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New York, New York 10017

AMERICAN NATIONAL STANDARD

Methods for Measurement of Impulse Noise

ABSTRACT

This standard describes methods for measurement of impulse noise and presentation of data. Its scope applies to all kinds of impulse noise, whether discrete event sources, such as quarry and mining explosions or sonic booms, or from multiple event sources such as pile drivers, riveting, or machine-gun firing, but not to sounds from other sources which have specific measurement standards based on the general methods for measurement of quasisteady noise. Data which may be reported include characteristics of the time variation of the sound pressure, with or without specific frequency weighting, and sound exposure level.

AMERICAN NATIONAL STANDARDS ON ACOUSTICS

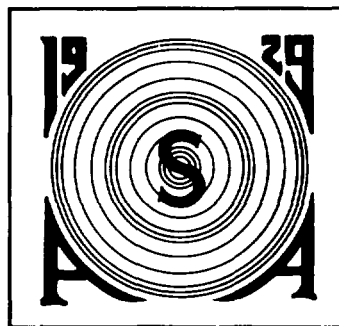
The Acoustical Society of America holds the Secretariat for Accredited Standards Committees S1 on Acoustics, S2 on Mechanical Shock and Vibration, S3 on Bioacoustics, and S12 on Noise. Standards developed by these committees, which have wide representation from the technical community (manufacturers, consumers, and general-interest representatives), are published by the American Institute of Physics for 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 as a public service to provide standards useful to the public, industry, and consumers, and to Federal, State, and local governments.

This standard was approved by the American National Standards Institute as ANSI S12.7-1986 on 20 February 1986.

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review and users are cautioned to obtain the latest editions.

Caution Notice: An American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to affirm, revise, or withdraw this standard no later than five years from the date of publication.



FOREWORD

[This Foreword is for information only, and is not a part of American National Standard Methods for the Measurement of Impulse Noise, S12.7-1986 (ASA Catalog No. 62-1986)]

This standard was developed under the jurisdiction of Accredited Standards Committee S12 using the American National Standards Institute (ANSI) Standards Committee Procedure. The Acoustical Society of America holds the Secretariat for Committee S12.

Accredited Standards Committee S12, under whose jurisdiction this standard was developed, 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 environment and occupational noise.

At the time this standard was submitted to Accredited Standards Committee S12 for approval, the membership consisted of:

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FOREWORD

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Suggestions for improvement of this standard will be welcomed. They should be sent to the Standards Secretariat, Acoustical Society of America, 335 East 45th Street, New York, NY 10017.

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American National Standard

Methods for Measurement of Impulse Noise

1 SCOPE

This standard describes preferred methods for measurement of impulse noise and presentation of the data. This standard does not provide methods for interpreting the potential effects of impulse noise on hearing, community response, or structures.

This standard applies to the measurement of impulse noises, including (1) discrete sources, such as quarry and other mining explosions, artillery fire, bombing and other similar military activities, sonic boom, pistol and rifle fire, and tripping of industrial circuit breakers; and (2) multiple-event sounds, such as pile driver, riveting, machine-gun firing, and helicopter blade slap. This standard is not intended to apply to sounds from other sources which have specific measurement standards based on the general standardized methods for measurement of quasi-steady noise, or to impulse noises from receivers or speakers that are close-coupled to the ear.

Two different kinds of measurements are considered: (1) measurements of parameters, such as peak sound pressure level or duration, that directly characterize the variation of instantaneous sound pressure with time, and (2) measurements of time-integrated quantities such as (frequency-weighted) sound exposure level.

2 STANDARDS REFERRED TO IN THIS AMERICAN NATIONAL STANDARD

When the following American National Standards are superseded by a revision approved by the American National Standards Institute, Inc., the revision shall apply.

(1) American National Standard Specification for Sound Level Meters, S1.4-1983. American National Standard S1.4A-1985 (Amendment to S1.4-1983).

(2) American National Standard Method for the Calibration of Microphones, S1.10-1966 (R1986)

(3) American National Standard Specification for Octave, Half-Octave, and One-third Octave Band Filter Sets, S1.1-1966 (R1976).

(4) American National Standard Methods for the Measurement of Sound Pressure Levels, S1.13-1971 (R1986).

(5) American National Standard Specifications for Acoustical Calibrators, S1.40-1984.

3 DEFINITIONS

For the purpose of this standard, the following definitions apply:

A-duration. Total time between the 20-dB start time and the first time that the flat-weighted sound pressure level is 20 dB down from the peak flat sound pressure level. (See Ref. 1 and Fig. 1.) Unit: second (s).

B-duration. Total time that the envelope of flat-weighted sound pressure level fluctuations, both positive and negative, is within 20 dB of the peak flat sound pressure level. Included in the B-duration is the duration of that part of any reflection pattern that is within 20 dB of the peak flat sound pressure level. (See Ref. 1 and Fig. 2.) Unit: second (s).

bandwidth. Frequency range over which response of a system is within zero to -3 dB of an ideal flat response. Unit: hertz (Hz).

droop. Amount multiplied by 100 by which the system output drops below the ideal final output in response to a step-function input, divided by the ideal final output. This measurement shall be made at a time which equals or exceeds the duration of the waveform of interest. Unit: percent (%).

dynamic range. Difference between (1) the maximum signal level expressed as sound pressure level for which the electrical or acoustical system operates within stated specifications and (2) the system background noise level expressed as sound pressure level. Unit: decibel (dB).

NOTES:

(1) The useful dynamic range is limited at low sound pressure levels by acoustic noise or by electric circuit noise. The nature of the background noise limit should be stated explicitly (e.g., ambient noise, equipment noise, thermal noise).

(2) The useful dynamic range is limited at high sound pressure levels by overloading of the microphone or the electronic instrumentation. The nature of this overload condition should be stated explicitly (e.g., departure from linear response, signal distortion, overheating).

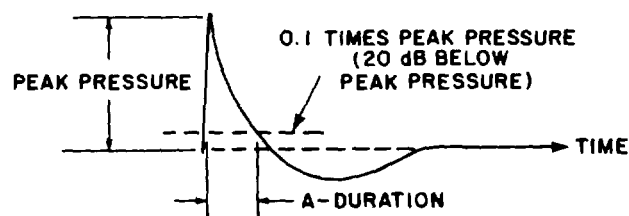


FIG. 1. A-duration.