

Acoustics Design Philosophy

I approach room acoustics a little differently than a few of my peers, particularly the acoustics of recording and control rooms. It is my opinion that the *dead studio* is a real bad thing. I have engineered many records and CDs and *never* have I been able to produce a good sound in any room that is *dead*. This is based on my experience in acoustics over a period of 38 years. In that time I have seen the art of acoustics and acoustic control products evolve to the current level.

One must know that our auditory system's main responsibilities are to locate sounds, analyze their properties, and then recognize what they mean. For example; for locating sounds on the horizontal plane — those coming from the left or right of the head — factors such as relative sound intensity in each ear, and the difference in sound's arrival time (phase) at each ear are important cues.

Without these important spatial cues that we normally hear, (such as is heard in a living room or bedroom) we suffer from what is known in acoustic circles as *ear fatigue* (which is caused by a *dead* listening room like an anechoic chamber). When a listener is suffering so, it can sometimes be so unbearable that the poor victim must run from the room for some fresh air. This is because of the *alien environment*. We humans did not evolve in such an environment nor were we meant to work in one. I term rooms designed like this as the “*suck your brains out*” type.

Rooms built in this manner also require as much as 10 times the amplifier power to produce the perception of *immersion in the sound field* while listening to music in them. The sense of immersion usually occurs at 85 to 90 decibels in a normal room on average. However, in a very dead room the amplifiers or powered monitors must be run into clipping before immersion occurs (hearing damage also occurs).

There are also many rooms that suffer from confusing flutter-echo which is never properly addressed. Large flat, hard surfaces facing each other or very large expanses of glass provide a bounty of *specular* reflections which degrade intelligibility and destroy the functionality of the room for anything to do with sound.

My common suggestion to most of my clients is that they increase the diffusion in their rooms. While others attempting to design acoustic spaces place an emphasis on absorption and usually cover the entire room with absorption panels that, in my opinion, ruin the natural acoustics of the space.

Using the latest acoustical design techniques we have learned that the acoustics of an enclosed space must be made diffuse in the mid and hi frequency bands, and that the modal resonances in the low frequency bands be normalized. The ideal room should have reverberation decay (RT60) of around .4 to .6 seconds broadband. In other words the RT60 should be equal for all frequencies from 20Hz to 20kHz. This is difficult to achieve without proper knowledge of acoustics and analysis techniques. The RT60 of rooms smaller than about 2000 cu. ft. (56.6 cu. meters) is irrelevant because room modes, slap echo, and early reflection comb filtering will dominate.

Applying all the absorbent in a room on all surfaces such as is done in most sound room installations, or applying all the absorbent to only one or two surfaces does not result in a diffuse condition, the absorbent is not used effectively, and the acoustics of the room are completely ruined in the process - making the room ineffective.

I always distribute the absorbent so that it contributes to the diffusion of sound in the room. Patches of absorbent with reflective walls showing between the patches have the effect of altering wavefronts,

which improves diffusion and makes the rooms that I design a pleasure to be in and work in.

I also incorporate the ever-growing *cutting edge* of science by applying the principle of diffraction grating to acoustics in the use of my special designed *diffraction grating diffusors*. These diffusors (the *AcuFusor* – one of my products) are designed for optimum diffusion of the critical bands. Commercially available quadratic residue diffusors or primitive root diffusors are good and suit many purposes, however, they usually address a mid-line of functionality. The rooms that I analyze and spec require exact acoustics and precise response times, therefore I have designed these diffusors to address these specific problem areas.

NOTE** I have also seen some new commercial diffusor panels on the market that are only about 4 inches (10 cm) deep with wells of about 4 inches (10 cm) wide. I have also seen them used by many people with *some* success, however, as I always quote Scotty from Star Trek... **“Ya canno’ change th’ laws o’ Physics!!”** Please note that these panels (with max well depths of 4” and 4” well widths) **ONLY** work at about 1kHz and have a ‘Q’ of about 1... so you are getting diffusion **ONLY** from about 800Hz to 1.8kHz. Yes, they look really COOL and they are pretty inexpensive, but is that what you want? To look good and NOT sound good? It’s up to you. I can not do that and I will not lie to my clients. Most of my diffusors have an effective range from about 800Hz to around 6kHz. Above and below that range there are other more effective devices for controlling reflections and for LF modal correction.**

Surrounding vocalists/speakers or a group of musicians with an array of *AcuFusors* both conserves music energy and spreads it around to achieve ensemble and improve intelligibility between speakers and/or musicians. Difficult small-room acoustics are especially helped by the use of *AcuFusors*. With proper design it is possible to

get acceptable voice recordings from small booths using properly installed diffusing elements which create a larger room sound. The need to cant or splay walls to achieve some semblance of sound diffusion is relaxed by the proper use of efficient diffusors.

Reflections can be both a distraction and a help in music studios. It is the time delay of the reflection that determines in which category it will fall. By careful analysis the distractions can be eliminated so that the music sound stage is uncluttered. In a reflection free zone, with proper diffusion and LF modal correction, the engineer will easily be able to complete his/her task of mixing and/or editing without the tedious task of checking the mix on multiple systems before finalizing the recording.

My services are for the discriminating listener that desires the cutting edge in technology and a “*no-vooodoo*” approach. There is nothing mysterious about good sound. It is simply **physics at work**.

I create designs for acoustical environments that are easily adapted to *any* sound installation. From live performance halls, recording studios, and A/V facilities to home music studios & home theater systems, I design rooms which will provide the *neutral* acoustic canvas upon which sonic masterpieces can be created and/or appreciated.

If you would like a personal consultation or need more information, please contact me at john@jhbrandt.net or jhbrandt@yahoo.com or visit <http://javakustik.com>

Sincerely,
— John H. Brandt