

Why Acoustical Treatment In Performance Spaces

Most large performance venues such as Houses of Worship, theaters and large conference rooms have issues with reverberation, echoes and things like early reflections. These mystical things interfere with the listener's ability to understand the content in the presentation be it spoken word or music. Our ability to decipher consonants, s, t, b and the like, which are short bursts of higher frequency sounds, is significantly decreased when the sound arriving at the listener's ear is interfered with by other sounds left over from previous sound waves (words).

So how do we solve this problem? Some rooms are designed to minimize these unwanted sounds by installing non-parallel walls or walls that have cavities in them called Helmholtz resonators and a variety of other architectural design features. However, most buildings are designed in a square or rectangle design pattern with square corners and hard surface walls all of which add to the problems we are facing. The overarching objective is to have the original sound from the person speaking or the music arrive at the listener's ear without be interfered with unnecessarily. (Some reverberation is important and necessary but not for discussion here.) Since the interference we are talking about comes from the original sounds hitting the surfaces of the room and then coming back into the room, those sounds arrive at the listener's ear during the time the next original sound is arriving at the listener's ear. So, at any point in time the original new sound and the reflected or left-over sound from the previous sound are arriving at the same time. So, the brain must sort out what it already heard from what it is hearing for the first time to be able to understand what the new sound is. Depending on the strength of either of the sounds and how much later in time the reflected sounds arrive at the listener, it may be impossible to actually tell what is being said. The severity of this issue will correlate to the position of the listener in the room and other factors like ambient noise say, from the air handler.

The resolution, in simplified form, is to minimize the reflected sounds and amplify or properly direct the new original sounds. For a room where architectural changes are impractical, generally the first item of business is making sure that a properly designed reinforcement speaker system is installed in the room. For more on this see the section on sound system design. The second issue to address is surface treatments. These most often take the form of sound deadening panels. Other treatments include sound deflecting panels or devices, wall banners, ceiling banners and a host of other treatments.

So how do I now which treatment is right for my room? The auditory frequency spectrum is quite large, 20 to 20,000 cycles (Hz) all inclusive. The material that will reduce the unwanted 20Hz may not impact 20,000hz at all and in fact may make the situation worse. To determine the impact of a treatment option on a space, a lot of complicated mathematical calculations are required. Originally these were done by hand by individuals trained in that science. Today however we have several software apps that perform the calculations for us after we enter the required room dimensions and other considerations. Not all of these apps are created equal however. Some apps simply determine what material combinations can be used to reduce the sound levels in the room without regard to the individual frequencies or for propagation of original sound. These apps are good for making industrial spaces tolerable but not particularly helpful for a performance area. We use a software called EASE which is designed specifically for performance spaces and can take into consideration every nuance of the space and the sound system as well. From studies performed by this software we can determine the optimal materials to reduce the unwanted sounds in the room while minimizing the effect to the good or desired sounds in the room.

Before purchasing and installing any materials in a space an EASE study must be done to be sure that the money being spent on materials and labor will actually perform the desired task. Too much damping in a room can be just as detrimental as not enough. Contact us for no cost initial site visit and to determine what the cost is for a complete room analysis. It is much better to get it right the first time rather than have to go back and redo the project later.

