA S12.9 / Part 5 are minor. The most major revision is that the outdoor noise environment recommended by ANSI/ASA S12.9-2007 / Part 5 for schools agrees with the recommendations in ANSI S12.60. Other changes to Figure A.1 are that the marginally compatible zone for single-family homes is reduced by 5 dB to be the same size range as other housing. Largely because of sleep disruption concerns, the un-soundproofed marginally compatible range for health care facilities is reduced to DNL 55 from 60 dB, and the un-soundproofed marginally compatible range for hotels is reduced to DNL 60 from 65 dB. The upper limit for health care facilities and hotels that include soundproofing remains unchanged at a DNL of 75 dB. There are numerous editorial changes including the change of the word “noise” to “sound” or “acoustical” and reference to ANSI S12.9 / Part 6.

This Standard contains one informative annex.

This Standard was developed under the jurisdiction of Accredited Standards Committee S12, Noise, which has the following scope:

*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.*

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

R.D. Hellweg, *Chair*  
W.J. Murphy, *Vice-Chair*

S.B. Blaeser, *Secretary*

<b>Acoustical Society of America</b> .....	B.M. Brooks
.....	D. Lubman (Alt.)
<b>Aearo Company</b> .....	E.H. Berger
<b>Air-Conditioning and Refrigeration Institute</b> .....	S. Lind
.....	D. Brown (Alt.)
<b>Alcoa Inc.</b> .....	W.D. Gallagher
<b>American Academy of Otolaryngology</b> .....	R.A. Dobie
.....	L.A. Michael (Alt.)

<b>American Industrial Hygiene Association</b> .....	D. Driscoll
.....	S.N. Hacker (Alt.)
<b>American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)</b> .....	R.J. Peppin
<b>American Speech-Hearing-Language Association</b> .....	L.A. Wilber
.....	V. Gladstone (Alt.)
<b>Bruel &amp; Kjaer Instruments, Inc.</b> .....	M. Alexander
.....	J. Chou (Alt.)
<b>Caterpillar, Inc.</b> .....	K.G. Meitl
<b>Compressed Air and Gas Institute</b> .....	R.C. Johnson
.....	D.R. Bookshar (Alt.)
<b>Council for Accreditation in Occupational Hearing Conservation</b> .....	J.A. Mann
.....	E.H. Berger (Alt.)
<b>Emerson Electric – Copeland Corporation</b> .....	A.T. Herfat
<b>General Motors</b> .....	D. Moore
<b>Howard Leight Industries</b> .....	B. Witt
.....	V. Larson (Alt.)
<b>Information Technology Industry Council</b> .....	R.D. Hellweg
.....	J. Rosenberg (Alt.)
<b>Institute of Noise Control Engineering</b> .....	B. Tinianov
.....	M. Lucas (Alt.)
<b>International Safety Equipment Association</b> .....	J. Birkner
.....	J.C. Bradley (Alt.)
<b>John Deere</b> .....	K. Cone
<b>Modular Building Institute</b> .....	D. Shuford
.....	J. Brosius (Alt.)
<b>National Council of Acoustical Consultants</b> .....	J. Erdreich
.....	G.E. Winzer (Alt.)
<b>National Hearing Conservation Association</b> .....	K. Michael
<b>National Institute for Occupational Safety and Health</b> .....	W.J. Murphy
.....	M. Stephenson (Alt.)
<b>Noise Control Engineering, Inc.</b> .....	M. Bahtiarian
.....	R. Fischer (Alt.)
<b>Noise Pollution Clearinghouse</b> .....	L. Blomberg

<b>North American Insulation Manufacturers Association</b> .....	R.D. Godfrey
<b>PCB Group</b> .....	K. Cox
.....	L. Harbaugh (Alt.)
<b>Plantronics, Inc.</b> .....	A.K. Woo
<b>Power Tool Institute, Inc.</b> .....	W.D. Spencer
.....	M. Hickok (Alt.)
<b>Quest Technologies, Inc.</b> .....	M. Wurm
.....	P. Battenberg (Alt.)
<b>Rubber Manufacturers Association</b> .....	S. Butcher
.....	A. Hartke (Alt.)
<b>SAE</b> .....	C. Michaels
<b>Schomer and Associates, Inc.</b> .....	P.D. Schomer
<b>U.S. Air Force</b> .....	R. McKinley
<b>U.S. Army Aeromedical Research Lab</b> .....	W. Ahroon
<b>U.S. Army Center for Health Promotion and Preventive Medicine</b> .....	W.A. Russell
.....	D. Fenneman (Alt.)
<b>U.S. Army Construction Engineering Research Laboratory</b> .....	M. White
.....	L. Pater (Alt.)
<b>U.S. Army Human Research and Engineering Directorate</b> .....	K. Cave
.....	M.S. Binseel (Alt.)
<b>U.S. Department of Transportation</b> .....	A. Konheim
<b>U.S. Naval Surface Warfare Center - Carderock</b> .....	M. Craun

Individual Experts of Accredited Standards Committee S12, Noise, were:

P.K. Baade	L.S. Finegold	P.D. Schomer
L.L. Beranek	W.J. Galloway	J.P. Seiler
E.H. Berger	R.D. Hellweg	L.C. Sutherland
S.H.P. Bly	R.K. Hillquist	W.R. Thornton
B.M. Brooks	W.W. Lang	L.A. Wilber
A.J. Campanella	D. Lubman	G.E. Winzer
K.M. Eldred	R.J. Peppin	G.S.K. Wong
	J. Pope	



Working Group S12/15, Measurement and Evaluation of Outdoor Community Noise, which assisted Accredited Standards Committee S12, Noise, in the preparation of this Standard, had the following membership:

	P.D. Schomer, <i>Chairman</i>	
L. Blomberg	L.S. Finegold	G.A. Luz
A. Bontomase	L. Goodfriend	A.H. Marsh
B.M. Brooks	A.G. Konheim	L. Pater
G.A. Daigle	S. Lind	K.S. Pearsons
K.M. Eldred		W.D. Whiteford

Suggestions for improvements of 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](mailto:asastds@aip.org)

## Introduction

0.1 The compatibility of various land uses with the outdoor noise environment at a receiver site depends on acoustical and non-acoustical factors.

- (i) *Acoustical factors*: the sound level at the receiver's outdoor location and its variation with time; the sound isolation provided by the buildings where people experience the effects of outdoor noise; and the noise environment generated indoors by indoor sources, including sounds produced by people themselves.
- (ii) *Non-acoustical factors*: the type of human activity associated with a specific land use; the differing responses of individuals to the same noise environment; attitudes toward the noise sources and the persons responsible for creating the noise; familiarity with an intruding noise through previous experiences; the disturbance of an activity or the annoyance caused by the noise; specific requirements of individual communities; the cost of achieving lower average sound levels; and the technical feasibility of reducing the sound levels.

0.2 Many rating methods and measurement procedures have been proposed for assessing the compatibility between the noise environment and human activity. To assess the environmental acceptability of a site for various land uses it is desirable, when possible, to use a single measure that applies to sounds from all sources, individually and in combination, contributing to the overall sound at a site.

0.3 This Standard specifies the annual average of the total day-night adjusted sound exposure and corresponding annual average of the adjusted day-night average sound level as the acoustical measures to be used in assessing compatibility between various land uses and an outdoor noise environment. Total day-night adjusted sound exposure and adjusted day-night average sound level are similar to non-adjusted total day-night sound exposure and day-night average sound level. The difference is that the sound exposures for sounds with special characteristics such as impulsiveness, dominant pure tones, rapid onset, and sounds with strong low-frequency content are adjusted by a factor before they are added into the total.

NOTE 1 The annual average of the total day-night adjusted sound exposure is the average of the daily total day-night sound exposure over the number of days specifically included in the computation. As such, it can be thought of as *the total (day-night) sound (exposure) on the average day*.

NOTE 2 For some noise environments, the total day-night sound exposure or the day-night average sound level without some of the adjustments may be more appropriate for assessments of compatible land use. Annex A designates land uses such as sports arenas where the total day-night sound exposure or the day-night average sound level without the adjustments may be more appropriate for assessments of compatible land use.

0.4 Part 4 of ANSI S12.9 describes the calculation of total day-night adjusted sound exposure and adjusted day-night average sound level. Part 1 of ANSI S12.9 defines day-night average sound level and other descriptors of community noise. Part 2 of ANSI S12.9 describes long-term measurement procedures. Part 3 of ANSI S12.9 describes short-term measurement procedures with an observer present. Part 6 of ANSI S12.9 provides methods for the estimation of awakenings associated with aircraft noise events heard in homes.

0.5 Definitions of the descriptors of sound are exact and are specified with the same precision as any physically measurable acoustical quantity. In contrast to the physical measurement of the sound, the assessment of the relation of land use to prevailing noise is significantly less precise, in view of the non-acoustical factors described in 0.1 and because average noise levels may not adequately characterize the

noise environment for some types of noise (e.g., an environment characterized by a series of loud, infrequent noise events).

0.6 The ranges to the annual average of the total day-night adjusted and non-adjusted sound exposure or annual average of the adjusted and non-adjusted day-night average sound level noted in the annex for various land uses reflect the statistical variability of the responses of large groups of people to noise. Any particular value of adjusted day-night average sound level may not, therefore, accurately assess an individual's response to an actual acoustical environment.

0.7 Guidelines given in the annex for the annual average of the total day-night adjusted sound exposure and annual average of the adjusted day-night average sound level were based on studies of noise-induced annoyance and other forms of noise-induced activity interference. A listing of the data on these relationships is given in the bibliography to Part 4 of ANSI S12.9.

This is a preview of "ANSI/ASA S12.9/Part ...". [Click here to purchase the full version from the ANSI store.](#)

# American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound — Part 5: Sound Level Descriptors for Determination of Compatible Land Use

## 1 Scope

1.1 This Standard provides guidelines for assessing the compatibility of various human uses of land with the actual or projected outdoor acoustical environment at a site. The total acoustical environment is characterized by the annual average of the total day-night adjusted sound exposure or the annual average of the adjusted day-night average sound level. This Standard is based on the long-term annoyance response of average communities as measured by the percent of a community that is highly annoyed.

**NOTE** Annex A contains designated land uses such as sports arenas where the total day-night sound exposure or the day-night average sound level without the adjustments may be more appropriate for assessments of compatible land use.

1.2 This Standard does not address the effects of short-term exposure of people to intrusive sounds in locations such as parks and wilderness areas. The Standard does not address other effects of noise such as sleep disturbance or health effects. The effects of aircraft noise on sleep can be found in ANSI S12.9-2000 / Part 6. This Standard does not provide a method to predict the response of a community to short-term, infrequent, or non-repetitive sources of sound.

## 2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI S1.1-1994 (R 2004) *American National Standard Acoustical Terminology*.

ANSI S12.9-1988 / Part 1 (R 2003) *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound — Part 1*.

ANSI S12.9-2005 / Part 4 *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound — Part 4: Noise Assessment and Prediction of Long-Term Community Response*.

## 3 Definitions

For the purposes of this Part 5, the following definitions and quantities given in ANSI S1.1, ANSI S12.9/Part 1 and ANSI S12.9/Part 4 apply.