

Sound Isolation Primer

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There is no such thing as “Soundproof”.

Let's start by saying that no room is completely soundproof. Even the very best recording studios are not “100% soundproof” as there will always be some level of disturbing noise loud enough to be heard inside. You may not be able to hear a person shouting outside but if they fired a machine gun you would probably hear it. These studios provide a huge amount of sound isolation but they are not soundproof.

A simple example of sound isolation is the covering of a ticking watch with a towel, which will prevent you from hearing the ticking. Achieving sound isolation means using construction techniques and materials to reduce the level of a disturbing noise so that it is no longer disturbing. A towel covering a concert loud speaker is no longer sound isolating because it won't stop the speaker from disturbing you. The sound level from a concert speaker is far higher than the sound isolating ability of a towel.

This example highlights a very important aspect of solving noise problems: the solution always depends on the type of noise that needs to be controlled. The way to approach a noise problem is not to aim for “soundproof” but rather to determine the nature of the disturbing noise and choose materials and techniques that will reduce the noise to a level that is no longer noticed. For a ticking watch, a towel will do; for a concert speaker, you need to surround it with a concert hall! Following this approach will create rooms that provide adequate sound isolation for the *particular* disturbing noise they were designed to reduce – only in this narrow sense are they “soundproof” – but these rooms can not be soundproof *in general*.

How do you get sound isolation?

Achieving sound isolation almost always means doing building work. There are three things that can improve sound isolation: mass, airtight construction and decoupling structures.

Mass: The amount of sound that passes through a wall depends primarily on how heavy the wall is (its mass). The heavier the wall, the less sound will pass through it. Putting mass between a source of noise and a listener will reduce the noise heard by the listener.

Airtight Construction: Sound travels through air and where air goes, sound goes. Sound isolated constructions have to be airtight. This means sealing all the small gaps and cracks

at the top and bottom of walls, around windows, doorframes and so on. Blocking the path of air also blocks the path for sound.

Decoupling Structures: When a truck drives past, you feel the earth rumbling beneath your feet. For sound sensitive spaces this rumbling is a real problem. These spaces need to be separated from sources of vibration. This is done by building “floating” rooms that rest on springs that absorb disturbing vibrations. Floating rooms are said to be decoupled from their surroundings.

It is important to be absolutely consistent when building for sound isolation. The result will always only be as good as its weakest point. For example, there is limited benefit in having thick brick walls between rooms if the walls barely extend beyond ceiling level and the ceilings are of thin plasterboard (as in many homes). In this case, while the heavy wall greatly reduces the sound level, the light ceiling does not, so sound has a relatively easy path between rooms.

But what about egg boxes?

Covering a room in egg boxes does little to improve sound isolation. Egg boxes are not massive or airtight. Covering walls in flattened cardboard boxes would add more mass to a wall and do more to improve isolation. However, acoustic foams, blankets and even egg boxes are types of sound treatments. Sound treatments improve the quality of sound in a room by reducing echoes, which makes listening clearer and more pleasurable. Most sound treatments are to sound what a sponge is to water in that they *absorb* sound. In the same way that you cannot make a swimming pool from sponges, you cannot make a sound isolated space with sound treatments (even egg boxes). Sound treatments do not isolate sound from coming in or going out of a room.

When tackling a noise problem consider these factors and avoid products and “experts” that guarantee “soundproof” without these important qualifications.

