Glossary

Common Terminology & Definitions

ABSORPTION
Energy dissipation in materials wherein the energy is transferred into rather than reflected from or transmitted through the material. When a sound wave comes in contact with a surface, part of the acoustic energy is "absorbed" into the material and transferred into very small amounts of heat. The amount of absorbed sound energy is proportional to the amount of energy reflected back from the surface. This is not to be confused with **sound transmission**, which only characterizes the amount of sound energy transmitted through the surface.

In general, soft or porous materials absorb more sound energy than smooth, rigid materials. The absorption of specific materials is characterized by the absorption coefficient. The amount of sound absorption within a room can be quantified by the absorption area of the room surfaces, or the total absorption area. Absorption area is calculated from the room dimensions and the absorption coefficients of each of the room surfaces, and is particularly useful in the design of concert halls and recording studios.

ACOUSTICS
1. Physics. The category of physical phenomena associated with sound and sound waves.

2. The characteristics, measurements, and metrics applied to building structures that determine the audibility, fidelity, intelligibility, and comfort levels of the sound within.

ACOUSTICAL SEALANT
Any material (caulking, putty, or liquid) designed for application to a surface or fissure in order to form a resilient (non-hardening) barrier, thereby reducing the risk of sound leakage through penetrations or gaps in assembly partitions.

COINCIDENCE FREQUENCY
The frequency at which the acoustic wave number of the incident sound wave matches the structural wave number of the surface (panel, plate, beam, or string). It can usually by observed in STC reports where there is sudden drop in a sound transmission loss (STL) curve—normally at high frequencies—that would have otherwise followed a relatively linear path.

CONSTRAINED-LAYER DAMPING (CLD)
A vibration isolation technique that employs the application of materials that are viscoelastic—materials that can deform easily when forced upon and then reshape back into their original form—between rigid plates or panels. The resulting composite panel uses shear-loading and vibration decay to reduce noise by 10 dB or more versus traditional treatments. **QuietRock** is an example of a constrained-layer damping (CLD) panel.

DAMPING
Any mechanism that causes dissipation, or loss, in energy.

Damping is not to be confused with dampening, which means "to make wet".

DECIBEL (dB)
A base-ten logarithmic—$\log_{10}$, thus the "deci" in the unit name—ratio that is normally calculated as the ratio between measured energy and a reference energy value. For most building noise control measurements the decibel is calculated as 20 times the base-ten logarithm of the ratio between the measured sound pressure and a reference sound pressure (20 µPa). Decibels are logarithmic, not linear. Therefore, decibel levels of two different sound sources cannot be added linearly (2+2=4). For example, 80 dB + 80 dB = 83 dB.

DECOUPLING
The separation of mechanically- or structurally-coupled systems so that they may operate—or in regard to acoustics, vibrate—independently. Decoupling common to the building noise control industry involves mechanically isolating the gypsum wallboard from the structural members via materials such as resilient channels or sound isolation clips.

FIELD MEASUREMENT
Measurements made on-site in rooms or buildings instead of a laboratory. Some examples of field building noise measurements include:

- **ISPL** – Impact Sound Pressure Level is a measurement of the impact noise transmitted from one floor to another
- **RTNISPL** – Reverberation Time Normalized Impact Sound Pressure Level is a measurement of the impact sound pressure level that is normalized based on a reverberation time of 0.5 seconds.
- **ANISPL** – Absorption Normalized Impact Sound Pressure Level is a measurement of the impact sound pressure level that is normalized based on the average absorption area of the test room.
- **NR** – Noise Reduction is a measurement of the sound transmission loss through partitions without accounting for reverberation time, absorption, and flanking paths
- **NNR** – Normalized Noise Reduction is a measurement of the sound transmission loss through partitions that is normalized based on a reverberation times of 0.5 seconds
- **ATL** – Apparent Transmission Loss is a measurement of the sound transmission loss through partitions that is normalized based on the average absorption area of the test room
- **FTL** – Field Transmission loss is a measurement of the sound transmission loss through partitions wherein all possible flanking paths and sound leakage points are treated before measurement and wherein the measurement is normalized based on average absorption area of the test room

FIELD METRICS

Calculations from measured data that normally result in a single-number rating used for characterizing materials, structures, and other physical phenomena. Field building noise control metrics attempt to characterize the performance of an installed building partition. Field metrics are not calculated based on the data measured in laboratories. Examples of field metrics used to characterize building noise control include:

ISR – Impact Sound Reduction is calculated from the ISPL measurement by fitting the ISR contour curve to the ISPL measurement data

NISR – Normalized Impact Sound Reduction is calculated from the RTNISPL measurement by fitting the NISR contour curve to the RTNISPL measurement data

AIIC – Apparent Impact Insulation Class is calculated from the ANISPL measurement by fitting the AIIC contour curve to the ANISPL measurement data

NIC – Noise Isolation Class is calculated from the NR measurement by fitting the NIC contour cure to the NR measurement data

NNIC – Normalized Noise Isolation Class is calculated from the NNR measurement by fitting the NNIC contour curve to the NNR measurement data

ASTC – Apparent Sound Isolation Class is calculated from the ATL measurement by fitting the ASTC contour curve to the ATL measurement data

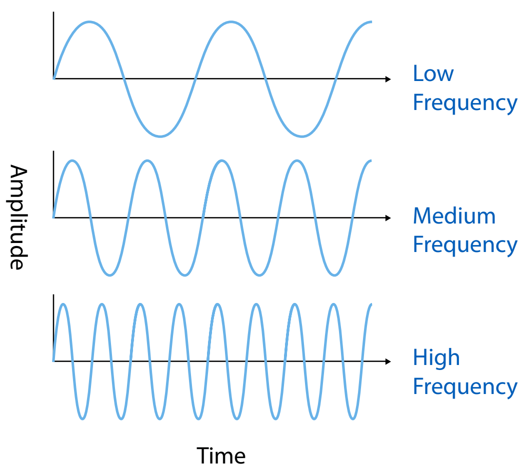
FSTC – Field Sound Transmission Class is calculated from the FTL measurement by fitting the FSTC contour curve to the FTL measurement data

FLANKING

Passing around. As with sound, a flanking path is the indirect transmission of sound around a partition of interest, frequently through building elements such as adjacent wall partitions, open plenum ceilings, window mullions, and HVAC ducts.

FREQUENCY

Frequency is measured as the number of wave oscillations per second. The unit for frequency is Hertz (Hz). A 1 Hz wave oscillates only once per second. Frequency is the property of a sound wave related to its pitch. The audible frequency range for humans is 20 Hz to 20,000 Hz (20 kHz).



LAB METRICS

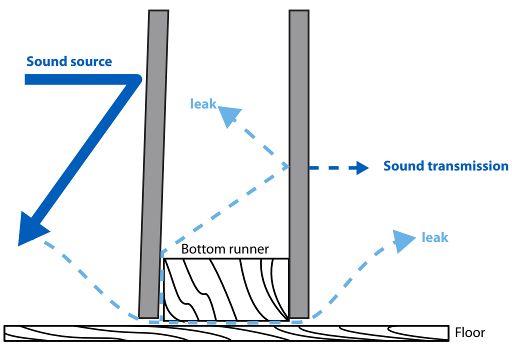
Similar to Field Metrics except that the data is collected in a controlled laboratory environment and not in the field. Examples of laboratory metrics used to characterize materials and assemblies for building noise control include:

IIC – Impact Insulation Class is calculated from the Normalized Impact Sound Pressure Level (NISPL), the impact sound pressure level measured in a laboratory and normalized based on the absorption of a standard room, by fitting the NISPL data to the IIC contour curve

STC – Sound Transmission Class is calculated from the STL by fitting the STL data to the STC contour curve

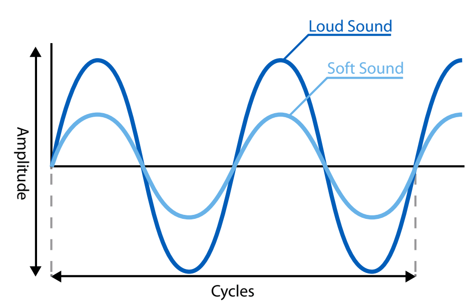
LEAKAGE

The loss of all or part of a useful agent. In the case of sound leakage, it is the flow of sound through an insulator or assembly component, typically via a crack or untreated segment of a wall, a wall penetration or through a flanking path. Sound leakage can most often be eliminated with acoustic caulking, or putty around perimeters, joints or other penetrations.



LOUDNESS

How we perceive fluctuations in the amplitude of sound pressure waves, measured in phons or sones. Loudness levels do not directly result from microphone **sound pressure level (SPL)** measurements themselves. Instead, the SPL at each distinct frequency is matched to an equal-loudness contour. Equal-loudness contours are data curves spanning the audible frequency range. Each curve varies according to the known perceived loudness of the human ear at each frequency and is given a phon value. The phons can then be used to calculate the more linear sone value.



Glossary

LOUDSPEAKER
A transducer that converts an electrical source signal into sound with the combination of an electro-magnetic device coupled with a diaphragm, similar to the design of a microphone, only a loudspeaker radiates acoustic energy rather than receiving it. Loudspeakers are most commonly used to reproduce speech and music. Field and laboratory sound testing often requires the use of loudspeakers to generate noise.

MASS
The property of an object, measured in grams, that is determined by its resistance to acceleration by a given force. Mass is not the same as weight.

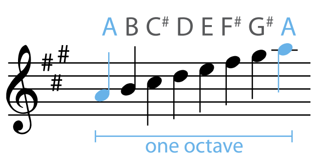
MICROPHONE
A transducer or sensor that converts incoming sound waves into an electrical signal. Sound waves incident on the microphone diaphragm are converted into equivalent fluctuations in an electric signal that is transmitted to a measurement device or audio converter.

NOISE CRITERIA (NC)
A single-number metric that is used to rate the interior noise levels in enclosed spaces. The NC is calculated by fitting the interior Sound Pressure Level (SPL) measurement data to a set of predefined NC curves over a specified frequency range: from 63 Hz to 8,000 Hz. The value of the lowest NC curve that the SPL measurement data does not exceed is reported as the NC value of the enclosure.

NOISE
Unwanted sound. Noise is caused by numerous sound sources such as air handling equipment, construction equipment and machinery, and even computers and electric lighting. It has been known to cause increases in heart rate and stress levels, especially in the work place. "Noise pollution" is a term and is becoming common, as population density and industry rises.

NOISE REDUCTION COEFFICIENT (NRC)
A single-number rating that is related to the sound absorption of materials and surfaces. NRC values approaching zero characterize highly reflective surfaces and NRC values approaching or exceeding one characterize highly absorptive surfaces.

OCTAVE
The interval between two frequencies, based on a power of two. In music, the most common note used for tuning an orchestra is an A at 440 Hz. The A-note one octave higher is found at 880 Hz, twice the value of A at 440 Hz, while the A-note that is one octave lower will be found at 220 Hz. A major scale is typically written using eight notes with the interval between the first and last notes as one octave, or twice the frequency value.



1/3 OCTAVE
Similar to an octave-band measurement, but with two additional measured frequencies per octave. Whereas an octave-band measurement will be made at frequencies such as 125, 250, 500, and 1,000 Hz, the same measurement frequency range in one-third octave bands will have data at 125, 160, 200, 250, 315, 400, 500, 630, 800, and 1,000 Hz. For example, one-third points would approximate:

Note	Note Frequency (Hz)	Testing Frequency (Hz)
G2	98.0	100
B2	123.5	125
D#3	155.6	160
G3	196.0	200

OUTDOOR-INDOOR TRANSMISSION CLASS (OITC)
A laboratory and field metric that is used to characterize and rate the transmission of sound through exterior building facades and other elements. The OITC is measured and calculated from an A-weighted Sound Pressure Level (SPL) measurement of the sound source outside the building facade and the Sound Transmission Loss (STL), Outdoor-Indoor Transmission Loss (OITL), or Apparent Outdoor-Indoor Transmission Loss (AOITL).

REFLECTION
The physical phenomena that occurs when energy incident upon any surface or barrier is propagated back in the opposite direction of the incident energy. For sound in buildings, reflection is the propagation of a sound wave back into the enclosed space, resulting in **reverberation**.

REVERBERATION
The echo-effect in enclosures or acoustically reflective environments wherein sound is reflected from rigid or semi-rigid surfaces such as interior building partitions and concrete barriers. Reverberation Time (T60) is measured in seconds and, for building noise control measurements, is the amount of time it takes for the Sound Pressure Level (SPL) at each frequency to drop by 60 dB.

SHEAR
The deformation of solid objects such as beams, panels, and plates that occurs when one side of the material is forced in one direction and a parallel side simultaneously experiences an equal force that causes it to remain rigid. For example, when a foam pad is rigidly glued to a plywood subfloor and a child attempts to slide across the floor on the foam, the foam will undergo a shear deformation wherein the side of the foam that is glued to the subfloor remains rigid and the surface of the foam where the child is sliding will move in the same direction as the child. Gypsum wallboard panels that are rigidly attached to assembly partition framing experience shear deformation in the presence of sound waves.

SOUND
The audible result of a pressure wave that is transmitted through a medium such as air or water; caused by the vibration of solid materials or turbulent fluctuations in air and other gases.

SOUND PRESSURE LEVEL
Measurement of radiated sound pressure, in dB, usually by a microphone.

SOUND TRANSMISSION LEVEL
A laboratory measurement, in dB, of the transmitted Sound Pressure Level (SPL) through a partition dividing two spaces.

SOUNDPROOF
A commonly-used term that usually implies an intent to provide additional sound isolation to a partition, room, barrier, or building. Technically, the word "soundproof" is indicative of the absence of all sound, including ambient noise: a completely unattainable goal.

Building partitions can, however, be built with an acceptable degree of sound isolation.

SPEECH PRIVACY CLASS (SPC)
A laboratory or field metric that is calculated based on a measurement of the sound transmission loss between two enclosed rooms as well as the background noise.

For laboratory measurements, the SPC is calculated by arithmetically averaging the Sound Transmission Loss (STL) of the laboratory assembly partition from 160 Hz to 5,000 Hz and assuming an average background noise level based on either project-related background noise data for the partition in concern or on a standard background level cited in current research documents.

The average STL is then added to the average background noise level, plus one, for the Speech Privacy Class (SPC) result.

In the field, the SPC calculation is based on the measurement of the STL between two enclosed spaces for multiple noise source (loudspeaker) locations and at multiple locations within the receiving room, or the room on the other side of the partition from the source room. The background noise level is then measured at each of the microphone locations. The STL and background noise levels are averaged between all loudspeaker and microphone locations and then, similar to the laboratory calculation, the SPC is calculated as the sum of the arithmetically-averaged STL and background noise level from 160 Hz to 5,000 Hz.

TRANSMISSION
The transfer of energy from point to another through a barrier. Transmitted sound in buildings is primarily caused by:

Airborne noise - human speech, television, home theater systems, and the like cause sound pressure waves in the air that transmit through partitions.

Impact noise - high heel noise, closing cupboards, machinery, and other collision- or contact-based noise sources result in structural vibration that transmits through partitions via framing and other rigid connections.

Flanking noise - any airborne or impact noise transmitted from one space to another indirectly (not directly through the partition itself) such as through continuous subfloors, window mullions, and open plenum ceilings.