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Standard Terminology Relating to Building and Environmental Acoustics[1]

This standard is issued under the fixed designation C634; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—Editorial corrections made throughout in October 2016.

INTRODUCTION

In some of the entries, those that are measures of physical quantities, the term is followed by several items: an abbreviation or a symbol, or both, the dimensions of quantities, the measurement units, and the part of speech. The abbreviation, where applicable, indicates the term as typically referenced. The symbol stands for the magnitude of the quantity in mathematical expressions. The dimensions of a quantity express its measure in terms of three fundamental quantities: *M* for mass, *L* for length, and *T* for time. Speed, for instance, is the quotient obtained when the distance an object moves is divided by the time involved. The dimensions are $[LT^{-1}]$, the negative exponent indicating division. The measurement units are consistently in SI, Le Système International d'Unités. Those still using the cgs (centimetre-gram-second) or the inchpound system of units are referred for most of the conversion factors to IEEE/ ASTM SI 10. Some conversion factors are listed in Section 5 of this document for convenient reference.

The dimensions of a quantity are the same regardless of the units in which the quantity is measured. Speed has the dimensions $[LT^{-1}]$ whether it is measured in miles per hour, feet per second, or metres per second. Quantities with different dimensions are not the same. Flow resistance and specific flow resistance, for instance, are quantities of different kinds even though the names are similar. On the other hand, quantities with the same dimensions are not necessarily of the same kind. Sound energy density, for instance, has the same dimensions as sound pressure, $[ML^{-1}T^{-2}]$, but it is not a kind of sound pressure. Nor is absorption with the dimensions $[L^2]$ a kind of area.

1. Scope

1.1 This terminology covers terms and definitions related to environmental acoustics. Only definitions common to two or more standards under the jurisdiction of Committee E33 are listed here. The purpose of this terminology is to promote uniformity of key definitions. Definitions pertinent to only one standard and exceptions to the definitions listed below are contained in the individual standards and should be used when following those standards.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C367 Test Methods for Strength Properties of Prefabricated Architectural Acoustical Tile or Lay-In Ceiling Panels

C384 Test Method for Impedance and Absorption of Acoustical Materials by Impedance Tube Method

C423 Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

C522 Test Method for Airflow Resistance of Acoustical Materials

C635 Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

C636 Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

E90 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

E336 Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings

E413 Classification for Rating Sound Insulation

[1] This terminology is under the jurisdiction of ASTM Committee E33 on Building and Environmental Acoustics and is the direct responsibility of Subcommittee E33.07 on Definitions and Editorial.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

E477 Test Method for Laboratory Measurements of Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
E492 Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
E557 Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions
E596 Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures
E756 Test Method for Measuring Vibration-Damping Properties of Materials
E795 Practices for Mounting Test Specimens During Sound Absorption Tests
E966 Guide for Field Measurements of Airborne Sound Attenuation of Building Facades and Facade Elements
E989 Classification for Determination of Impact Insulation Class (IIC)
E1007 Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures
E1014 Guide for Measurement of Outdoor A-Weighted Sound Levels
E1042 Classification for Acoustically Absorptive Materials Applied by Trowel or Spray
E1050 Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones and a Digital Frequency Analysis System
E1110 Classification for Determination of Articulation Class
E1111 Test Method for Measuring the Interzone Attenuation of Open Office Components
E1123 Practices for Mounting Test Specimens for Sound Transmission Loss Testing of Naval and Marine Ship Bulkhead Treatment Materials
E1124 Test Method for Field Measurement of Sound Power Level by the Two-Surface Method
E1130 Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Index
E1179 Specification for Sound Sources Used for Testing Open Office Components and Systems
E1222 Test Method for Laboratory Measurement of the Insertion Loss of Pipe Lagging Systems
E1264 Classification for Acoustical Ceiling Products
E1265 Test Method for Measuring Insertion Loss of Pneumatic Exhaust Silencers
E1289 Specification for Reference Specimen for Sound Transmission Loss
E1332 Classification for Rating Outdoor-Indoor Sound Attenuation
E1374 Guide for Open Office Acoustics and Applicable ASTM Standards
E1414 Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
E1503 Test Method for Conducting Outdoor Sound Measurements Using a Digital Statistical Sound Analysis System
E1573 Test Method for Evaluating Masking Sound in Open Offices Using A-Weighted and One-Third Octave Band Sound Pressure Levels
E1574 Test Method for Measurement of Sound in Residential Spaces
E1686 Guide for Applying Environmental Noise Measurement Methods and Criteria
E1704 Guide for Specifying Acoustical Performance of Sound-Isolating Enclosures
E1780 Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source
E2179 Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors
E2202 Practice for Measurement of Equipment-Generated Continuous Noise for Assessment of Health Hazards
E2235 Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods
E2249 Test Method for Laboratory Measurement of Airborne Transmission Loss of Building Partitions and Elements Using Sound Intensity
E2459 Guide for Measurement of In-Duct Sound Pressure Levels from Large Industrial Gas Turbines and Fans
E2638 Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room
IEEE/ ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System

2.2 *ANSI Standard:*
ANSI S1.4 Specification for Sound Level Meters[3]
ANSI S1.6 Preferred Frequencies, Frequency Levels, and Band Numbers for Acoustical Measurements
ANSI S1.11 Octave-Band and Fractional Octave-Band Analog and Digital Filters, Specifications for

3. Terminology

3.1 If the term sought by the user cannot be found in 3.2, it may be found in 4.1.

3.2 *Definitions:*

acoustic impedance, $Z[ML^{-4}T^{-1}]$**,** (mks acoustic ohm or Pa·s/m^3)**,** *n—of a surface, for a given frequency,* the complex quotient obtained when the sound pressure averaged over the surface is divided by the volume velocity through the surface. The real and imaginary components are called, respectively, **acoustic resistance** and **acoustic reactance**.

$$Z \equiv R + jX \quad (1)$$

where:

R = the real component of acoustic impedance, and
X = the imaginary component of acoustic impedance.

acoustical barrier, *n*—contiguous objects such as solid walls, buildings, or earthen berms that substantially block the direct path of sound between a source and receiver, and which, if they have an open edge or edges allowing diffraction around

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

them, are sufficiently wide and high to cause significant reduction of the sound traveling from the source to the receiver.

acoustical material, *n*—any material considered in terms of its acoustical properties. *Commonly and especially,* a material designed to absorb sound.

admittance ratio, yρc**[***dimensionless***],** *n*—the reciprocal of the impedance ratio. The real and imaginary components are called, respectively, **conductance ratio** and **susceptance ratio.**

$$ypc \equiv gpc - jbpc \tag{2}$$

where:

$g\rho c$ = the real component of admittance ratio, and
$b\rho c$ = the imaginary component of admittance ratio.

airborne sound, *n*—sound that arrives at the point of interest, such as one side of a partition, by propagation through air.

airflow resistance, R**[***ML*$^{-4}$*T*$^{-1}$**],** (mks acoustic ohm or Pa·s/m^3)**,** *n*—the quotient of the air pressure difference across a specimen divided by the volume velocity of airflow through the specimen. The pressure difference and the volume velocity may be either steady or alternating.

airflow resistivity, r_o**[***ML*$^{-3}$*T*$^{-1}$**],** (mks rayl/m or Pa·s/m^2)**,** *n—of a homogeneous material,* the quotient of its specific airflow resistance divided by its thickness.

ambient noise, *n*—the composite of airborne sound from many sources near and far associated with a given environment. No particular sound is singled out for interest.

arithmetic mean sound pressure level, *n—of several related sound pressure levels measured at different positions or different times, or both, in a specified frequency band*, the sum of the sound pressure levels divided by the number of levels.

DISCUSSION—The arithmetic mean sound pressure level is sometimes used to approximate the **average sound pressure level**. The accuracy of this approximation depends upon the range of sound pressure levels.

average sound pressure level, $\bar{L}_p$**[***dimensionless***],** *n—of several related sound pressure levels measured at different positions or different times, or both, in a specified frequency band*, ten times the common logarithm of the arithmetic mean of the squared pressure ratios from which the individual levels were derived.

DISCUSSION—1—An average sound pressure level obtained by averaging the A-weighted sound level continuously over a specified period is called the **time-average sound level**.

DISCUSSION—2—Since, by definition, a squared pressure ratio, p_i^2/p_0^2, is equal to $10^{L_i/10}$, average sound pressure level is calculated from the expression:

$$\bar{L}_p = 10\log_{10}\left(\frac{1}{n}\sum_{i=1}^{n} 10^{L_i/10}\right) \tag{3}$$

where:

$\bar{L}_p$ = average sound pressure level, dB,
n = number of individual sound pressure levels,
p_i = rms pressure at an individual position or time, or both, Pa,
p_0 = 20 μPa, reference sound pressure, and
L_i = an individual sound pressure level, dB.

If conditions warrant, an integral expression may be used:

$$\bar{L}_p = 10\log_{10}\left(\frac{1}{T}\int_{t1}^{t2} (p^2(t)/p_0^2)\, dt\right) \tag{4}$$

where:

$\bar{L}_p$ = average sound pressure level during a specified time interval, dB,
T = $t_2 - t_1$ = a specified time interval, s, min, h, or day,
$p(t)$ = instantaneous sound pressure, Pa, and
p_0 = 20 μPa, reference sound pressure.

background noise, *n*—noise from all sources unrelated to a particular sound that is the object of interest. Background noise may include airborne, structureborne, and instrument noise.

cutoff frequency, *n—of an anechoic wedge or set of wedges*, the lowest frequency above which the normal incidence sound absorption coefficient is at least 0.990.

damp, *v*—to cause a loss or dissipation of the oscillatory or vibrational energy of an electrical or mechanical system.

decay rate, d**[***T*$^{-1}$**],** (dB/s)**,** *n—for airborne sound,* the rate of decrease of sound pressure level after the source of sound has stopped; *for vibration,* the rate of decrease of vibratory acceleration, velocity, or displacement level after the excitation has stopped.

decibel, dB**[***dimensionless***],** *n*—the term used to identify ten times the common logarithm of the ratio of two like quantities proportional to power or energy. (See **level, sound transmission loss.**) Thus, one decibel corresponds to a power ratio of $10^{0.1}$ and *n* decibels corresponds to a power ratio of $(10^{0.1})^n$.

DISCUSSION—Since the decibel expresses the ratio of two like quantities, it has no dimensions. It is, however, common practice to treat "decibel" as a unit as, for example, in the sentence, "The average sound pressure level in the room is 45 decibels."

diffraction, *n*—a change in the direction of propagation of sound energy in the neighborhood of a boundary discontinuity, such as the edge of a reflective or absorptive surface.

diffuse sound field, *n*—the sound in a region where the sound intensity is the same in all directions and at every point.

direct sound field, *n*—the sound that arrives directly from a source without reflection.

dummy microphone, *n*—a microphone substitute which has electrical characteristics identical to a functional microphone, but which has essentially no sensitivity to incident sound pressure.

field sound transmission class, FSTC**[***dimensionless***],** *n*—sound transmission class calculated in accordance with Classification E413 using values of field transmission loss.

field transmission loss, FTL[*dimensionless*], *n*—sound transmission loss measured in accordance with Annex A1 of Test Method E336.

flanking transmission, *n*—transmission of sound from the source to a receiving location by a path other than that under consideration.

impact insulation class, IIC[*dimensionless*], *n*—a single-number rating derived from measured values of normalized impact sound pressure levels in accordance with Annex A1 of Test Method E492. It provides an estimate of the impact sound insulating performance of a floor-ceiling assembly.

impedance ratio, z/ρc[*dimensionless*], *n*—the ratio of the specific normal acoustic impedance at a surface to the characteristic impedance of the medium. The real and imaginary components are called, respectively, **resistance ratio** and **reactance ratio**.

$$z/\rho c \equiv r/\rho c + jx/\rho c \quad (5)$$

where:

$r/\rho c$ = the real component of impedance ratio, and
$x/\rho c$ = the imaginary component of impedance ratio.

impulsive sound, *n*—a brief, intrusive sound, such as that associated with a tire blowout, operation of a punch press, the discharge of a firearm, a door slam, or a shout, usually characterized by a rapid rise time in the initial pressure pulse of less than a few milliseconds, and by a decay time of less than a few seconds.

DISCUSSION—No mathematical description exists to unequivocally define the presence of impulsive sound.

insertion loss, IL[*dimensionless*], *n—of a silencer or other sound-reducing element, in a specified frequency band,* the decrease in sound power level, measured at the location of the receiver, when a sound insulator or a sound attenuator is inserted in the transmission path between the source and the receiver.

interference, *n*—any activity or event that could produce anomalous measurements.

level, L[*dimensionless*], *n*—ten times the common logarithm of the ratio of a quantity proportional to power or energy to a reference quantity of the same kind. (See **sound power level, sound pressure level**.) The quantity so obtained is expressed in decibels.

level reduction, LR[*dimensionless*], *n—in a specified frequency band,* the decrease in sound pressure level, measured at the location of the receiver, when a barrier or other sound-reducing element is placed between the source and the receiver.

DISCUSSION—Level reduction is a useful measure in circumstances when measures of transmission loss, insertion loss, or noise reduction are not possible.

maximum sound level, L_{AFmax}[*dimensionless*], (dB), *n*—Ten times the common logarithm of the square of the ratio of the largest frequency-weighted and exponential-time-weighted (or otherwise time-averaged) sound pressure during the measurement period to the square of the reference-sound-pressure of 20 μPa. The subscripts designate the frequency weighting (A or C), and time the weighting or averaging (F for fast, S for slow, I for impulse, or a number with proper units to indicate time interval).

DISCUSSION—The time weighting or averaging time must be specified. The frequency weighting should be specified; otherwise, A-weighting will be understood.

measurement plan, *n*—a document formally describing the specific steps to be taken during a measurement, including any unique requirements.

measurement set, *n*—the set of acoustical measurements and related data obtained at a single measurement location during a specified time interval.

DISCUSSION—The specified time interval may include brief documented periods during which data recording or analysis are paused for the purpose of eliminating the effects of interference.

metric sabin, [L^2], *n*—the unit of measure of sound absorption in the metre-kilogram-second system of units.

noise isolation class, NIC[*dimensionless*], *n*—a single-number rating calculated in accordance with Classification E413 using measured values of noise reduction. It provides an estimate of the sound isolation between two enclosed spaces that are acoustically connected by one or more paths.

noise reduction, NR[*dimensionless*], *n*—the difference between the average sound pressure levels either at two well defined locations based on existing conditions, or at a single location before and after some mitigation measure is implemented.

DISCUSSION—Specific standards may use a more restrictive definition related to the difference either between two locations or before and after a mitigation measure, and some standards may require the noise reduction to be measured in specified frequency bands.

noise reduction coefficient, NRC[*dimensionless*], *n*—a single-number rating, the average, rounded to the nearest 0.05, of the sound absorption coefficients of a material for the four one-third octave bands at 250 Hz, 500 Hz, 1000 Hz, and 2000 Hz, inclusive, measured according to the test method described in Test Method C423.

normal incidence sound absorption coefficient, α_n[*dimensionless*], *n— of a surface, at a specified frequency,* the fraction of the perpendicularly incident sound power absorbed or otherwise not reflected.

normal mode, *n—of a room,* one of the possible ways in which the air in a room, considered as an elastic body, will vibrate naturally when subjected to an acoustical disturbance. With each normal mode is associated a resonance frequency and, in general, a group of wave propagation directions comprising a closed path.

normalized noise isolation class, NNIC[*dimensionless*], *n*—a single-number rating calculated in accordance with Classification E413 using measured values of normalized noise reduction. (See **normalized noise reduction**.)

normalized noise reduction, NNR[*dimensionless*], *n—between two rooms, in a specified frequency band*, the

value that the noise reduction in a given field test would have if the reverberation time in the receiving room were 0.5 s. NNR is calculated as follows:

$$NNR = NR + 10\log_{10}(T/0.5) \quad (6)$$

where:

NR = noise reduction, dB and
T = reverberation time in receiving room, s.

DISCUSSION—The normalized noise reduction is intended to approximate the noise reduction that would exist between two ordinarily furnished rooms.

octave band, *n*—a band of sound frequencies for which the highest frequency in the range is (within 2%) twice the lowest frequency. The position of the band is identified by the rounded geometric mean of the highest frequency and the lowest frequency of the band. The nominal mid-band frequencies of "preferred" octave bands as defined in ANSI S1.6 fall in the series 16, 31.5, 63, 125, 250, 500, 1000 Hz etc.

octave band sound pressure level, OBSPL or Lpl/lf where f indicates the nominal center frequency of a specific band if applicable**[***dimensionless***],** (dB)**,** *n*—sound pressure level for sound filtered using an octave-band filter meeting the requirements of ANSI S1.11.

outdoor-indoor transmission loss, OITL**[***dimensionless***],** *n—of a building facade, in a specified frequency band*, ten times the common logarithm of the ratio of the airborne sound power incident on the exterior of the facade to the sound power transmitted by the facade and radiated to the interior. The quantity so obtained is expressed in decibels.

particle velocity, u**[**LT^{-1}**],** (m/s)**,** *n*—a fluctuating velocity superimposed by the presence of sound on the other velocities the particles of the medium may have. In analogy with alternating voltage its magnitude can be expressed in several ways, such as instantaneous particle velocity or peak particle velocity, but the unqualified term means root-mean-square particle velocity. In air, the other velocities are those due to thermal agitation and wind currents.

peak sound pressure level, L_{PK}**[***dimensionless***],** (dB)**,** *n*—ten times the common logarithm of the square of the ratio of the largest absolute value of the instantaneous sound pressure in a stated frequency band during a specified time interval to the reference sound pressure of 20 μPa.

percentile level, L_x**[***dimensionless***],** (dB)**,** *n—of a time varying level,* the level exceeded x percent of the time during the stated measurement period.

DISCUSSION—Percentile levels are affected by measurement parameters such as bandwidth, frequency weighting, time weighting, and sampling rate that must be explicitly stated.

pink noise, *n*—noise with a continuous frequency spectrum and with equal power per constant percentage bandwidth. For example, equal power in any one-third octave band.

receiving room, *n—in architectural acoustical measurements,* the room in which the sound transmitted from the source room is measured.

reverberant sound field, *n*—the sound in an enclosed or partially enclosed space that has been reflected repeatedly or continuously from the boundaries.

reverberation, *n*—the persistence of sound in an enclosed or partially enclosed space after the source of sound has stopped; *by extension,* in some contexts, the sound that so persists.

reverberation room, *n*—a room so designed that the reverberant sound field closely approximates a diffuse sound field, both in the steady state when the sound source is on, and during decay after the source of sound has stopped.

reverberation time, T_{60}**[***T***],** (s)**,** *n—for airborne sound*, the time it takes a reverberant sound field to decay 60 dB after the source is interrupted.

DISCUSSION—If an ambient sound field limits the ability to measure 60 dB of decay, then this time can be extrapolated from the measure of the shorter decay.

sabin, [L^2**],** *n*—the unit of measure of sound absorption in the inch-pound system.

self-noise, *n*—extraneous non-acoustical signals, generated or induced in a measurement system.

sound absorption, *n*—(*1*) the process of dissipating sound energy. (*2*) the property possessed by materials, objects and structures such as rooms of absorbing sound energy. (*3*) A, *[*L^2*]*; metric sabin—*in a specified frequency band,* the measure of the magnitude of the absorptive property of a material, an object, or a structure such as a room.

DISCUSSION—Sound energy passing through a wall or opening may be regarded as being absorbed in certain calculations.

sound absorption average, SAA**[***dimensionless***],** *n*—a single number rating, the average, rounded to the nearest 0.01, of the sound absorption coefficients of a material for the twelve one-third octave bands from 200 through 2500 Hz, inclusive, measured according to the test method described in Test Method C423.

sound absorption coefficient, α**[***dimensionless***],** (metric sabin/m^2)**,** *n—of a surface, in a specified frequency band,* the measure of the absorptive property of a material as approximated by the method of Test Method C423. *Ideally*, the fraction of the randomly incident sound power absorbed or otherwise not reflected.

sound attenuation, *n*—the reduction of sound pressure as it travels from the source to a receiving location. Sound absorption is often involved as, for instance, in a lined duct. Spherical spreading and scattering are other attenuation mechanisms.

sound energy, E**[**ML^2T^{-2}**],** (J)**,** *n*—energy added to an elastic medium by the presence of sound, consisting of potential energy in the form of deviations from static pressure and of kinetic energy in the form of particle velocity.

sound insulation, *n*—the capacity of a structure to prevent sound from reaching a receiving location. Sound energy is

not necessarily absorbed; impedance mismatch, or reflection back toward the source, is often the principal mechanism.

DISCUSSION—Sound insulation is a matter of degree. No partition is a perfect insulator of sound.

sound intensity, I[MT^{-3}], (W/m^2), *n*—the quotient obtained when the average rate of energy flow in a specified direction and sense is divided by the area, perpendicular to that direction, through or toward which it flows. The intensity at a point is the limit of that quotient as the area that includes the point approaches zero.

sound isolation, *n*—the degree of acoustical separation between two locations, especially adjacent rooms.

DISCUSSION—This qualitative term may be used in lieu of the more quantitative term **noise reduction**. Sound isolation is achieved by using sound-insulating or sound-attenuating elements.

sound level, L_{AF}[*dimensionless*], (dB), *n—of airborne sound*, a sound pressure level obtained using a signal to which a standard frequency-weighting and exponential time weighting has been applied, where the subscript A designates the frequency weighting and the subscript F designates fast exponential time weighting (the A is replaced by C to designate C-weighting, and the F by either S or I to designate slow or impulse time weighting).

NOTE 1—Standard frequency-weightings designated A and C, and exponential time weightings designated fast, slow, and impulses, are defined in ANSI S1.4, Specification for Sound Level Meters.[3]

NOTE 2—The frequency-weighting and exponential time weighting must be specified unless made clear from the context.

NOTE 3—The frequency-weighting modifies the amplitude of the signal as a function of frequency to adjust for differences in perception of sound at different frequencies.

NOTE 4—In symbols, A-weighted sound level L_{AF}, at running time, t, is

$$L_{AF}(t) = 10\log_{10}\left\{\frac{\frac{1}{T}\cdot\int_{-\infty}^{t} P_A^2(v)^{-(t\,-\,v)/T_{dv}}}{P_o^2}\right\} \quad (7)$$

where:

T = the time constant for the time averaging, s (T = 0.125 s for "Fast" time weighting),
v = a dummy variable of integration,
$P_A^2(v)$ = the squared, instantaneous, time varying, A-weighted sound pressure, Pa, and
P_o = the reference sound pressure of 20 μPa.

sound power, W[ML^2T^{-3}], (W), *n—in a specified frequency band,* the rate at which acoustic energy is radiated from a source. *In general,* the rate of flow of sound energy, whether from a source, through an area, or into an absorber.

sound power level, L_W[*dimensionless*], *n—of airborne sound,* ten times the common logarithm of the ratio of the sound power under consideration to the standard reference power of 1 pW. The quantity so obtained is expressed in decibels.

sound pressure, p[$ML^{-1}T^{-2}$], (Pa), *n*—a fluctuating pressure superimposed on the static pressure by the presence of sound. In analogy with alternating voltage its magnitude can be expressed in several ways, such as instantaneous sound pressure or peak sound pressure, but the unqualified term means root-mean-square sound pressure. In air, the static pressure is barometric pressure.

sound pressure level, L_p[*dimensionless*], *n—of airborne sound,* ten times the common logarithm of the ratio of the square of the sound pressure under consideration to the square of the standard reference pressure of 20 μPa. The quantity so obtained is expressed in decibels.

DISCUSSION—The pressures are squared because pressure squared, rather than pressure, is proportional to power or energy.

sound transmission class, STC[*dimensionless*], *n*—a single-number rating calculated in accordance with Classification E413 using values of sound transmission loss. It provides an estimate of the performance of a partition in certain common sound insulation problems.

sound transmission coefficient, τ[*dimensionless*], *n—of a partition, in a specified frequency band,* the fraction of the airborne sound power incident on the partition that is transmitted by the partition and radiated on the other side.

DISCUSSION—Unless qualified, the term denotes the value obtained when the specimen is exposed to a diffuse sound field as approximated, for example, in reverberation rooms meeting the requirements of Test Method E90.

sound transmission loss, TL[*dimensionless*], *n—of a partition, in a specified frequency band,* ten times the common logarithm of the ratio of the airborne sound power incident on the partition to the sound power transmitted by the partition and radiated on the other side. The quantity so obtained is expressed in decibels.

DISCUSSION—Unless qualified, the term denotes the sound transmission loss obtained when the specimen is exposed to a diffuse sound field as approximated, for example, in reverberation rooms meeting the requirements of Test Method E90.

source room, *n—in architectural acoustical measurements,* the room that contains the noise source or sources.

specific airflow resistance, r[$ML^{-2}T^{-1}$], (mks rayl or Pa·s/m), *n*—the product of the airflow resistance of a specimen and its area. This is equivalent to the quotient of the air pressure difference across the specimen divided by the linear velocity, measured outside the specimen, of airflow through the specimen.

specific normal acoustic impedance, z[$ML^{-2}T^{-1}$], (mks rayl or Pa·s/m), *n—at a surface,* the complex quotient obtained when the sound pressure averaged over the surface is divided by the component of the particle velocity normal to the surface. The real and imaginary components of the specific normal acoustic impedance are called, respectively, **specific normal acoustic resistance** and **specific normal acoustic reactance**.

$$z \equiv r + jx \quad (8)$$

where:

r = the real component of the specific normal acoustic impedance, and
x = the imaginary component of the specific normal acoustic impedance.

thermal insulation, *n*—a material or assembly of materials used primarily to provide resistance to heat flow.

time-average sound level, TAV or L_{AT} where the subscript T is the time of the interval of measurement**[***dimensionless***],** (dB)**,** *n*—ten times the logarithm to the base ten of the ratio of mean-square instantaneous A-weighted sound pressure, during a stated time interval T, to the square of the standard reference sound pressure.

DISCUSSION— Time-average sound level is also termed equivalent sound level or equivalent continuous sound level with corresponding abbreviation LEQ and symbol L_{AeqT}.

tonal, *adj—in reference to audible sound,* capable of exciting an auditory sensation having pitch.

unit, *n—measurement,* a precisely specified quantity in terms of which the magnitudes of other quantities of the same kind can be stated.

vibration isolation, *n*—a reduction, attained by the use of a resilient coupling, in the capacity of a system to vibrate in response to mechanical excitation.

white noise, *n*—noise with a continuous frequency spectrum and with equal power per unit bandwidth. For example, equal power in any band of 100-Hz width.

4. Compound Terms

4.1 The definitions of compound terms may be found in the alphabetical section under the word in boldface type as listed below.

A-weighted, **sound level**
absorption, **sound**
absorption coefficient, **normal** incidence sound
absorption coefficient, **sound**
acoustic admittance, **specific** normal
acoustic impedance, **specific** normal
acoustic reactance—see **acoustic** impedance
acoustic resistance—see **acoustic** impedance
admittance, **specific** normal acoustic
airflow resistance, **specific**
attenuation, **sound**
C-weighted, **sound level**
class, **field** sound transmission
class, **impact** insulation
class, **noise** isolation
class, **sound** transmission
coefficient, **noise** reduction
coefficient, **normal** incidence sound absorption
coefficient, **sound** absorption
coefficient, **sound** transmission
conductance ratio—see **admittance** ratio
density, **sound** energy
energy, **sound**
energy density, **sound**
equivalent continuous sound level, see **time-average sound level**
equivalent sound level, see **time-average sound level**
exponential time weighting—see **sound level**
fast, **sound level**
fast exponential time weighting—see **sound level**
field, **diffuse** sound
field, **direct** sound
field, **reverberant** sound
frequency, **cutoff**
frequency weighted, **sound level**
impedance, **acoustic**
impedance, **specific** normal acoustic
impedance of the medium, **characteristic**
impulse, **sound level**
impulse exponential time weighting—see **sound level**
insulation, **sound**
insulation, **thermal**
insulation class, **impact**
intensity, **sound**
isolation, **sound**
isolation, **vibration**
isolation class, **noise**
level, **arithmetic** mean sound pressure
level, **sound**
level, **sound** power
level, **sound** pressure
loss, **field** transmission
loss, **insertion**
loss, **sound** transmission
material, **acoustical**
mode, **normal**
noise, **ambient**
noise, **background**
noise, **pink**
noise, **white**
noise isolation class, **normalized**
noise reduction, **normalized**
normal acoustic admittance, **specific**
normal acoustic impedance, **specific**
power, **sound**
power level, **sound**
pressure, **sound**
pressure level, **arithmetic** mean sound
pressure level, **average** sound
pressure level, equivalent sound—see **average** sound pressure level
pressure level, **sound**
rate, **decay**
ratio, **admittance**
ratio, conductance—see **admittance** ratio
ratio, **impedance**
ratio, reactance—see **impedance** ratio
ratio, resistance—see **impedance** ratio
ratio, susceptance—see **admittance** ratio
reactance, acoustic—see **acoustic** impedance
reactance ratio—see **impedance** ratio
reduction, **level**
reduction, **noise**
reduction, **normalized noise**
reduction coefficient, **noise**
resistance, acoustic—see **acoustic** impedance
resistance, **airflow**
resistance, **specific** airflow
resistance ratio—see **impedance** ratio
resistivity, **airflow**

room, **receiving**
room, **reverberation**
room, **source**
sabin, **metric**
slow, **sound level**
slow exponential time weighting—see **sound level**
sound, **absorption average**
sound, **airborne**
sound, **structureborne**
sound absorption coefficient, **normal** incidence
sound field, **diffuse**
sound field, **direct**
sound field, **reverberant**
sound level, equivalent—see **average** sound pressure level
sound transmission class, **field**
susceptance ratio—see **admittance** ratio
time weighting—see **sound level**
transmission class, **field** sound
transmission class, **sound**
transmission coefficient, **sound**
transmission, **flanking**
transmission loss, **field**
transmission loss, **outdoor-indoor**
transmission loss, **sound**
velocity, **particle**

5. Conversion Factors

5.1 Most factors for converting from measurements in other systems to the International System, SI, are listed in IEEE/ASTM SI 10. A few conversion factors that are not listed explicitly are listed in Table 1.

TABLE 1 Conversion Factors

Quantity	to convert from	to	multiply by
acoustic impedance	cgs acoustic ohm	mks acoustic ohm ($Pa·s/m^3$)	10^5
specific acoustic impedance	cgs rayl	mks rayl (Pa·s/m)	10
airflow resistivity	cgs rayl/cm	mks rayl/m ($Pa·s/m^2$)	10^3
absorption	sabin	metric sabin	0.0929

APPENDIXES

X1. TERMS FROM C634 USED IN OTHER STANDARDS UNDER THE JURISDICTION OF E33

X1.1 See Table X1.1.

TABLE X1.1

Term	ASTM Standards
acoustic impedance	C384, E1050
acoustical barrier	E90, E557, E1014, E1110, E1111, E1374, E1704, E1780
acoustical material	C367, C384, C522, C635, C636, E557, E1042, E1050, E1110, E1130, E1179, E1414
admittance ratio	E1050
Airborne Sound	E90, E336, E413, E477, E492, E557, E1007, E1110, E1222, E1289, E1332, E1374, E1414, E1686, E1704, E1780, E2179, E2249, E2459
Airflow Resistance	C384, C522
Airflow Resistivity	C522
Ambient Noise	C384, E1111, E1124, E1130, E1179, E1686, E1704, E2459
arithmetic mean sound pressure level	E1130, E1573
average sound pressure level	E90, E477, E492, E596, E1007, E1124, E1130, E1222, E1265, E1414, E1573, E2179, E2249, E2459
background noise	C384, C423, E90, E336, E477, E492, E596, E966, E1007, E1050, E1124, E1130, E1179, E1222, E1414, E1503, E1574, E1780, E2179, E2202 , E2249
cutoff frequency	C384
damp	E90
decay rate	C423, E90, E336, E492, E2179
decibel	E90, E336, E477, E492, E1014, E1050, E1110, E1111, E1124E1130E1222, E1265, E1332, E1414, E1573 , E1686, E1704, E1780, E2202 , E2249, E2459
diffraction	C423, E90, E1111
diffuse sound field	C423, E90, E336, E492 , E596, E1007, E1222, E1414
direct sound field	E90, E1124, E1414
dummy microphone	E1503, E1780
field sound transmission class	E336, E413
field transmission loss	E336
flanking transmission	E90, E336, E413, E477, E492, E557, E966, E1007, E1050, E1222, E1374, E1414, E2249
impact insulation class	E492, E989, E1007, E1332, E2179
impedance ratio	C384, E1050
impulsive sound	E1503, E1686, E1780
insertion loss	E477, E1222, E1265, E1265, E1704, E2459
interference	C384, C423, C636, E477, E1014, E1222, E1503, E1686, E1780, E2249, E2459
level reduction	E966, E1130, E1332, E1503, E1686, E1704,E1780
maximum sound level	E966, E1014, E1686
measurement plan	E1503, E1780
measurement set	E1014, E1503, E1574, E1780
metric sabin	E492, E596, E1414
noise isolation class	E336, E413, E557, E596, E1704
noise reduction	C423, E336, E413, E596, E966, E1042, E1414, E1704,, C423, E1042, E1704,E1780
noise reduction coefficient	C423, E1014, E1042, E1264, E1704
normal incidence sound absorption coefficient	C384, E1050, E1130, E1179

TABLE X1.1 *Continued*

Term	ASTM Standards
normal incidence sound absorption coefficient	C384, E1050, E1130, E1179
normal mode	E90, E492
normalized noise isolation class	E336, E413
octave band	C423, E90, E413, E477, E492, E596, E966, E989, E1007 , E1042, E1110, E1124, E1130, E1179, E1222, E1289, E1332, E1374, E1414, E1503, E1573, E1574, E1686, E1704, E1780, E2179, E2202 , E2249, E2459
octave band sound pressure level	E477, E492, E596, E989, E1007, E1124, E1130, E1179, E1374, E1414, E1573 , E1574, E1686, E1704
outdoor-indoor transmission loss	E966
particle velocity	C384, C522, E2249
peak sound pressure level	E1686
percentile level	E1686
pink noise	E90, E336, E477, E1111, E1179, E2459
receiving room	E90, E336, E477, E492, E596, E966, E1007, E1414, E2179, E2249
reverberant sound field	C423, E90, E492, E966, E1007, E1414, E1704, E2249
reverberation	C384, C423, E90, E336, E477, E492, E596, E795, E966, E1042, E1050, E1110, E1222, E1265, E1265, E1374, E1414, E1704, E2249
reverberation room	C384, C423, E90, E336, E477, E492, E596, E795, E966E1042, E1050, E1110E1222, E1265, E1374, E1414, E1704, E2249
reverberation time	E1111, E2235, E2249, E2638
sabin	C423, E90, E336, E492, E596, E795, E966, E1007, E1414,
self-noise	E1503, E1780
sound absorption	C367, C384, C423, C522, E90, E336, E477, E492, E596, E795, E966, E1007, E1042, E1050, E1130, E1179, E1222, E1374, E1414, E1574, E1704
sound absorption average	C423, E1042, E1111
sound absorption coefficient	C384, C423, E336 , E477, E596, E795, E966, E1042, E1050, E1111, E1130, E1179, E1222, E1414, E1574, E1704
sound attenuation	C384, C636, E90, E413, E1007, E1050, E1110, E1374, E1414, E1573, E2179
sound energy	C384, E90, E1050, E1289, E1686, E1704, E2249
sound insulation	E90, E413, E492, E557, E596, E966, E989, E1007, E1332, E1414, E1686, E1704, E2179, E2249
sound intensity	E492, E966, E1124, E2249
sound isolation	E90, E413, E557, E596, E1007, E1414, E1704, E2179, E2249
sound level	E90, E477, E492, E596, E966, E1007, E1014, E1110, E1124, E1130, E1179, E1222, E1265, E1332, E1374, E1414, E1503, E1573 , E1574, E1686, E1704, E1780, E2202, E2459
sound power	C384, C423, E90, E477, E596, E966, E1007, E1124, E1222, E1265, E1414, E1704, E2249
sound power level	C423, E90, E477, E596, E966, E1124, E1222, E1265, E1704, E2249, E2459
sound pressure	C384, C423, E90, E477, E492, E596, E966, E989, E1007, E1050, E1124, E1130, E1179, E1222, E1265, E1374, E1414, E1503, E1573, E1574, E1686, E1704, E1780, E2179, E2249
sound pressure level	C384, C423, E90, E477, E492, E596, E966, E989, E1007, E1050, E1111,E1124, E1130, E1179, E1222, E1265, E1374, E1414, E1503, E1573, E1574, E1686, E1704, E1780, E2179, E2249, E2459
sound transmission class	E90, E413, E557, E2249

TABLE X1.1 *Continued*

Term	ASTM Standards
sound transmission coefficient	E90
sound transmission loss	C423, E90, E413, E477, E492, E557, E596, E966, E1007, E1110, E1222, E1289, E1332, E1414, E1574, E2179, E2249
source room	E90, E492, E1007, E1110, E1414, E2179, E2249
specific airflow resistance	C522
specific normal acoustic impedance	C384, E1050
thermal insulation	E2202
time-average sound level	E1686, E1780, E2202
tonal	E1014, E1503, E1574, E1780
unit	C423, C635, E90, E492, E966, E1007, E1686, E2179, E2202, E2249
vibration isolation	E596, E756, E1111, E1265, E1704, E2235
white noise	E1111, E1130, E1222 , E2459

X2. TERMS FROM C634 USED IN OTHER STANDARDS UNDER THE JURIDICTION OF E33 (SORTED BY STANDARD)

X2.1 See Table X2.1.

TABLE X2.1

Standard	Term
C367	acoustical material, sound absorption
C384	acoustic impedance, acoustical material, airflow resistance, ambient noise, background noise, cutoff frequency, impedance ratio, interference, normal incidence sound absorption coefficient, particle velocity, reverberation, reverberation room, sound absorption, sound absorption coefficient, sound attenuation, sound energy, sound power, sound pressure, sound pressure level, specific normal acoustic impedance
C423	background noise, decay rate, diffraction, diffuse sound field, interference, noise reduction, noise reduction coefficient, octave band, reverberant sound field, reverberation, reverberation room, sabin, sound absorption, sound absorption average, sound absorption coefficient, sound power, sound power level, sound pressure, sound pressure level, sound transmission loss, unit
C522	acoustical material, airflow resistance, airflow resistivity, particle velocity, sound absorption, specific airflow resistance,
C635	acoustical material, unit
C636	acoustical material, interference, sound attenuation
E90	acoustical barrier, airborne sound, average sound pressure level, background noise, damp, decay rate, decibel, diffraction, diffuse sound field, direct sound field, flanking transmission, normal mode, octave band, pink noise, receiving room, reverberant sound field, reverberation, reverberation room, sabin, sound absorption, sound attenuation, sound energy, sound level, sound power, sound power level, sound pressure, sound pressure level, sound transmission class, sound transmission coefficient, sound transmission loss, source room, unit, sound insulation, sound isolation
E336	airborne sound, background noise, decay rate, decibel, diffuse sound field, field sound transmission class, field transmission loss, flanking transmission, noise isolation class, noise reduction, normalized noise isolation class, pink noise, receiving room, reverberation, reverberation room, sabin, sound absorption, sound absorption coefficient
E413	airborne sound, field sound transmission class, flanking transmission, noise isolation class, noise reduction, normalized noise isolation class, octave band, sound attenuation, sound insulation, sound isolation, sound transmission class, sound transmission loss
E477	airborne sound, average sound pressure level, background noise, decibel, flanking transmission, insertion loss, interference, octave band, octave band sound pressure level, pink noise, receiving room, reverberation, reverberation room, sound absorption, sound absorption coefficient, sound level, sound power, sound power level , sound pressure, sound pressure level, sound transmission loss
E492	airborne sound, average sound pressure level, background noise, decay rate, decibel, diffuse sound field, flanking transmission, impact insulation class, metric sabin, normal mode, octave band, octave band sound pressure level , receiving room, reverberant sound field, reverberation, reverberation room, sabin, sound absorption, sound insulation, sound intensity, sound level , sound pressure, sound pressure level, sound transmission loss, source room, unit
E557	acoustical barrier, acoustical material , airborne sound, flanking transmission, noise isolation class, sound insulation, sound isolation, sound transmission class, sound transmission loss
E596	average sound pressure level, background noise, diffuse sound field, metric sabin, noise isolation class, noise reduction, octave band, octave band sound pressure level, receiving room, reverberation, reverberation room, sabin, sound absorption, sound absorption coefficient, sound insulation, sound isolation, sound level, sound power, sound power level, sound pressure, sound pressure level, sound transmission loss, vibration isolation
E756	vibration isolation
E795	reverberation, reverberation room, sabin, sound absorption, sound absorption coefficient
E966	airborne sound, background noise , decibel, diffuse sound field, flanking transmission, interference, level reduction, maximum sound level , noise reduction, octave band, outdoor-indoor transmission loss, receiving room, reverberant sound field, reverberation, reverberation room, sabin, sound absorption, sound absorption coefficient, sound insulation, sound intensity, sound level, sound power, sound power level, sound pressure, sound pressure level, sound transmission loss, unit
E989	impact insulation class, octave band, octave band sound pressure level, sound insulation, sound pressure, sound pressure level
E1007	airborne sound, average sound pressure level, background noise, diffuse sound field, flanking transmission, impact insulation class, octave band, octave band sound pressure level, receiving room, reverberant sound field, sabin, sound absorption, sound attenuation, sound insulation, sound isolation, sound level, sound power, sound pressure, sound pressure level, sound transmission loss, source room, unit
E1014	acoustical barrier, decibel, interference, maximum sound level, measurement set, sound level, tonal
E1042	acoustical material, noise reduction, noise reduction coefficient, octave band, reverberation, reverberation room, sound absorption, sound absorption average, sound absorption coefficient
E1050	acoustic impedance, acoustical material, admittance ratio, background noise, decibel, flanking transmission, impedance ratio, normal incidence sound absorption coefficient, reverberation, reverberation room, sound absorption, sound absorption coefficient, sound attenuation, sound energy, sound pressure, sound pressure level, specific normal acoustic impedance

TABLE X2.1 *Continued*

Standard	Term
E1110	acoustical barrier, decibel, octave band, sound attenuation, sound level, decibel, vibration isolation
E1111	acoustical barrier, ambient noise, diffraction, pink noise, reverberation time, sound absorption average, sound absorption coefficient, sound pressure level, white noise
E1123	acoustical material, airborne sound, reverberation, reverberation room, sound transmission loss, source room
E1124	ambient noise, average sound pressure level, background noise, decibel, direct sound field, octave band, octave band sound pressure level, sound intensity, sound level sound power, sound power level, sound pressure, sound pressure level
E1130	acoustical material, ambient noise, arithmetic mean sound pressure level, average sound pressure level, background noise, decibel, level reduction, normal incidence sound absorption coefficient, octave band, octave band sound pressure level, sound absorption, sound absorption coefficient, sound level, sound pressure, sound pressure level, white noise
E1179	acoustical material, ambient noise, background noise, normal incidence sound absorption coefficient, octave band , octave band sound pressure level, pink noise, sound absorption, sound absorption coefficient, sound level, sound pressure, sound pressure level
E1222	airborne sound, average sound pressure level, background noise, decibel, diffuse sound field, flanking transmission, insertion loss, interference, octave band, reverberation, reverberation room, sound absorption, sound absorption coefficient, sound level, sound power, sound power level, sound pressure, sound pressure level, sound transmission loss, white noise
E1265	average sound pressure level, decibel , insertion loss, reverberation, reverberation room, sound level, sound power, sound power level, sound pressure, sound pressure level, vibration isolation
E1289	airborne sound, octave band, sound energy, sound transmission loss
E1332	airborne sound, decibel, impact insulation class, level reduction, octave band, sound insulation, sound level, sound transmission loss
E1374	acoustical barrier, airborne sound, flanking transmission, octave band, octave band sound pressure level, reverberation, reverberation room, sound absorption, sound attenuation, sound level, sound pressure, sound pressure level
E1414	acoustical material, airborne sound, average sound pressure level, background noise, decibel, diffuse sound field, direct sound field, flanking transmission, metric sabin, noise reduction, octave band, octave band sound pressure level, receiving room , reverberant sound field, reverberation, reverberation room, sabin, sound absorption, sound absorption coefficient, sound attenuation, sound insulation, sound isolation, sound level, sound power, sound pressure, sound pressure level, sound transmission loss, source room, reverberation, reverberation room, sabin, sound absorption, sound absorption coefficient
E1503	background noise, dummy microphone, impulsive sound, interference, level reduction, measurement plan, measurement set, octave band, self-noise, sound level, sound pressure, sound pressure level, tonal
E1573	arithmetic mean sound pressure level, average sound pressure level, decibel, octave band, octave band sound pressure level, sound attenuation, sound level, sound pressure, sound pressure level
E1574	background noise, measurement set, octave band, octave band sound pressure level, sound absorption , sound absorption coefficient, sound level, sound pressure, sound pressure level, sound transmission loss, tonal
E1686	airborne sound, ambient noise, decibel, impulsive sound interference, level reduction, maximum sound level, octave band, octave band sound pressure level, peak sound pressure level, percentile level, sound energy, sound insulation, sound level, sound pressure, sound pressure level, time-average sound level, unit
E1704	acoustical barrier, airborne sound, ambient noise, decibel, insertion loss, level reduction, noise isolation class, noise reduction, noise reduction coefficient, octave band, octave band sound pressure level, reverberant sound field, reverberation, reverberation room , sound absorption, sound absorption coefficient, sound energy , sound insulation, sound isolation , sound level , sound power, sound power level, sound pressure, sound pressure level, vibration isolation
E1780	acoustical Barrier, airborne Sound, background noise, decibel, dummy microphone, impulsive sound, interference, level reduction, measurement plan, measurement set, noise reduction, octave band, self-noise, sound level, sound pressure, sound pressure level, time-average sound level, tonal
E2179	airborne sound, average sound pressure level, background noise, decay rate, impact insulation class , octave band, receiving room, sound attenuation, sound insulation, sound isolation, sound pressure, sound pressure level, sound transmission loss, source room, unit
E2202	background noise, decibel, octave band, sound level , thermal insulation, time-average sound level, unit
E2235	reverberation time, vibration isolation
E2249	airborne sound, average sound pressure level, background noise, decibel, flanking transmission, interference, octave band, particle velocity, receiving room, reverberation time, reverberant sound field, reverberation, reverberation room, sound energy, sound insulation, sound intensity, sound isolation, sound power, sound power level, sound pressure, sound pressure level , sound transmission class, sound transmission loss, source room, unit

TABLE X2.1 *Continued*

Standard	Term
E2459	airborne sound, ambient noise, average sound pressure level, decibel, insertion loss, interference, octave band, pink noise, sound level, sound power level, sound pressure level, white noise
E2638	reverberation time