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GLOSSARY OF TERMS APPLICABLE TO ACOUSTICS IN BUILDINGS

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GLOSSARY OF TERMS APPLICABLE TO ACOUSTICS IN BUILDINGS

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GLOSSARY OF TERMS APPLICABLE TO ACOUSTICS IN BUILDINGS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 January 1981, after the draft finalized by the Terminology, Notations, Drawings and Documentation Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A number of codes have already been published to cover important functional aspects pertaining to the acoustical design and sound insulation of buildings. With a view to bringing about uniformity in the expression of various terms applicable to acoustics in buildings this standard is being issued.

0.3 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practice in the field in this country.

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1. SCOPE

1.1 This standard covers definitions of various terms applicable to acoustics in buildings.

2. TERMINOLOGY

2.1 Absorption Coefficient — Ratio of sound energy absorbed to the incident sound energy on a material.

2.2 Absorption Unit — This is expressed in sabins (*see* **2.58**).

2.3 Absorption of Surface — Product of the area of a surface and its absorption coefficient.

2.4 Acoustic — When used as a qualifying term, it means containing, producing, arising from, actuated by, or carrying sound, or designed to carry sound and capable of doing so, for example acoustic horn, transducer, energy, wave impedance.

2.5 Acoustical — When used as a qualifying term, it means related to, pertaining to, or associated with sound, but not having its properties or characteristics, for example acoustical engineer, terminology, unit.

2.6 Acoustical Treatment — Any treatment of surfaces of an enclosure or introduction therein of sound absorbing devices with the specific purpose of controlling the reverberation time of an enclosure.

2.7 Acoustics — It is the science of sound including its production, transmission and effects.

2.8 Air-borne Noise — Noise transmitted into an enclosure by air vibration through doors, windows, ventilating ducts and other openings.

2.9 Ambient Noise — Ambient noise in the all-encompassing noise associated with a given environment, being usually a composite of sound from many sources near and far.

2.10 Articulation — i) A measure of the intelligibility of speech.

ii) The articulation of a system used for transmitting or reproducing speech in the percentage number or fraction of components correctly recognised over the system.

2.11 Attenuation — The decrease of sound power in decibels between two points in an acoustical system.

2.12 Baffle — A reflecting/absorbing structure, such as a partition, used to modify or restrict the distribution of sound in an acoustical system.

2.13 Bel — It is the fundamental division of a logarithmic scale used to express the ratio of two specified or implied quantities, the number of bels denoting such a ratio being the logarithm to the base 10 of this ratio.

2.13.1 *Decibel* (*dB*) — It is one-tenth of a bel.

Example:

$$\text{Sound power level} = 10 \log_{10} \frac{W}{W_0} \text{ in decibels, dB}$$

$$\text{Sound power level} = 20 \log_{10} \frac{p}{p_0} \text{ in decibels, dB}$$

where

W = measured acoustical power;

W_0 = reference acoustical power, expressed in the same units as W;

p = measured sound pressure; and

p_0 = reference sound pressure, expressed in the same units as p.

2.14 Cavity Wall — A wall constructed of two separated thicknesses with a 50 mm to 100 mm (or more) cavity between, and held together by solid or flexible ties.

2.15 Completely Diffuse Sound — Sound which throughout any given region, has uniform energy density, and for which the directions of propagation at any point are wholly random in distribution.

2.16 Continuous and Impulsive Noise — Sound may be continuous, when the source is constantly vibrating, or as with many industrial noises, it may be impulsive in character, the source being set in vibration only for a short time. For instance, sound from a drop forge hammer belongs to the latter category. Here the high intensity pressure waves die away fast, although the peak levels attained are very high.

2.17 Curtain Wall — A non-structural wall.

2.18 Damage-Risk Noise Criteria — Damage-risk criteria specify the maximum levels and duration of noise exposure that can be considered safe.

2.19 Damping — Gradual, steady absorption of sound/vibration energy and consequent steady decrease of volume of sound.

2.20 Dead — Sets or studios are called 'dead' when these are enclosed by materials which absorb almost all sound within the set or studio.

2.21 Dead Spots — Locations in hall or room where the intensity of sound is negligible due to destructive interference of sound waves.

2.22 Diffracted Wave — A diffracted wave is one whose front has been changed in direction by an obstacle or another non-homogeneity in a medium, otherwise than by reflection or refraction.

2.23 Diffraction — Diffraction is that process which produces a diffracted wave.

2.24 Echo — A distinct and clearly discernible reflected sound received at a point within the enclosure when any sound emanates from any part of that enclosure. A quick succession of such echoes is called flutter or flutter echo.

2.25 Effective Sound Pressure (Root-mean-square sound pressure) — The effective sound pressure at a point is the root-mean-square value of the instantaneous sound pressure, over a time interval at a point under consideration. The term 'effective sound pressure' is frequently shortened to 'sound pressure'.

2.26 Flutter Echo — A rapid multiple echo of even rate.

2.27 Forced Vibration — A vibration directly maintained in a system by a periodic force and having the frequency of the force.

2.28 Free Field — A free sound field is the field in a homogeneous, isotropic medium free from boundaries. In practice it is a field in which the effects of the boundaries are negligible over the region of interest.

2.29 Free Vibration — A vibration resulting from a disturbance of a system and having a period depending solely on the properties of the system.

2.30 Frequency of Pitch — Frequency is the number of vibrations per second while pitch is the frequency sensation as perceived by a human ear. Pitch is defined as that aspect of auditory sensation in terms of which sounds may be arranged on a scale extending from 'low' to 'high' as a musical scale.

2.31 Fundamental — Lowest natural frequency of oscillation for a vibration body.

2.32 Hearing Loss — The hearing loss of an ear at a specified frequency or for a specified type of sound is the difference between the sound pressure level corresponding to the threshold of hearing for that ear and the sound pressure level corresponding to the normal level of hearing.

2.33 Impact Noise — Noise generated in solid structures which gets transmitted as air-borne noise.

2.34 Indoor Noise — i) Noises contributed by internal sources of noise, for example conversation of the occupants, footsteps banging of doors, playing of radios, etc.

ii) Noises in industrial buildings are mainly of indoor origin. These are caused by the machinery in operation and the work processes involved.

2.35 Intensity — Intensity at a point is the average rate at which sound energy is transmitted through a unit or around the point and perpendicular to the direction of propagation of sound.

2.36 Live Stage — i) A stage with a small amount of boundary absorption.

ii) A stage in use for a performance.

2.37 Loudness — It is the sensation produced in the human ear and it depends on the intensity of sound and also its frequency.

2.38 Muffled Sound — Sound confused by overlap of syllables.

2.39 Multiple Echo — A succession of separate echoes from a single sound.

2.40 Noise — It is defined as unwanted sound.

2.41 Noise Reduction Coefficient (NRC) — The noise reduction coefficient of a material is the average, to the nearest multiple of 0·05, of the absorption coefficients at 250, 500, 1 000 and 2 000 Hz.

2.42 Octave-Band Noise Levels — Noise is usually measured in groups of frequencies. A convenient grouping is f_0-2f_0, $2f_0-4f_0$, $4f_0-8f_0$, etc. These are called octave bands.

2.43 Party Wall — Common wall separating two adjoining properties.

2.44 Peak Level — It is the maximum instantaneous level that occurs during a specified time interval. In acoustics, peak sound pressure level is to be understood, unless some other kind of level is specified.

2.45 Peak Sound Pressure — The peak sound pressure for any specified time interval is the maximum absolute value of the instantaneous sound pressure in that interval.

2.46 Peak to Peak Amplitude (Double Amplitude) — The peak-to-peak amplitude of an oscillating quantity is the algebraic difference between the extremes of the quantity.

2.47 Period — The time required for one complete cycle of a periodic quantity in seconds.

2.48 Pitch — It is defined as that aspect of auditory sensation in terms of which sounds may be arranged on a scale extending from low to high like a musical scale.

2.49 Power Spectrum Level — The power spectrum level of a sound at a specified frequency is the power level for the acoustic power contained in a band 1 Hz wide, centered at the specified frequency.

2.50 Public Address System (PA System) — The complete chain of sound equipment (comprising essentially microphones, amplifiers and loud-speakers) required to reinforce the sound emanating from a source in order to provide adequate loudness for comfortable hearing by the audience.

2.51 Random Noise — It is a fluctuating quantity (such as sound pressure) whose instantaneous amplitudes occur, as a function of time, according to a normal (Gaussian) distribution.

2.52 Resonance Air — Air within any enclosure is set into vibration by sound waves. All enclosures have their own resonance frequency which depends on the stiffness of entrapped air.

2.53 Resonance Frequency — A frequency at which resonance occurs in a system.

2.54 Resonance Structural — A resonant effect is produced by the coincidence of the period of the exerting external vibration with the natural period of oscillation of the body (building, structure).

2.55 Reverberation — Persistence of sound in an enclosure (partially or completely enclosed) after the source of sound has stopped.

2.56 Reverberation Chamber — A highly reverberant room with highly sound reflective surfaces, used for providing excess reverberation required for producing sound effects. Such rooms are also used for certain acoustical measurements.

2.57 Reverberation Time — The time taken by the reverberant sound to decay to one-millionth of the sound intensity level existing at the time the source of the sound is stopped.

2.58 Sabin (m^2) — Unit of sound absorption in metric system. This is equal to sound absorption of one square metre of 'open window'.

2.59 Simple Harmonic Motion — It is one in which the relationship between time t and displacement x can be expressed in the form $x = A \sin (wt + \phi)$, where A is the amplitude, w the angular frequency, and ϕ the phase angle.

2.60 Sound Insulation of Building Components — The reduction in the level of sound when it passes through a building component like wall, floor, roof, door, window, etc.

2.61 Sound Level Meter — A device used to measure the sound pressure level or frequency weighted sound pressure level, constructed in accordance with international specifications.

2.62 Sound Power of a Source — It is the total sound energy radiated by the source per unit of time.

2.63 Sound Power Level — The sound power level of a sound source, in decibels, is 10 times the logarithm to the base 10 of the ratio of the sound power radiated by the source to a reference power (Internationally taken as p).

2.64 Sound Reduction between Rooms — The sound reduction, in decibels, between two rooms is the amount by which the mean square sound pressure level in the source room exceeds the level in the receiving room. If a common partition separates two rooms, the first of which contains a sound source, the sound reduction between the two rooms is equal to the transmission loss of the partition plus a function of the total absorption in the second room and the area of the common partition.

2.65 Splay — Sloping or slanting surface.

2.66 Threshold of Feeling — i) Measured under specified conditions and at a specified frequency. The minimum rms value of the sound pressure of a sinusoidal sound wave of that frequency which excites in the ear the sensation of feeling.

ii) Minimum value of the sound pressure of a sinusoidal sound wave of that frequency which excites in the ear the sensation of feeling.

2.67 Threshold of Hearing — Minimum value of the sound pressure of a sinusoidal sound wave of that frequency which excites the sensation of hearing.

2.68 Transmission Loss — The transmission loss between two points of a transmission system is the decrease in power, expressed in decibels.

2.69 Wave Length — Wave length of a sinusoidal progressive wave in an isotropic medium. The perpendicular distance between two wave fronts in which the phases differ by one complete period.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N=1kg. m/s^2
Energy	joule	J	1 J=1 N.m
Power	watt	W	1 W=1 J/s
Flux	weber	Wb	1 Wb=1 V.s
Flux density	tesla	T	1 T=1 Wb/m^2
Frequency	hertz	Hz	1 Hz=1 c/s (s^{-1})
Electric conductance	siemens	S	1 S=1 A/V
Electromotive force	volt	V	1 V=1 W/A
Pressure, stress	pascal	Pa	1 Pa=1 N/m^2