Solving Acoustic Problems in Rehearsal and Practice Spaces

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In the ideal world, every music educator could design his or her own rehearsal and practice facilities, working with world-class acoustical experts and unlimited financial resources. In reality, however, music educators must "make do" with facilities that are often inadequate, antiquated or poorly designed. When a rehearsal or practice space has poor acoustical properties, the entire music program suffers.

The importance of good acoustics in music facilities cannot be over-emphasized because listening is the foundational skill of music education. Musicians must be able to hear even the smallest variations in pitch, dynamics, tone color, articulation and balance.

This article will highlight four types of common acoustical problems -- sound isolation, interior room acoustics, mechanical noise and practice room acoustics. Some solutions are simple, most will require funding. In some cases, very little can be done beyond renovating your space. The input of a professional acoustician is also invaluable in this process. Whatever your situation, learning more is an important step toward advocating improvements.

Sound Isolation

To paraphrase the Renaissance poet John Donne, "No rehearsal room is an island." This is particularly true with sound isolation, which considers how sound travels in and out of a room or area. Proper sound isolation helps create a musical "island" -- a welcoming, Hawaii-like paradise. Inadequate sound isolation, however, imprisons musicians in an inhospitable, Alcatraz-type setting.

How well is your rehearsal space acoustically isolated from surrounding areas? Do outside sounds cause distractions? Is the music from the rehearsal area impacting nearby classrooms? If there are problems, here is what to look for:

Doors & Windows. Check the doors' basic structure – are they too thin or hollow? Doors should be solidly built, with sufficient mass. A tight seal is also essential to contain sound. It's easy to check seals by closing the door or window on a piece of paper. If you can easily pull the paper through with little or no resistance, your seals are not as good as they should be. Anywhere you can feel air movement or see light shine through is also a trouble spot. Seals and gaskets should be made of dense, flexible material like neoprene.

Windows can provide effective sound isolation if they are constructed of two isolated panes, each more than ¼" -- but different thicknesses so they do not resonate at the same frequency.

If the mounting hardware can support the extra weight, doors can be reinforced with ¾" plywood or sheet metal. Single-pane windows can have a second pane of glass added. However, it's important to compare the cost of these modifications with complete replacement. Also, fire code requirements must be considered with any modifications.

Walls. Looks can be deceiving. While walls are impenetrable visual barriers, they often make poor sound barriers. For example, even a tiny hole the size of a quarter can reduce the isolation effectiveness of a 4' x 8' wall by 80 percent!

When evaluating walls, focus first on interior walls shared by adjoining classrooms or office spaces. For walls to offer adequate sound isolation, they should have substantial mass and contain a space of dead air and insulation. Walls should also seal at the floor and ceiling deck -- not just the suspended ceiling. Any electrical outlet or light switch in the wall may compromise sound isolation if the hole is cut directly through to the room on the other side. Back-to-

back electrical boxes should instead be staggered at least two feet, to ensure that a stud separates the boxes.

Also, examine trim or mopboard along the floor surface, perhaps even pulling back a small section to be sure the walls have been sealed to the floor with caulking.

Ceilings and Floors. As with walls, the ceiling and floor must have sufficient mass to isolate sound. If your ceiling is the roof deck, it may be too thin or constructed of corrugated steel, allowing outside sounds like airplanes or rain to disrupt the rehearsal room. Overhead sound isolation can be improved by adding a suspended, sound-isolating ceiling supported by acoustical hangars.

If sound is coming into your rehearsal room from the floor, you may need to consider adding a floated floor, which includes a resilient isolation pad made of neoprene or compressed glass fiber.

Interior Room Acoustics

Most classrooms are designed for lecture-based education. However, the same room acoustics necessary to support human speech in English or math class can cause serious problems in a music rehearsal space. The size, shape and surface materials in a rehearsal area all play key roles in defining the acoustics of a space. Some common problems include:

Room Too Loud. This is one of the most common acoustical complaints about rehearsal areas. Usually, excessive loudness is caused by inadequate cubic volume – the room is too small for the sound being produced.

A good rule-of-thumb for a band/orchestra rehearsal room that accommodates 60-75 students is a ceiling height of 18'-22', floor space of 2,500 square feet and a resulting cubic volume of 45,000 – 55,000 cu. ft.

To increase a room's cubic volume, consider removing a portion of the suspended ceiling or removing the wall between an adjacent room. [Be advised, however, that this space is often used by the heating, ventilation and air-conditioning (HVAC) system for a return air plenum.]

Also, remove cabinets, closed risers, desks, marching band equipment and anything else that takes up space. The space under portable risers, if left open, will not reduce the room's total cubic volume.

Sound absorption panels are another way to quiet a room. These panels should be at least 3" thick to absorb a broad range of musical sound. For best results, use in conjunction with sound-diffusive surfaces, such as diffuser panels, to distribute sound evenly around a room. As a last resort for loud rooms, consider reducing the sound energy by splitting rehearsal times and reducing your group sizes.

Bass-Heavy Room. Some rooms may seem to be too loud, but the real problems are exaggerated low frequencies that make the room sound boomy or bass-heavy. In general, most surface finishing materials (drapes, carpet, ceiling tile) are too thin and do not absorb powerful, low-frequency sound. These materials absorb primarily higher-frequency sounds, such as flutes and violins, and the high harmonic overtones of most instruments. As a result, the low sounds are accentuated.

To fix this problem, replace thin curtains and carpet, especially on the walls, with a treatment of absorption panels. The thicker the panels, the greater the absorption. At a minimum, panels should be 3" thick. If your room has reflective ceiling tiles, replace them with 1" thick fiberglass panels.

Echoes and Standing Waves. Untreated parallel surfaces can create negative acoustical effects such as flutter echoes or standing waves. Flutter echoes result in a prolonged buzzing sound; standing waves overemphasize certain frequencies and make them abnormally loud.

To solve these problems, try to minimize the parallel, reflective paths between the surfaces in your room. This is best accomplished by a combination of diffusive and absorptive treatments applied to the walls and ceiling.

Poor Ensemble – Difficult to Hear. Hot spots, dead spots, excessive reverberation, a lack of clarity or a combination of these problems can make proper ensemble difficult to achieve, if not impossible. When diagnosing the problem, be sure to move around the room to evaluate the acoustical differences throughout the space.

These problems are usually treatable with a proper combination of absorption and diffusion throughout the rehearsal space. Both are important. Absorption can balance the dynamics of frequency and help control loudness, but diffusion is also needed to scatter and blend the musical sound. Seek the help of an acoustical consultant experienced in music rehearsal rooms.

Mechanical Noise

There are a wide variety of building systems and equipment within or nearby a rehearsal room that can generate unwanted noise, creating distractions and also masking certain musical frequencies.

The biggest culprits are the HVAC systems. Because music making is a physical activity, such areas require an air exchange rate roughly double that of regular classrooms. Larger air ducts and grilles are required to reduce the 'whooshing' sound caused by increased air volume and velocity.

If compressors or motors are located in areas adjacent to the rehearsal room, low-frequency sound vibrations may be transmitted through the building's structure. Sometimes, noisy equipment simply needs maintenance, such as new belts or lubrication. Mounting equipment on springs or neoprene barriers can also help minimize sound transmission.

Fluorescent light fixtures are another common source of noise, due to ballasts or transformers buzzing. To reduce this noise, use electronic ballasts with an 'A' sound rating or install the ballasts in a remote location.

Practice Room Problems

Just as with rehearsal rooms, good practice rooms should provide sound isolation and musically supportive interior acoustics. Unfortunately, practice

rooms are often the worst music spaces because they break the first rule of good acoustics: inadequate cubic volume to properly dissipate the sound energy created.

The best practice rooms are heavily sound-absorbing, balancing sound across a broad frequency range. As a result, these rooms will be very dry acoustically – exactly opposite of the environments in which musicians would choose to perform.

Sound isolation of a practice room is critical, to minimize any distraction to nearby practice or rehearsal areas. The same trouble spots mentioned earlier for rehearsal areas (doors, windows, floors, etc.) also apply here. Mechanical systems such as HVAC can also disrupt practice room activity.

If sound isolation is not a problem, the easiest way to improve interior acoustics is by adding a significant amount of absorptive material to the walls and ceiling. A good rule of thumb for practice rooms is 3" thick fibrous absorption covering more than 30% of the room's surfaces.

When compared to the cost of properly constructing built-in practice rooms with good sound isolation, pre-engineered practice rooms offer a cost-effective alternative. These modular rooms offer guaranteed sound isolation and can be relocated if necessary.

You and your students spend countless hours rehearsing and practicing. To receive the maximum benefit from this time, your facilities should be acoustically supportive. A basic understanding of strengths and weaknesses in four key areas -- sound isolation, interior room acoustics, mechanical noise and practice room acoustics – can help determine the necessary steps toward making improvements. The results will really be music to your ears!

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