Acoustics in Project Studio Control Rooms

Application Note 0803

1) Introduction: Project studio control rooms have several acoustic requirements:
   a. Sound isolation should be adequate.
   b. Background noise should be low.
   c. Echoes and reflected sound energy should be controlled.
   d. Mixes should translate well into the real world.

   MSR offers several solutions for the above criteria.

2) Adequate Sound Isolation: A project studio control room should be isolated from its surroundings in order to prevent instruments in the tracking rooms from bleeding into the control room and, likewise, to prevent the control room monitors from bleeding into microphones in the tracking rooms. Isolation is achieved through a series of strategies, including suspension, damping, adding mass, and sealing all gaps. A typical wall made of drywall and studs provides about 40 decibels (dB) of isolation in the mid frequencies and only 6dB in the low frequencies. This means that a snare drum hit of 100dB in the control room would still be 60dB in adjoining rooms, while a 100dB kick drum hit would only be attenuated to 94dB! Clearly, a traditional wall isn't sufficient.

   A better wall structure, using visco-elastic polymer damping compound, would result in 50dB of sound isolation. This is sufficient for typical monitoring levels. An even better structure using suspension bushings and damping compound would result in 60dB of isolation. This is adequate for high monitoring levels.

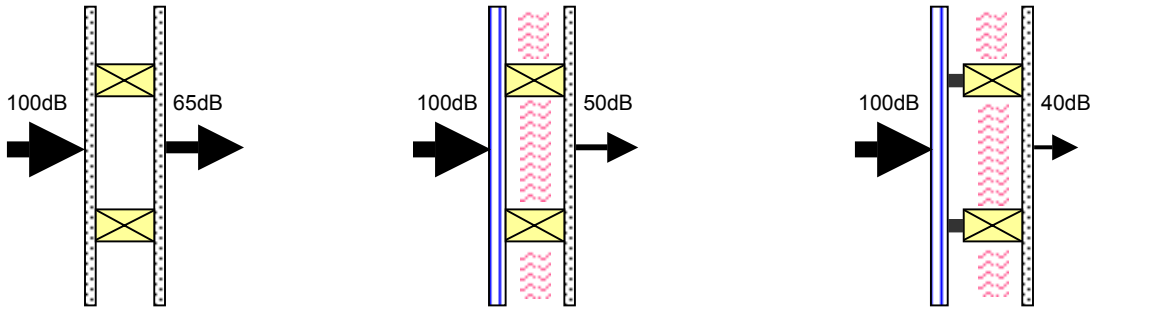


Figure 1: Wall isolation specifications for three types of structures.
Also shown is the isolation effect of each wall on a 100dB sound.

MSR can supply the visco-elastic drywall and suspension bushings for your project.

MSR, Inc. 9A Mono Avenue, Fairfax, CA94930 USA info@msr-inc.com www.msr-inc.com
Toll Free: (800) 497-2087 Phone: (415) 454-2087 Fax: (415) 454-2171

3) Low Background Noise: Several sources of noise in a control room can elevate the noise floor above an acceptable level – normally NC17 to NC25. The most common noise source is the heating, cooling, and ventilation system. The mechanical noise generated by the air handlers can be reduced by using suspension systems.

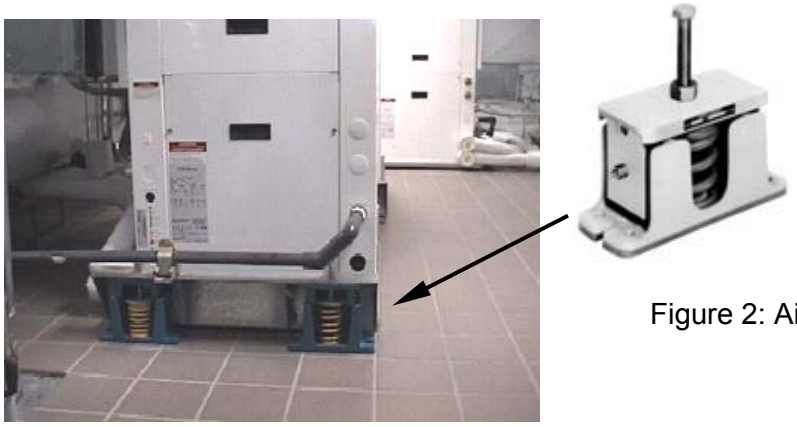


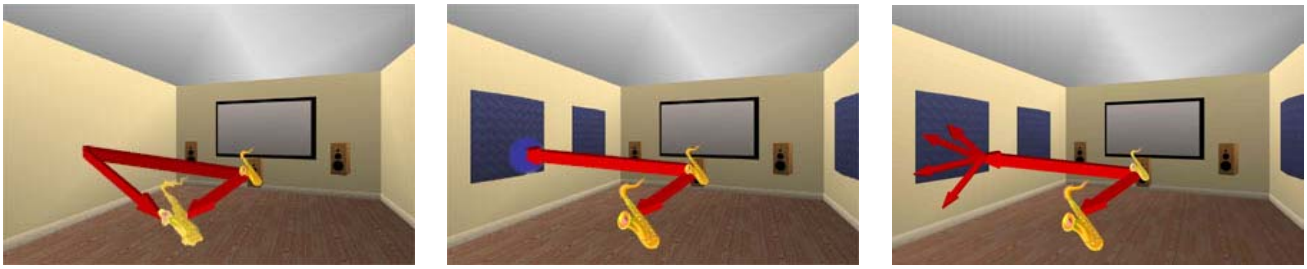
Figure 2: Air handler suspension system

The noise generated by the fans and the air rushing through ducts can be reduced by the use of duct silencers. Silencers can also reduce the sound bleed-through between rooms serviced by the same HVAC system.

Figure 3: An inline duct silencer

Silencers can easily be retrofitted into an existing duct system. MSR has several models of suspension and silencer systems available to fit your needs.

4) Echo and Reflected Sound Energy Control: A room with hard surfaces will reflect sound, much like a mirror reflects light. Some sound reflection is good for a sense of presence, but too much is fatiguing and distracting. Sound reflections and echoes should be reduced and controlled. Absorption and scattering are two strategies for reducing echoes and reflections.



Sounds reflect off walls. Absorption removes reflections. Scattering breaks up reflections.

Figure 4: Absorption and scattering treatments to reduce sound reflections

As a general rule, 25% of a room's wall surfaces should be covered with absorption. Another 20-30% should be treated with one of two types of diffusion. 2D diffusion, which scatters sound in a horizontal plane, is preferable for the side walls toward the front of the room, while 3D diffusion, which scatters sound hemispherically, is better suited for the back of the room and the rear wall. Regardless of type or placement, all treatments should be wideband – meaning that they are effective below 500 Hz.

For very low bass, where standing wave resonances become problematic, special treatments called bass traps are employed. They should be placed in the corners of the room where the standing wave pressure is highest.

MSR Acoustics offers acoustic treatment solutions to fit every application and budget.

The ZSound product line provides state-of-the-art acoustic control for the uncompromising recording engineer. Developed by top acoustics researchers and musicians at ZS International, ZSound acoustic treatments are the product of pure passion for sound.

ZSound includes a variety of absorber and diffuser modules to place on your walls to provide reflection and echo control as well as spatial diffusion.

Equilateral Deep Absorber

Equilateral 3D Diffuser

Figure 5: Examples of ZSound acoustic treatments

Available in four standard finishes, and using a combination of exotic hardwoods and green-grade absorber composites, ZSound products are at home in the most demanding recording spaces.

MSR also offers pre-engineered Dimension4™ systems for professional recording studios, project studios, media rooms, and game developers. Dimension4 Systems are full-frequency solutions that provide improved accuracy, focus, and tonal balance with optimal absorption, diffusion and bass control for a given room size.

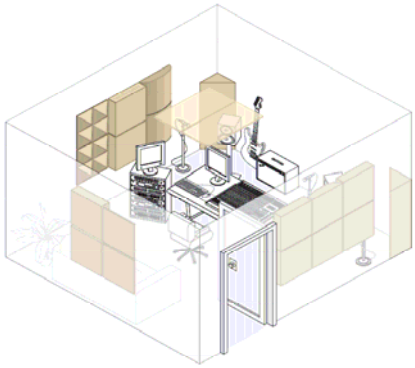
Dimension4 Pro Series

Dimension4 Project Series

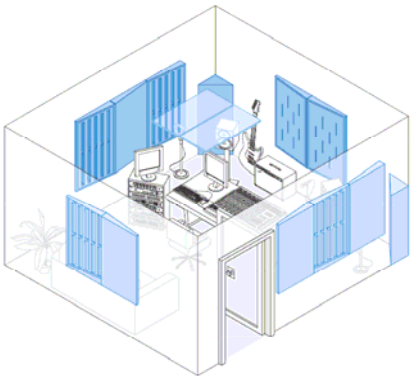
Dimension4 Prime Series

Figure 6: Examples of Dimension4 Absorbers and Diffusers

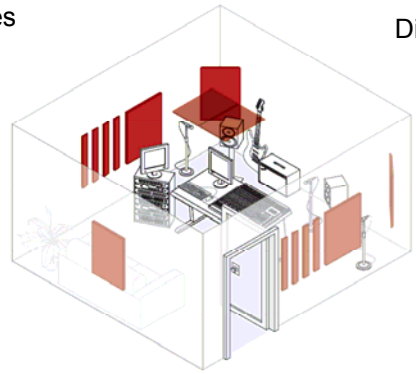
Systems are available in three performance levels: Pro (high-end), Project (intermediate), and Prime (entry-level). Utilizing a scientifically-designed combination of high-performance absorbers, diffusers, and bass traps, each system provides the best sound quality without complex acoustical calculations.



Dimension4 Pro Series



Dimension4 Project Series



Dimension4 Prime Series

Figure 7: Recommended Room Layouts

Dimension4 systems include modules for your walls that provide reflection and echo control as well as spatial diffusion. Ceiling panels control the detrimental vertical first reflections. Bass absorber traps placed in corners or on the front wall address the low-end balance of the room.

5) Mix Translation: MSR can assist in the acoustic design, monitor system design, and calibration/tuning of high quality project studio control rooms. Its sister company, Performance Media Industries (PMI) has years of experience engineering and calibrating AV systems. PMI can be contracted to consult on any aspect of a system in order to ensure that your mixes sound good everywhere, not just in your control room!