Ensuring quality sound for more effective music education
The study of music is dependent upon the ability to learn and hear differences in intonation, dynamics, articulation, and balance. This skill, called critical listening, can be developed only in a learning environment with proper acoustics. How well your facility promotes critical listening is directly proportional to how effective it will be.

Wenger Interactive Acoustical Panel Systems promote critical listening and effective music education. The information in this brochure will help you understand how you can effectively put these treatments to work in your facility to ensure successful education.

Excellent acoustics demand adequate cubic volume that results from higher ceilings and ample floor space. The shape of your room and angle of its walls also have a profound effect on the quality of its acoustics; as do construction properties within the room.

If your music space has proper cubic volume, Wenger panels can tune the acoustics to perfection. But when room size is too small, sound reflections return too quickly for musicians to properly hear the sound they create, resulting in a lack of envelopment. In these environments, no combination of panels can completely compensate for the lack of cubic volume. But, the right combination of Wenger acoustical panels can enhance acoustics by increasing your room’s ability to accommodate big sound in a small space.

The chart below shows typical problem areas that can be remedied by Wenger Interactive Acoustical Panel Systems, thus creating an environment in which real learning can be achieved through listening.

TYPICAL ACOUSTICAL PROBLEMS

<table>
<thead>
<tr>
<th>Problem areas</th>
<th>Effect on acoustics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rooms with limited cubic volume</td>
<td>Overemphasizing loudness; lack of presence, dynamism; and envelopment</td>
</tr>
<tr>
<td>Low ceilings</td>
<td>Reduction in cubic volume; lack of cubic volume</td>
</tr>
<tr>
<td>Poured concrete rooms</td>
<td>Unfavorable reduction of reverberation and immobility</td>
</tr>
<tr>
<td>Untreated parallel walls</td>
<td>They create an annoying, ringing or booming sound, called flutter echo</td>
</tr>
<tr>
<td>Multi-angle walls</td>
<td>They vary the hot spots and dead spots if not acoustically designed; in which case construction costs may be prohibitive</td>
</tr>
<tr>
<td>Visual acoustics (i.e., curved walls and domes that look to have good acoustical properties but are more often detrimental to the acoustical environment)</td>
<td>A myriad of problems, including hot spots, dead spots, and echoes</td>
</tr>
<tr>
<td>Square or cube-shaped rooms with parallel walls</td>
<td>They create additive wave lengths, called standing waves, that over-emphasize certain frequencies, making them noticeably loud</td>
</tr>
<tr>
<td>Instrument storage cabinets with solid doors in the rehearsal room</td>
<td>Reduction in cubic volume; they should be kept outside of rehearsal rooms, if possible, or outfitted with grille doors</td>
</tr>
<tr>
<td>Excessive wall finishing materials like, cement, plaster, wood</td>
<td>Absorption of higher frequencies, but not lower frequencies</td>
</tr>
<tr>
<td>Excessive ceiling finishing materials like, concrete tiles, hardwood</td>
<td>High reflection of sound; normal absorption</td>
</tr>
</tbody>
</table>

Wenger Interactive Acoustical Panel Systems are based on the principles of absorption and diffusion. To achieve critical listening, the music environment must have the proper combination of these qualities, which control excessive loudness and diffuse sound throughout the space thereby improving acoustics.

**Note:** In rooms that only utilize high-frequency absorption, flutes, violins, sopranos and other high-frequency sounds, are ineffective.

**Different music environments require varying degrees of absorption and diffusion, depending upon their shape, volume, etc. Wenger professionals work to achieve the right balance of absorption and diffusion to create the ideal music learning environment, where musicians can hear the music as they played it. In these effective environments, proper reverberation times are achieved to give instructors a more accurate account of student performance and progress.**

**ROADBLOCKS TO CRITICAL LISTENING**

**SOLUTIONS THAT ENHANCE CRITICAL LISTENING**

**Absorption**

Sound absorption can generally be defined as the reduction of sound energy that occurs when sound comes into contact with various surfaces and materials. When sound strikes a hard, dense surface such as a gymnasium floor, there is nominal absorption. When sound comes into contact with thick, fibrous materials such as acoustical panels, a great deal of sound energy can be absorbed, and less sound is reflected back toward its origin.

**Diffusion**

Sound diffusion can generally be defined as the scattering and redirection of sound caused when sound comes into contact with acoustically reflective surfaces. Diffusion of musical sound is necessary so that the music can be clearly heard from all points in a facility. The ornamentation, columns, and plaster work in historic theaters, for example, provide many angled, acoustically reflective surfaces which result in excellent diffusion.

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“Sound waves are like the waves in a pool of water. They travel outward from the source and are affected by their surroundings.”

Ron Frashelt
Acoustical Products Manager
Wenger Corporation
Owatonna, Minnesota

“_students at the beginning level need as much help as possible. It’s up to us to establish a sound foundation for their future.”

Kay Niamik
Band Director
Middlefield Middle School
Middlefield, Connecticut

“_I couldn’t figure out why the trumpets were always overlapping until I stood in their section and played for myself. It was totally dead, so the only way they could hear themselves was to blow like crazy._”

Cal Schmidt
Instrumental Music Teacher
Morris High School
Morris, Minnesota
Each Wenger acoustical panel has been engineered to absorb specific frequencies in a precise manner. We also offer the broadest line — 39 total panels — to ensure the ideal combination of absorption and diffusion for your facility.

On this page you’ll find a brief explanation of the types of panels we’ll use to optimize the acoustic qualities within your rehearsal environment — a solution that complements your existing facility both acoustically and aesthetically.

### Absorber Panels
These acoustic treatments are designed to tailor the reverberation and loudness of a room. Flat in shape, absorber panels are constructed with sound-absorptive, glass-fiber insulation and are engineered to absorb sound across a broader frequency range. Wenger Absorber Panels are ideally suited for the widest range of environments.

### Type I Convex Diffuser Panels
Used on walls and ceilings, Wenger Convex Diffuser Panels feature a composition that scatters and blends sound. Polycylindrical in shape, diffuser panels are typically the best remedy for echoes, flutter, hot spots, and dead spots. They are constructed with a recyclable thermomolded plastic that diffuses the middle-to-high-range frequencies which define timbre and articulation. Wall models are fabric covered, ceiling models are not.

### Type II Convex Diffuser Panels
Though Type II Panels have a similar polycylindrical shape as Wenger Type I Diffuser Panels, Type II’s are significantly larger. Along with their sound-diffusion qualities, these panels are also selectively absorbive in the lower frequencies due to a special insulation, applied to their rear surface, which adds density to the panel.

### Quadratic Diffuser Panels
These special-application panels are designed based on the quadratic number theory to provide the most effective diffusion from 750 Hz to 3300 Hz. Made from recyclable thermomolded plastic, Quadratic Diffuser Panels are available in a 4’ x 4’ size made for ceiling lay-in applications.

### Pyramid Diffuser Panels
Also made for ceiling lay-in applications and available in both 4’ x 4” and 2’ x 2’ sizes, these impact-resistant diffusers feature an offset pyramid shape to address specific acoustical applications. They are made from recyclable thermomolded plastic.

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### Key points to keep in mind:
- Walls must be treated with a combination of absorber and diffuser panels.
- Every surface in every environment has a direct effect on how sound and acoustics work within that specific environment.
- The thicker the fiberglass treatment, the lower the frequency it can absorb.
- It is a good minimum thickness for the effective, wide-range absorption of musical frequencies.

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### DECIBEL LEVELS

<table>
<thead>
<tr>
<th>Decibel Level</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Whisper</td>
</tr>
<tr>
<td>30</td>
<td>Conversation</td>
</tr>
<tr>
<td>60</td>
<td>Traffic</td>
</tr>
<tr>
<td>100</td>
<td>Jackhammer</td>
</tr>
<tr>
<td>130-140</td>
<td>Airplane</td>
</tr>
</tbody>
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### Protect Yourself from Hearing Loss

Rings after a day of rehearsals is an indication that there is too much strain on your hearing. It’s a serious problem often overlooked even though its consequences can happen quickly. At 135 decibels, permanent hearing damage can occur after just 15 minutes. And, because we all react to sound differently, a sound level that one person might consider tolerable may be damaging to someone else.

Wenger Interactive Acoustical Panel Systems can help you understand these conditions by absorbing and diffusing damaging levels of sound. It’s smart to monitor the loudness of all your rehearsal facilities and evaluate the risk to yourself and your students. Please feel free to call us at Wenger any time you have questions or would like additional information.

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### Treatment

Wenger has pioneered the use of advanced active acoustics — called V-Room technology — to bring you a fantastic option for the acoustic treatment of your rehearsal room.

V-Room contains microphones, speakers, and digital signal processing (DSP) to simulate the acoustics of practice and performance environments. Only V-Room allows your ensembles to practice under the acoustic conditions of the places they perform — right in your own room.

Once you have your room treated with absorber panels, V-Room technology lets you acoustically redesign your space with the push of a button. Go from center stage of the auditorium to the conditions of a digital bar in half as easily as changing channels on a TV. Available in V-Room Practice, V-Room Rehearsal, and V-Room Studio, V-Room technology puts acoustics under your control.

Please talk to your Wenger representative for more information.

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**“I’ve seen many rooms where carpet was put on floors and walls to solve acoustical problems, and in every case the problems persisted.”**

— Jane Mattoon, Band Director
Yerington High School, Yerington, Nevada

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**“First and foremost, as band directors, we have to take care of our hearing.”**

— Thomas Haugen, Band Director
Jefferson Senior High School, Alexandria, Minnesota
As stated, good acoustics are dependent upon the ideal balance of absorption and diffusion of sound. The shape, cubic volume, and needs of every space are unique and as a result, acoustical panels cannot simply be mounted at random. Their placement, mix, and size must be analyzed according to the room and the groups that practice there.

Similarly, there are no standard packages for a Wenger Interactive Acoustical Panel System because each system must be a combination tailored to a specific environment.

At Wenger, we have more experience treating music education spaces than any other company, and we’re ready to put our well-documented talents to work for your facility. But first, just look at the following examples of how we’ve helped transform problem spaces into superb musical environments.

**Leonard Tyl Middle School, Oakdale, Connecticut**

The original space was a small, narrow room with poured concrete risers. This resulted in excessive loudness and inadequate diffusion, which Wenger solved with a customized balance of absorber and diffuser panels. Note the use of grille-door instrument storage cabinets to maintain the cubic volume in the room and to minimize the number of flat reflective surfaces.

**Mountain Pointe High School, Tempe, Arizona**

Although generally a fine music space with adequate cubic volume and well-designed multi-angled walls, the room required improved diffusion. Wenger added low-frequency absorber panels to provide an effective level of absorption that cannot be achieved with carpet.

**Leonard Tyl Middle School, Oakdale, Connecticut**

“We’re very pleased with how Wenger acoustical panels have improved the sound in our facility. I’ve already recommended them to my colleagues.”

Neville Curtis
Director of Bands
James Island High School
Charleston, South Carolina

“We’re very pleased with how Wenger acoustical panels have improved the sound in our facility. I’ve already recommended them to my colleagues.”

Sister Ellen Ryan
Music Director
Mother McAuley High School
Chicago, Illinois

The best solution for your facility

Talk with your Wenger representative about how we can use our expertise — and proprietary computer program — to create an environment where the acoustics are always crisp and accurate and critical listening is a way of life. It’s the only way that music education can succeed, and it’s just a phone call away.

1-800-733-0393