

INTERACTIVE ACOUSTICAL PANEL SYSTEMS

Ensuring quality sound for more effective music education



Wenger®
Your Performance Partner

ROADBLOCKS TO CRITICAL LISTENING

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 music education.

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.

Protect Yourself from Hearing Loss

Rooms without adequate space to dissipate and absorb the loudness generated by musical ensembles can have dangerously high sound-pressure levels. Concert bands, marching bands, orchestras, and jazz bands generate especially high levels. In fact, according to OSHA standards*, 90 decibels (dB) is the maximum acceptable level of noise in a workplace. Yet sound levels in band rehearsal rooms reach peak levels that are often 7 to 12 dB higher than the standard, an alarming find when you consider that every 6 dB equates to a doubling of sound. No wonder that, in a recent study, 20% of K-12 choral and band instructors showed signs of noise-induced hearing loss.

Ringling ears 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 severe consequences can happen quickly. At 115 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.

*OSHA bases its standard on continuous exposure to noise. And though music directors are more often subjected to less prolonged periods of sound, they are still at risk if subjected to such high levels.

DECIBEL LEVEL EQUIVALENTS

Faint 30-40 decibels	Moderate 50-70 decibels	Very Loud 80-100 decibels	Extremely Loud 110-130 decibels	Painful 140-170 decibels
whisper library	conversation business office	fire crackers street traffic	rock concert jack hammer	airplane pain threshold

Wenger Interactive Acoustical Panel Systems can help 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.

TYPICAL ACOUSTICAL PROBLEMS

Problem area	Effect on acoustics*
Rooms with limited cubic volume	Overwhelming loudness; lack of presence; dangerous conditions
Low ceilings	Reduction in cubic volume and its consequences
Poured concrete risers	Unnecessary reduction of room volume and increased loudness
Untreated parallel walls	Create an annoying ringing or buzzing sound, called flutter echo
Multi-angled walls	Create hot spots and dead spots if not properly designed, in which case construction costs may be prohibitive
Visual acoustics (i.e., curved walls and domes that look to have good acoustical properties but are more often detrimental to the acoustic environment)	A myriad of problems, including hot spots, dead spots, and echoes
Square or cube-shaped rooms with parallel walls	Create additive wave lengths, called standing waves, that over-emphasize certain frequencies, making them abnormally loud
Instrument storage cabinets with solid doors in the rehearsal room	Reduction in cubic volume (they should be kept outside of rehearsal rooms, if possible, or outfitted with grille doors)
Excessive soft finishing materials (i.e., carpet, drapes, upholstery)	Absorption of higher frequencies, but not lower frequencies**
Excessive hard finishing materials (i.e., concrete, tile, hard wood)	Harsh reflection of sound; minimal absorption, very loud

*Essentially, all problems are relative to poor acoustics that lead to inadequate critical listening and, consequently, ineffective education.

**Note: In rooms that only utilize high-frequency absorption, flutes, violins, sopranos and other high-frequency sounds, including the high overtones of most instruments, can be lost; intonation, articulation, and timing can be blurred; and critical listening becomes impossible. Similarly, the remaining low frequencies become overpowering, and acoustics within the environment will lack clarity and become loud and boomy.

SOLUTIONS THAT ENHANCE CRITICAL LISTENING

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

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.

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 play it. In these effective environments, proper reverberation times are attained to give instructors a more accurate account of student performance and progress.



Untreated rehearsal room

- Parallel walls create flutter echo.
- Carpet, drapes, and upholstery absorb only the higher frequencies.
- The remaining lower frequencies become overpowering, reverberant, and indistinct.
- Loudness is excessive and nearly impossible to control.



Rehearsal room treated only with absorber panels

- Panels absorb high and low frequencies, reducing flutter echo and boomy sound.
- Loudness is also reduced, but overall acoustics are unbalanced.
- Lack of diffuser panels severely limits sound reflection, which adversely affects ensemble.



Rehearsal room treated with absorber and diffuser panels

- The ideal combination of absorber and diffuser panels creates an acoustically balanced environment
- Flutter echo, excessive reverberation, and boomy sounds are eliminated.
- Loudness is controlled and balanced over the full audible range.
- Performers hear themselves and others.
- Instructors hear balance with accuracy.

THE INDUSTRY'S MOST RESPECTED LINE OF ACOUSTICAL SOLUTIONS

Each Wenger acoustical panel has been engineered to affect 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 panels are fabric-covered, ceiling panels are not.



Match your Decor

Wenger absorber panels and convex diffuser panels are available in versatile colors that have been specially chosen to coordinate with the decor of virtually every facility.

"After teaching all day, my ears don't have nearly the fatigue they did before, when I taught without panels. The sound absorption in my room is very good — the panels make a huge difference."

— Eric Harris, Band Director & Music Dept. Chair
Vance High School
Charlotte, North Carolina

"First and foremost, as band directors, we have to take care of our hearing. Wenger Acoustical Panels solved that problem for us. They also have the students playing better because they're hearing better."

— Thomas Haugen, Band Director
Jefferson Senior High School
Alexandria, Minnesota

"Band members have commented that they're able to hear each other better or in some cases for the first time. Musicians are better able to sense the color and timbre of their own instrument. They can also extend their own dynamic levels without the sound turning into noise."

— Bill Wahl, Band Director
Crescent Heights High School
Alberta, Canada

FIVE TYPES AND 41 TOTAL PANELS



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 absorptive in the lower frequencies due to a special insulation applied to their rear surface.



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.

NOTE: All panels meet Class A fire rating.

Key points to keep in mind:

- Walls should be treated with a combination of absorber and diffuser panels.
- Absorber panels placed on the lower wall behind the percussion and lower brass sections significantly reduce loudness.
- 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. 3" is a good minimum thickness for the effective, wide-range absorption of musical frequencies.

"I've seen many rooms where carpet was put on floors and walls to solve acoustical problems, and in every case the problems persist."

— Jene Melton, Band Director
Yerington High School
Yerington, Nevada

"Since the Wenger acoustical panels were installed, the band can now play at full volume comfortably. The panels control the upper end of the volume very well and it's possible to hear all the parts distinctly."

— Kathy McIntosh, Band Director
Troy High School
Troy, Ohio

"The acoustical panels have made a tremendous difference — the effect is awesome! The room has cinder block walls without any carpet on the floor, so it was very loud before our renovation. The new room is also better for the eyes. All our equipment matches and has a coordinated look."

— Mike Bhone, Director of Activities
West High School
Bakersfield, California

EXAMPLES OF ACOUSTICAL TREATMENTS IN THE REHEARSAL ROOM



Kettering Fairmont High School, Kettering, Ohio

Top image: Band Rehearsal Room for an 86-piece concert band acoustically treated with Absorber Panels, Type I and Type II Convex Diffuser Panels on the walls and Pyramid Diffuser Panels on the ceiling.

Bottom image: Recital Hall acoustically treated with Absorber Panels and Type II Diffuser Panels on the walls.



“In our new performing arts center, Wenger designed and installed the optimal configuration of acoustical panels for our three rehearsal rooms and recital hall. The results are amazing! What this all means for the teachers’ ability to teach and the students’ ability to learn without distractions from bad acoustics is truly remarkable. This terrific new addition will help maintain and grow our music program, which was solid before and now can get even better.”

— Jim Probasco, Music Coordinator
Kettering City School District
Kettering, Ohio



Bernards High School, Bernardsville, New Jersey

Top image: Choral Rehearsal Room acoustically treated with Absorber Panels on the walls and Pyramid Diffuser Panels on the ceiling.

Bottom image: Band Rehearsal Room acoustically treated with Absorber Panels, Type II Convex Diffuser Panels on the walls and Pyramid Diffuser Panels on the ceiling.



“To justify my requests in planning meetings, I researched enrollment, acoustics and equipment. We ended up with a beautiful music facility. The acoustics in here are great - I’m not going to lose my hearing in five years.”

— Fred Trumpy, Band Director
Bernards High School
Bernardsville, New Jersey

ACOUSTICAL PANELS AND ACOUSTIC CABINETS™ IN THE REHEARSAL ROOM

Proper acoustics are essential in music education environments, enabling the development of critical listening skills. As one part of an overall acoustical solution, AcoustiCabinets are ideal for situations where instrument storage cabinets are located within a rehearsal room. The encapsulated acoustically absorptive material built into the back of the cabinets provides specific acoustical benefits by absorbing a broad range of sound frequencies.



WITHOUT ANY TREATMENT

A rehearsal room without any cabinets or acoustic treatments will have excessive loudness, flutter echoes and could possibly cause hearing loss over extended periods of time.



WITH ORDINARY STORAGE CABINETS

A rehearsal room with instrument storage cabinets succeeds in diffusing some sound but has little effect in quieting loudness or absorbing high and low frequencies.



WITH WENGER ACOUSTIC CABINETS

A rehearsal room with Wenger's AcoustiCabinets and used in conjunction with absorber and diffuser panels can create an acoustically balanced environment. Loudness is controlled and balanced over the full audible range.

"The acoustics in my band room are good - much better than my former band room. Even with my 100-piece marching band in there, the sound level is pretty comfortable. There's not as long of a delay, which is nice. When I make a cutoff, the sound doesn't ring for six or seven seconds afterwards. I can also hear better because the sound is getting diffused correctly. I love the AcoustiCabinets - I wish we had more."

— Brent Morrison, Band Director
Otsego High School
Otsego, Michigan



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.



Wenger Corporation was founded in 1946 to provide innovative, high-quality products and solutions for music and theatre rehearsal, performance and storage. We have spent more than 60 years listening to what our customers need and then designing and developing durable, functional products to meet those needs - products that enhance any program and deliver what they promise year after year.

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.

U.S.A./5-08/1M/LT0057B

©2008 Wenger Corporation
Printed in the U.S.A.

WENGER CORPORATION
555 Park Drive, PO Box 448
Owatonna, MN 55060-0448
Phone 800.4WENGER (493-6437)
Fax 507.455.4258
Parts & Service 800.887.7145

WENGER CORPORATION
CANADA OFFICE
Phone 800.268.0148

WENGER CORPORATION
BEIJING REPRESENTATIVE OFFICE
Tel 0086-10-84972502
Fax 0086-10-84972575

WORLDWIDE
Phone 1.507.455.4100
Fax 1.507.774.8576
Web Site
www.wengercorp.com

Wenger®
Your Performance Partner