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Articles: Home Studio Acoustics Part 1 - Soundproofing

Recently I started looking at the acoustics of my home studio and spent a some time doing research on how to isolate and improve the sound of my room. I thought that the next two months I would share some of the knowledge I gained.

While I avoided any major structural modifications, bear in mind that it is sometimes necessary to do some construction to gain the effect you are looking for.

What is Soundproofing?

The first thing you need to understand is the difference between soundproofing and acoustic treatment, as the two are often confused. Soundproofing cuts down noise that is transmitted in or out of your studio. In other words, stopping your music from disturbing the neighbours, as well as keeping the sound of passing traffic or barking dogs from becoming a part of your latest masterpiece. Acoustic treatment (which I will cover in part two of this article) controls the quality of sound in a room, making it more neutral. If your room has less effect on what you hear, you are more likely to create mixes which are "portable", i.e. that will sound good on different systems in different listening environments. Whatever you may have been told, you cannot soundproof with egg boxes, acoustic tiles, foam or carpet. These are used for acoustic treatment not soundproofing.

The Mechanics of Soundproofing

Without building your studio from scratch, using special construction techniques and materials (which are beyond the scope of this article and the budget of most of us), it is impossible to reach perfect soundproofing.

The simplest way to attenuate sound is to put a solid, dense barrier in its way - the more solid and dense, the better the isolation. A second barrier spaced apart from the first will improve things even further. In fact, this will always give better results than a single barrier of double the thickness. The wider the gap, the better the isolation, especially at low frequencies. Unfortunately, the efficiency of isolation falls with frequency - this means that while you should be able to isolate the mid and high frequencies totally, chances are you'll still be able to hear loud bass instruments from outside and some traffic rumble from inside.

It is critical that an acoustically isolated room is airtight (or as close as possible). A small hole in any barrier, such as a hole cut for wiring or an electrical outlet, can reduce the effectiveness drastically. A one-inch square hole cut into a 100 square foot barrier reduces its sound blocking capability by 70%.

Walls

Luckily, here in South Africa, the vast majority of buildings are constructed with masonry which has very good sound-isolation properties. It is generally other areas of the room which are problematic. Outer walls are often double which further improve matters (although not as much as if there were a space between them).

Windows

Windows, ideally, should not exist at all! But if you cannot brick yours up, there are a few things you can do. Second best would be two layers of double glazing with as much space between them as

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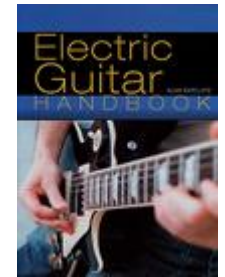
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possible. What? You don't want to make structural changes to your house/flat (or can't, as the owner might object)? Then make sure the window seals properly - airtight. Draft excluder around the edges of any opening windows should help immensely. You can fill the space with sandbags and board up the window if you can do without the light.

Doors

Well, you shouldn't brick/board up your door for the obvious reasons (unless you plan on spending a LOT of time in the studio). But they do leak a lot more sound than the walls, so you have to do something. Indoor doors are usually hollow lightweight jobs, so get yourself a good quality solid wood outside door. Make it as airtight as possible against the frame with draught excluder, paying attention to the bottom of the door too. It may seem like a good idea to have two doors (and for isolation, it is). However, you won't be able to open two airtight doors (repeat after me - "vacuum") without something to break the airtight seal, and that would obviate the effectiveness of having two doors. Some people recommend two sliding heavy glass doors. Oh yes - don't forget to eliminate any keyholes too.

Floors

Not much you can do here without some construction. Ideally, you would float a wooden floor above the existing one, with a layer of fibreglass or rockwool between them. Carpet with underfelt will help dampen some of the vibrations slightly (and also help control the room's reflections). Mounting amps and speakers on stands which are resting on layers of rubber or other damping material such as cork will also help dampen the sound transmitted to the floor and thus, the rest of the house. Of course, there is the option of using direct recording amps such as the POD or the Roland Virtual Amps. This eliminates the amp problem entirely.

Ceiling

Two things you can do here. The first is essential - seal the edges of the ceiling with caulk (silicon sealer) to make it airtight. The second thing is to suspend a second ceiling below the first, using 'Z' channelling to decouple it as much as possible from the first. Make sure your second ceiling is well sealed too.

Holes

Seal any holes between rooms. This may seem obvious, but sometimes two power outlets opposite each other on either side of a wall will share a single hole. Beware too of airbricks which are common for ventilation purposes.

Ventilation

We've just spent a while discussing how to make your room airtight for the purposes of acoustic isolation. Obviously you do need to breathe too! A proper studio ventilation system is very expensive. So you'll have to open the doors between takes instead. A simple air conditioner will make the room a lot more comfortable to work in providing you remember to open the doors from time to time. Remember also that an important function of ventilation is cooling, both for you and your equipment.

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