

## ACOUSTICS AND MONITORING, PART TWO

Last time we discussed soundproofing. But often when folks complain about sound in a room, they are referring to excessive sound wave reflections taking place inside a room.

Small rooms tend to have certain common acoustical problems. One of these can be excessive reverberation time... too many reflections off of too many hard surfaces.

When we're building studios, we can try and avoid parallel walls and square rooms. Doing this will help reduce the habit of reflections forming standing waves. But if the room is already built, what can we do to repair bad sound?

Of course we can treat walls and ceilings to be more sound absorptive. The trick here is to try and absorb the lower frequencies, and the higher tones will take care of themselves. High frequency reflections are very easy to attenuate, but if we don't treat the lows as well, we end up with a very "boomy" room. The main thing to remember is that for good low-frequency absorption, the medium must be quite thick.

The all time champion sound absorber is friction fit fiberglass. The loose fibers form labyrinths in which sound waves get lost. Great things have been done with fiberglass batts mounted on walls between studs, the whole covered over with a loose weave cosmetic material. Unfortunately, fiberglass fragments will eventually migrate through the material and get into the air, where they are very unpleasant. One alternative is to place an airtight layer of polyethylene sheet between the fiberglass and the covering material... the plastic sheet does reduce the efficacy of the fiberglass, but by less than you might expect. Whether or not you use a plastic sheet, nowadays you need to make sure the cloth covering material is fireproof, though.

There are commercial products available using stiff fiberglass board covered with colourful fireproof cloth. These can work almost as well as the loose batts, but are most effective if mounted off the wall by an inch or so, which increases their effective thickness.

Acoustic foam is really easy to use, but again, thicker is better. Avoid the temptation to purchase the thinner stuff (you get twice as much coverage per dollar, but the low frequency absorption is not nearly so good).

One of the things that you may discover quite quickly, is that you're not after absolute absorption. Some reverberation is expected and desirable. You can tell right away when you're in a room with excessive treatment. If it's the wrong kind, and the low frequencies are unattenuated, the room sounds boomy and

hollow. If there's too much absorption of all frequencies, the effect is a dull and lifeless-sounding room. It's far better to add treatment gradually, a piece at a time, until you reach the desired effect.

Much experimenting has been done to produce a small room that provides good stereo imaging and is non-fatiguing for the listener. While there are all sorts of approaches, here are some generally-accepted guidelines:

- 1) for optimum stereo, the speakers are often set up at the front of the room, positioned to form an approximate equilateral triangle with the listener. Typically the speakers are oriented "tweeters out" for maximum treble dispersion, although in more than twenty years of looking, I haven't been able to find a printed reference that calls for this practice.
- 2) it's important that the operator have a good casual line-of-sight so that she can see staff comings and goings. The monitors prevent hearing the approach of staff members, so visual cues are essential to prevent inadvertent heart-stopping surprises. I've seen truck style rear-view mirrors installed on speakers before, and have worked in enough control rooms to know why they're there. Line-of-sight to other working studios and control rooms, while not essential, is always appreciated.
- 3) an interesting room variation is the so-called "live end-dead end" (LEDE) studio. While there's a whole set of rigorous specs to LEDE, the basic idea is to make the front of the room (forward of the operator's ears) absorptive, and the back of the room reflective. In theory at least, this can provide the listener with exceptional aural cues, results in excellent stereo imaging and a low-fatigue environment.
- 4) If you're in a situation where you want sound levels kept lower, place the speakers close to the operator. Close-field monitors can be used to good effect for this kind of environment.