

Sound Advice

Helpful Information from *Stewart Acoustical Consultants*

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SOUND BLOCKAGE OF WALLS AND STRUCTURES

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Sound blockage is one of two primary factors influencing privacy, with the other being the available masking sound. Very quiet background sounds sometimes require extreme sound blockage.

Most solid walls with no open leaks will provide 40 to 50 dB of blockage for middle frequency sound. This is somewhat amazing if you consider that 40 dB amounts to blocking 99.99% of the sound, and 50 dB amounts to blocking 99.999%. With special care, blockage up to 60 dB or more can be achieved. However, success beyond 50 dB depends on careful construction, and is often limited by flanking or sound leakage by paths around the wall, door or window. A small leak can have a major effect on a wall with otherwise high blockage.

Higher frequency sound is easier to block than low frequency or bass sound. The bass sound has longer wavelengths. The wall looks thinner to the low-frequency sound. Walls are rated in their ability to block sound by the Sound Transmission Class (STC). Their blockage of bass sound will be less than the STC. The STC can be misleading, as the wall with the lower STC may actually be better for a particular application. The wall with the higher STC may actually be a poorer blocker of bass sound. A less known but better rating method for exterior walls and windows is the Outdoor-Indoor Transmission Class or OITC.

The major factor that influences the blockage of the structure is its weight. However, the efficiency of the material used can be improved by separating it into isolated layers. The more separation space provided, the greater the increase in blockage. For instance, suppose you have a layer of material that by itself blocks 20 dB. If you double the thickness of the layer, the blockage is improved by about 5 dB at most frequencies. However, if you use two layers well separated from each other, the blockage can be increased 20 dB or more at some frequencies. The problem is in establishing good separation, especially for lower frequencies. The improvement for bass sound may be only about 5 dB. To achieve the best improvement with isolated layers, the cavity between layers must contain sound-absorptive material, and the connections between layers should be flexible. Light gauge steel studs provide better isolation than wood studs. Resilient channels can be added to one side of wood studs to increase the flexibility. Two sets of studs can provide even better results even if wood.

All solid materials will have a weak point at a "critical" frequency. This frequency is lower and thus more of a problem for thick, stiff materials. The critical frequency of a thin, limp sheet of lead is very high. The critical frequency of many common materials is in the frequency range of speech. The effect of the critical frequency can be reduced by adding a vibration damping effect. An example is the laminating layer in safety glass. Another way is to use several layers of thinner material to raise the critical frequency. Using layers of different thicknesses assures that one layer will be strong at the critical frequency of another.

Structureborne sound, such as footsteps on a floor above, constitutes a more difficult problem. The structure itself becomes the noise source, rather than a blocker of the noise. Other examples of structureborne sound are plumbing and mechanical equipment that is not isolated from the structure. Sometimes very loud airborne sound can excite a structure (such as a side wall or roof) and become structureborne around a good wall, or travel and be heard in space that is not even directly adjacent. This is called flanking and is a common limitation if a floor, ceiling, or wall perpendicular to the dividing partition is continuous between two spaces.