FREQUENTLY ASKED QUESTIONS: SOUNDPROOFING AND ACOUSTIC TREATMENT

Paul White answers some of the most common questions we receive about soundproofing and acoustic treatment for the home studio.

When you're trying to set up a studio ona limited budget, it's all too easy to concentrate on buying equipment rather than spending your hard-earned cash on things that don't make a sound. A little money spent treating the room in which your studio is based, however, can often be a better investment.

A lot of people find out too late that the acoustics of their chosen room cause problems, either by coloring their recordings, distorting their monitoring perspective or leaking sound and thus disturbing their neighbours. In this article I'm going to tackle some of the most common problems and questions.

Here at *SOS* we get lots of phone calls asking about this subject. Most of them go something like this... "Hello, I'm sorry to bother you -- I know you must be very busy but I'm a regular *SOS* reader and I've got a bit of a problem that I hope you might be able to help with..." The caller then goes on to to describe a shed-to-studio conversion project, noise problems relating to home studios and neighbours in attached houses, noise caused by other family members who play the drums at antisocial hours, bedroom studio acoustic problems or some other equally familiar scenario. Sometimes we can help while at other times we are only able to temper the caller's expectations with a little reality.

Q What's the difference between soundproofing and acoustic treatment?

Acoustic treatment, in the context of a recording studio, generally deals with the acoustic qualityof the room from a listener's point of view. In other words, if you monitor in a control room that has been designed using the correct acoustic treatment, what you hear is likely to be more accurate than the same recording played back over the same speakers in an untreated room.

Soundproofing, on the other hand, is specifically designed to increase the degree of acoustic isolation between the studio and the world outside -- cutting down on noise that leaks into or out of the studio. Sound isolation works the same both ways, so there's no difference in approach to keeping sound in or out.

Q I've heard that sticking egg boxes or acoustic foam to walls will help soundproof a room. Is this true?

Egg boxes can make a marginal improvement to some aspects of a room's acoustics by breakingup reflections from hard surfaces, but they are virtually useless for soundproofing. The same is true of lightweight suspended ceilings, acoustic foam and even Rockwool (Rockwool tends to be used for acoustic treatment or for damping out resonances inside partition walls. All these materials have their uses, but they're mainly for acoustic treatment, not for soundproofing).

Q So, what are the requirements for soundproofing?

The term 'soundproofing' is rather misleading, because in most real-world situations, you can cut down on leakage but you can't get rid of it altogether. Sound isolation is a more accurate term.

The simplest way to attenuate sound is to put a solid wall in its way -- the more solid, the better the isolation you'll get. As a rule, if you double the mass of a wall, you halve the amount of sound transmitted through it. Unfortunately, sound isolation tends to fall with frequency, so even though you may be able to get the mids and highs under control, the chances are that you'll still be able to hear the bass drum and bass guitar thumping away from outside. That's why when you walk past a club, all you can hear from outside is bass.

To give you some examples of what to expect, a single brick wall might have a quoted Sound Reduction Index (SRI) of 45dB (this is averaged over a range of frequencies, so the bass-end isolation will be rather worse than this figure) while a domestic panel door might only give you around 10dB of isolation. Because the degree of sound isolation depends largely on mass, lightweight solutions such as partition walls work noticeably less well than solid brick or

concrete. However, there's another useful fact we can utilise -- two walls are always better than one.

If a single wall can reduce the sound leakage by 45 or 50dB, you might imagine that two separate walls spaced apart might give you 45dB for each wall, or 90dB altogether. Sadly, unless the walls are separated by a large distance, the air between them couples energy from one wall to the other and reduces this figure considerably. However, and this is the important bit, two walls with an air gap in between will always give better results than a single wall of double the thickness. The wider the gap, the better the sound isolation, especially at low frequencies.

Q But commercial studios often include plasterboard-covered studding walls. Surely these can't have enough mass to work properly?

In most serious studios, any partition walls have at least three layers of plasterboard on each side. This builds up enough mass to provide adequate isolation, though at the very low end, brick or concrete is still better.

Doors And Windows

Q OK, so I can build high-mass walls, but I can't make the windows out of concrete. Won't a lot of sound leak in and out there?

That's true, and even using the 'two layers are better than one' theory, double-glazed windows offer only a limited amount of sound isolation compared to a high-mass wall. Nevertheless, double-glazing is a lot better than single-glazing. The wider the gap, and the heavier the glass, the better the isolation. Adding secondary double- glazing inside an existing double-glazed window works even better, but all your glazing must be airtight, otherwise the sound will just leak around the edges. Of course if you don't need the light, you can board up the window and fill the space with sandbags!

Q But I can't board up the doors, otherwise I won't be able to get into my studio!

Doors can be a real problem, because no matter how thick and heavy you make them, they'll always leak a lot of sound compared to the surrounding walls. You also have to work harder to keep them airtight and you'll needs seals all the way round, including the bottom. The best solution is to use two doors separated by at least the thickness of your wall. A pair of heavy fire doors (these are usually filled with plasterboard) can work well, but make sure your frame can take the weight.

Q I think I can deal with the walls, doors and windows, but what about the floors and ceilings?

Concrete floors don't usually cause problems because of their high mass, but wooden floors are a different story, especially if you have neighbours trying to get to sleep in the room below. Being realistic, there's nothing simple you can do to a wooden floor to increase the isolation to the extent that you could play drums without upsetting the people below. Even the expression pedal from a piano will come through a wooden floor loud and clear! However, you may be able to make an improvement if you're using the room to mix or to play less noisy instruments. Fitting heavy felt carpet underlay is a good start, and if you're into DIY, you may even be able to make a floating floor (a kind of false wooden floor that rests on a resiliant base of Rockwool or neoprene).

It also helps to get noisy amps and speakers off the floor. You can stand instrument amps on blocks of foam rubber, though these days there are so many good DI solutions that you might be better off going for one of those. Thick neoprene slabs between your monitors and their stands can also help.

Q That's a lot to think about, but where should I start?

Look for the weak areas first. There's no point worrying about your walls if the doors and windows offer poor isolation. At the most basic level, you need as much structural mass as possible, air-tight seals around doors and windows, and double doors if you're going to make much of an improvement. Double-skin walls are a good idea, but there's little point worrying about the fact that you only have a single-thickness wall if the real problem lies elsewhere.

Also, consider structure-borne sound. Sound energy travels very efficiently, as mechanical vibrations, through wooden joists or steel girders. If you inject sonic vibrations into these components, they'll bypass all your careful soundproofing. Pay particular attention to floor supports as most unwanted energy gets injected into the floor.

Q If soundproof means airtight, how do I breathe?

For fresh air, you'll have to open the doors between takes unless you can afford a proper studio ventilation system. However, a simple air conditioner that cools and recirculates the air will make the room a lot more comfortable to work in providing you do remember to open the doors from time to time.

Acoustics

Q Assuming the noise levels are workable, what can I do to set up a reasonably accurate monitoring environment -- short of employing a studio consultant and spending a lot of money?

If you're doing any commercial work, then paying a consultant might not be a bad idea as it can save you from wasting a lot of money doing the wrong thing. Even so, there are simple things you can do to a domestic room to make it work better as a mixing environment.

For monitoring, it's important to have a room that's not too live -- everything should be as acoustically symmetrical as possible. Ideally, the reverb time should be even across the audio spectrum, though even in the best studios, it tends to rise a little at the bass end. In a domestic room, excessive reverb can be addressed reasonably well by carpeting the floor and using a few soft furnishings, though it also helps to fix a square metre or so of acoustic tiles to the walls each side of the listening position to kill flutter echoes. A soft sofa at the back of the room can also help, along with shelves, to break up reflections from the rear wall.

Strong early reflections from the monitors should also be avoided so, if at all possible, put your monitors on stands behind the mixer, not on the meter bridge. You probably won't need to worry too much about the bass end providing you use nearfield monitors that don't go too low. If you're getting reflections from the ceiling above the mixer, consider putting another foam absorber or two up there as well.

Q How much does the room that I'm working in affect which type of monitor I should choose?

While it is important to master commercial mixes over full-range speakers, a two-way nearfield monitor that rolls off gently below 50 or 60Hz is probably best for use in the typical project studio. Pumping too much bass into the room will just confuse the sound and may lead to an inaccurate mix. Studio monitors should be accurate and revealing rather than flattering, and they should sound smooth enough not to fatigue your ears when listening for long periods. Active monitors often perform better than passive models and they relieve you of the task of picking a suitable power amplifier.

Whichever speakers you have, it's a good idea to listen to some known pre-recorded material over the system before mixing. This gets you used to what your mix should sound like in your mixing environment. Not all CDs are well recorded, but if you can find something half decent in approximately the same style as the music you're working on, it will help you keep a sense of perspective.

Q Where should I put the monitors?

Putting speakers too close to corners tends to emphasise the bass in an unpredictable way, so try to site your speakers away from the room boundaries and make sure the setup is symmetrical, with the tweeters pointing at your head in your normal monitoring position (see diagram, left). Relatively small changes in speaker position can affect the sound quite significantly, so experiment with moving your speakers forward or backwards while some known commercial material is playing and aim for a smooth response, especially at the low end. If some bass notes seem louder than others (from your normal monitoring position), move the speakers around until the problem is minimised. Mounting the speakers on solid stands makes quite a difference, and hi-fi stands that you can fill with dry sand also work well.

Next Steps

Q Where can I obtain the materials I need for soundproofing and acoustic treatment?

Most of the materials can be found at regular builders' merchants or DIY shops, though studio-quality door seals, neoprene and acoustic foam are best obtained from a specialist studio supplier. You can usually find a choice of these advertising in *SOS*. Foam acoustic tiles are offered for sale by most studio suppliers, though you can also use fire-retardant furniture foam of around 100mm thickness for mid-range and high-frequency absorption.

Q Where can I obtain more information on this subject?

There are past articles on the *SOS* web site (enter Soundproofing or Acoustics in the Search facility at www.sospubs.co.uk/search), and a couple of my own books are available from the *SOS* bookshop (01954 789888), including *Creative Recording II* and *Basic Home Studio Design*. These are good if you want a practical rather than mathematical guide to the subject. For a more detailed, technical approach, there are some excellent books from F. Alton Everest, including *The Master Handbook of Acoustics*.

Q Are you sure I can't use egg boxes?

Quite sure!

Glossary

http://www.sospubs.co.uk/sos/regular_htm/glossary.htm

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