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Before you begin to swing a hammer or set your credit card down to buy materials, it's a good idea to take a look at what you're trying to do and analyze your needs. It's very easy to overlook a number of critical items that, at the very least, can bug you later or, at most, impair your ability to make or record music at some point.

You've already decided to go the extra mile and acoustically treat your space, so you know the result that you're looking for on that level, but let's look at how some particular types of studio applications can change your needs over time.

It is important that you establish the main purpose of your studio before starting a design. Imagine the primary ways that you'll use your studio, but also anticipate any other ways you might use it in the future. If you're a band that gets together on weekends and wants to use the studio to record the band's music, your design will be quite a bit different from that of a keyboardist or a guitarist who wants a songwriting studio. Likewise, if you're an engineer who wants to build a studio to record clients, you'll most likely proceed in a different manner than a musician/engineer who sets up a studio for him- or herself.

Individual Needs

With your idea in mind, here are some suggestions on ways you might want to design your space:

ENGINEERS

If you're an engineer wanting to build a room to service your music clients, you'll probably want to build a separate control room and tracking room. You must determine the proportion of space that you'll need to be comfortable for long, drawn-out sessions. If you're going to record drums and full-band sessions, you'll need a much larger proportion of your space designated for the tracking. On the other hand, if you'll only be doing vocals and miscellaneous overdubs, you won't need your tracking room to be as large.

DRUMMERS

If you are a drummer, you'll most likely want to set up your room so that it has a nice ambient quality to enhance the quality of your drum recordings. For this situation, an all-in-one room instead of a separate control room or equipment room might work best.

When making your plan for this kind of a room, you'll want to determine how to best position your DAW and recording gear so you can easily get to it. Most DAW's make it very easy to set up a way to trigger everything remotely, or even have a second monitor and keyboard. You can position this remote monitor and keyboard on a small table or desk next to your drums so you can easily record without having to keep getting up and running to the main computer and DAW position. With a well thought-out positioning of your gear, you can effectively do your own drum-recording session without the need to hire an engineer or have a second person on the session just to run the recording gear.

Personal Studio Parameters

The most common space to get an acoustic makeover these days is the personal studio. This type of studio can come in many forms, however, so it's good to understand what your current needs are as well as prepare for any future needs at the same time.

For most people, building a home studio will mean either converting the two-car garage, a basement or a spare room into a studio. Most two-car garages are 22 by 22 feet with a support post in the center. If you're fortunate enough not to have a support post directly in the middle of your garage, you'll be able to more effectively use your space, since you won't have to work around the location of this post when creating your plan. Also, if you're going to use the garage as a studio you must keep in mind where the restroom will be located, because the family won't be too happy having people coming in and out of the house to use the restroom at 2 A.M. Keep in mind that trying to get a permit from the city building authorities to build a bathroom in the garage can sometimes turn out to be a nightmare. All of these things must be considered well in advance of construction. Make sure to determine your recording needs thoroughly before proceeding with an effective design for your studio.

PRODUCTION/MIXING ROOM

It seems like just about everyone has their own production/mixing room these days. Usually it starts off with some equipment haphazardly thrown into an extra bedroom, office, garage, basement or living room that eventually needs to be turned into a room that has better playback accuracy than in its present form. In a straight production room, you'll most likely be creating with samples and loops, recording direct, and only have an occasional need for live tracking. In a mixing-only room, you just want it to sound as accurate as possible. And although you must work within the limitations of your budget, you can build a very effective room without having to sell your soul to afford it.

There are a number of major issues that are unique to this kind of room, while others like HVAC, electrical, and storage are common to every type of room, so we'll get to those later.

Isolation

Is it important that you keep the outside noise from leaking inside? Is it important that you keep the sound you're making from leaking outside? What kind of material is the wall made out of? Is a window or a door causing a problem? Isolation is one of the major concerns of most personal facilities, and unfortunately, it's also one of the most expensive to implement, especially if the structure of the space already exists (it's a lot cheaper if you're starting off with just a shell).

Size

The size of a room matters a great deal in the ultimate acoustic outcome of a room. Usually extra rooms or offices are very small with low ceilings, which calls for a lot of trapping, and that makes the room even smaller. In general, the larger the room, the easier it is to work with.

Shape

The ideal shape for any listening room is rectangular, and as you'll see in Chapter 3, there's even a specific formula for the best dimensions. That being said, many times production/mix rooms are closer to a square, or even worse, a cube, which become very difficult to treat because the dimensions are not acoustically friendly.

Acoustic Control

Once we can keep the sound from leaking in or out of the room, the next job is to control the reflections and reverb decay time in the hopes of giving the room an even frequency response. This is one of the more difficult aspects of acoustics, since the whole secret of a good sounding room is an even decay time across the entire audio bandwidth. It's done by carefully selecting the wall, floor and ceiling materials and their treatment. Before we do that, let's take a look at the room itself.

YOUR ROOM

The biggest component in the way a room sounds is the room itself. There are a number of factors that make a huge difference, some that we can control, and some that we can't.

Standing Waves

In order to understand how the rest of the parameters of a room affects the sound, you have to understand a little about "standing waves" first. A standing wave is a frequency below about 300Hz that's reflected back and forth between two parallel walls. As these reflections collide, they can combine to reinforce each other (see Figure 3.3) in certain zones in the room, or they can combine out-of-phase and cancel each other out, lowering the amplitude in that zone (see Figure 3.4) as a result. Obviously, neither case is ideal as it can cause that particular frequency to be too loud or too quiet depending on where you're standing inside the room. As you walk around the room, you'll hear the effect of these standing waves, but you'll notice that the bass seems stronger close to the walls and in the corners, where standing waves tend to collect.

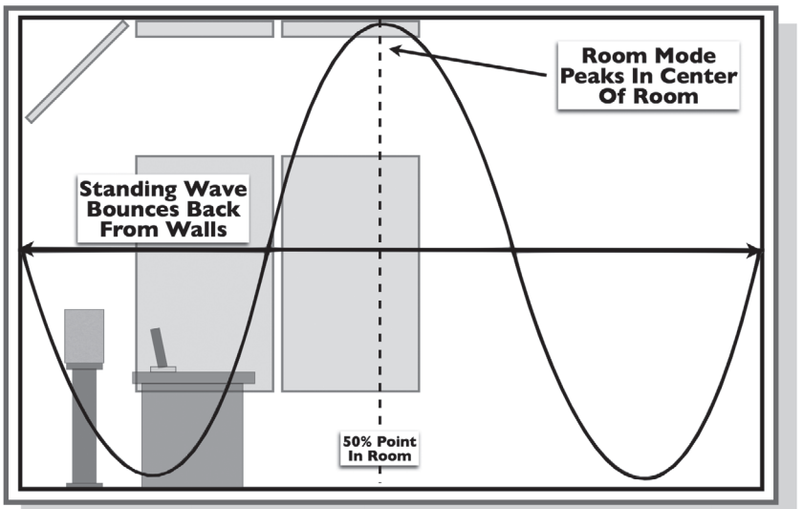


Figure 3.3: The point where the room mode peaks

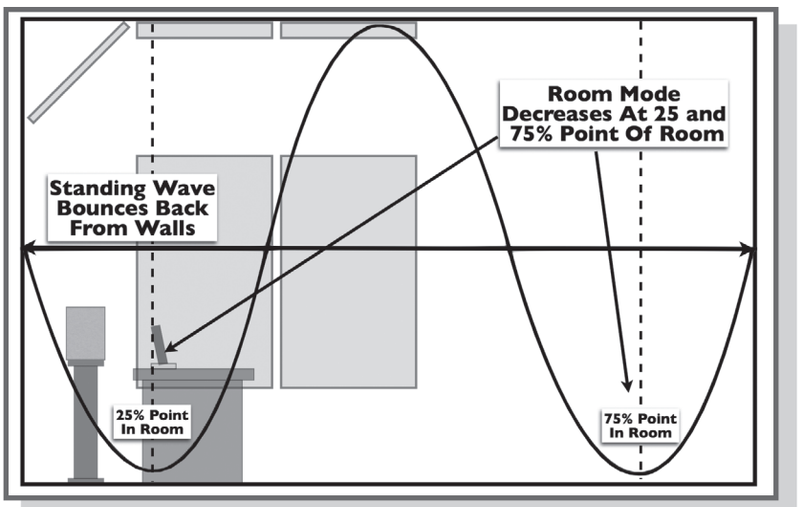


Figure 3.4: The points where the room mode cancels

DIFFUSERS

A diffuser scatters sound arriving from any direction to reduce the problem of direct reflection from the speakers. Diffusers create a more even, musical sound without reducing the reverb time significantly.

There are two types of diffusers; 2D and 3D (see Figure 3.23). A 2D diffuser scatters the reflections in the same single plane that they were received (see Figure 3.24), while a 3D diffuser scatters it in random directions (see Figure 3.25) at random times. If made well, the 3D diffuser is better at scattering the reflections, but more difficult to build so it's more expensive.

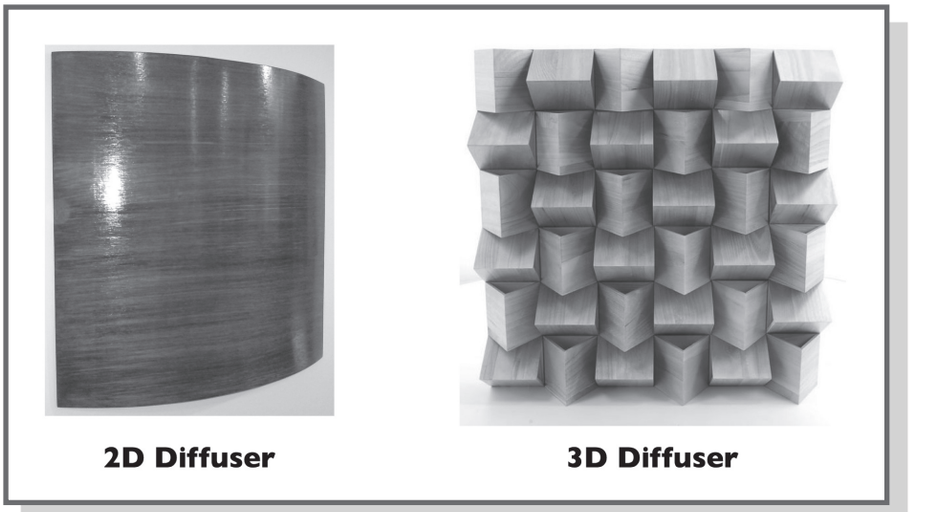


Figure 3.23: 2D and 3D diffusers

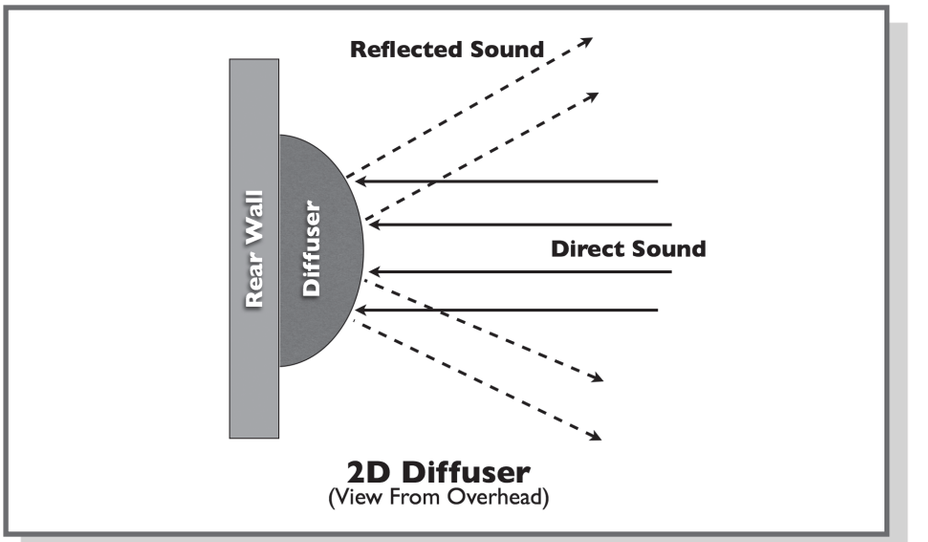


Figure 3.24: The reflections from a 2D diffuser

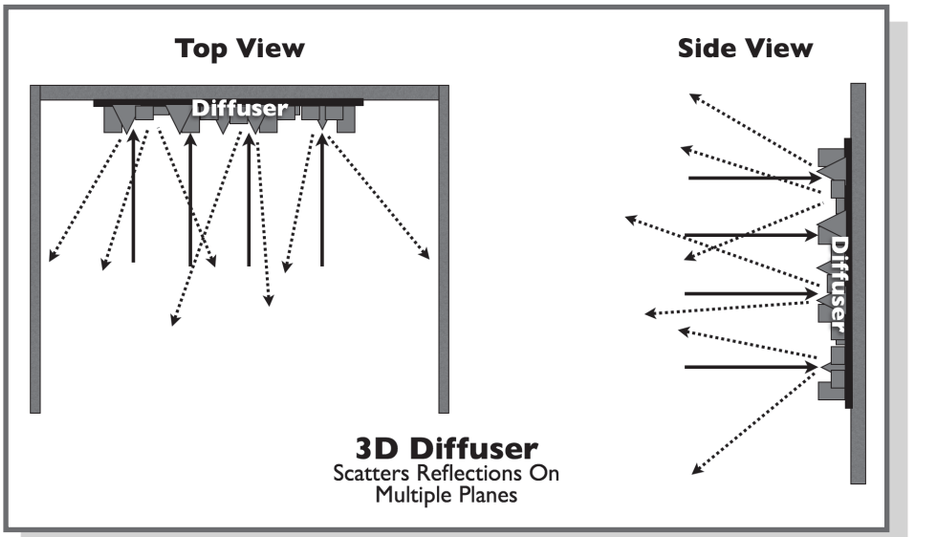
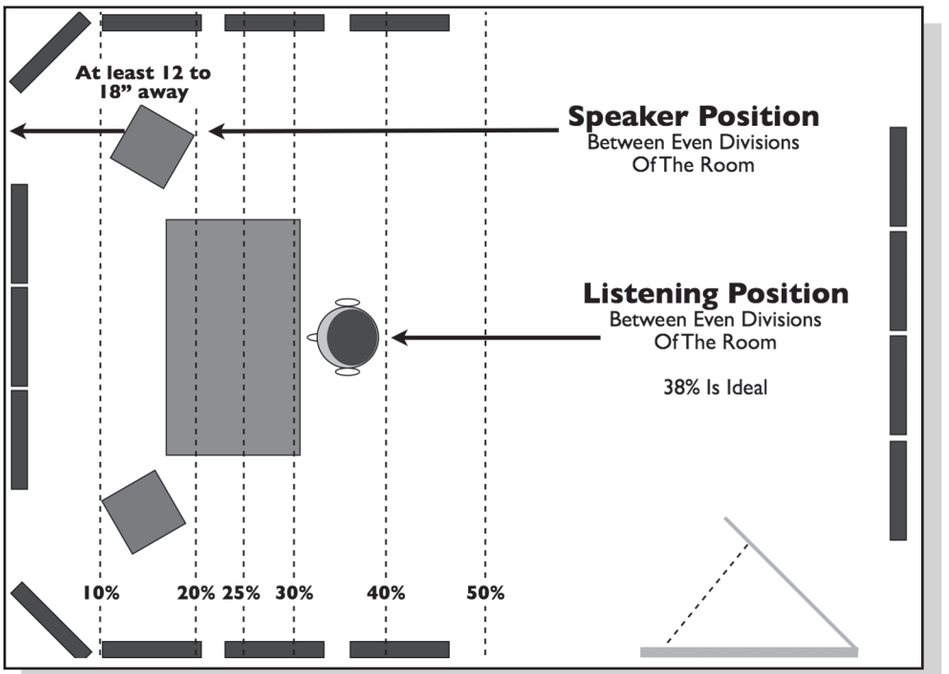


Figure 3.25: The reflections from a 3D diffuser

As a result, you want to place both the speakers and listening position somewhere in between at a point that doesn't evenly divide into the length. In other words, stay away from 25, 50 and 75 percent of the room (30, 40, 60 and 80 percent are good to stay away from as well), and place the speakers and listening area at an odd, non-divisible number like 27, 38, 45 etc. percent (see Figure 6.3). Although these placement points will get you in the ballpark, be prepared to move everything a few inches forward or backwards even after you've placed everything.



Chapter 6.3: Speaker placement in the room

Now if the ideal listening position is at the 38 percent point of the room, we're left with this:

The room length x 0.38 = the Listening position

12 feet x 0.38 = 4.56 (about 4 feet, 7 inches from the wall)

Now you would place the speakers anywhere in front of the 38-percent point except at the 25-percent mark, which in this case would be 3 feet.

The 38-percent point in the room may or may not be the right place for your room, which is why you must be prepared to experiment with placement a few inches backwards or forwards once all of the treatment is in place. There are so many variables involved with just about any room that even the best designers with the best equipment can't even precisely predict the correct placement, and may spend an entire week just tweaking the speaker and listening placement.

Make sure you place the speakers on stands. Speakers on a desk or console will defeat the purpose of much of the acoustic treatment. Mark the position of the speakers with masking tape, and mark the position of 1-inch increments up to 6 inches either way from the wall so you don't have to re-measure in the event that you have to move things. Exact distances are critical, so always use a tape measure because even an inch can make a big difference in the sound.

Step 2: Mic Panels

If you're beginning to build your studio or are comfortable with the idea of cutting a hole in your wall, your next decision is what to do with your mic inputs and headphone outputs. Would you rather have a neat, soundproof, professional-looking studio with custom panels for your mic and headphone jacks installed in the wall (see Figure 13.1), or the flexibility of running your cables through the door when you record? Either will work; it just depends on your preferences and needs.

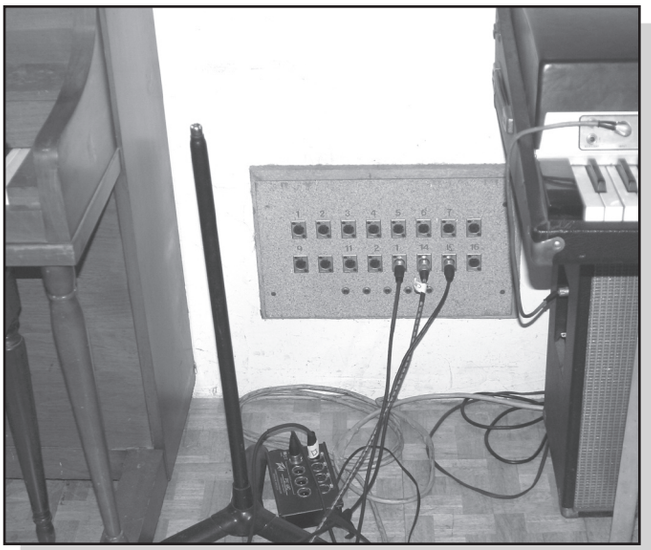


Figure 13.1: A Typical wall-mounted mic panel

For mic inputs, you can use a mic snake like a Whirlwind 8- or 16-channel mic input box and run the cables through the door, or make custom panels and run the cable through the wall. The snake is mobile in that you can move it to wherever you need it in your studio, or even bring it to another place outside of your studio if you need to. It also requires no commitment; if you decide to turn your studio back into an office at some point, you won't have to cover the mic input panels with your grandma's oil paintings. Although a mic snake might be more expensive than a wall panel you make yourself, when you consider what it takes to knock a hole in your wall and then patch it up, it may be cheaper in the long run.

If you haven't built your studio walls yet, or are handy with building, you can make a wall panel yourself and install it in your wall. The advantage is that your studio will look cleaner and neater and you can completely close any doors leading from the control room to the studio and have less sound leakage between rooms as a result. For headphone outputs, it's the same principle. You can either run cable through the wall or have a freestanding box where the cables are run through a door.

If you do decide to create a wall panel, make sure you determine the maximum number of mic inputs and headphone outputs you'll need for any future recording session, and make sure your wall panel can accommodate it. If you do run into a situation where you need more than your wall panel can handle, you can use a freestanding box, but that, of course, defeats the purpose of having a wall panel in the first place.