

Sound Investment:

ACOUSTICAL SHELLS PROVE VALUE

By Mark Ingalls

Photography provided by Wenger Corporation





Attending a musical performance can be captivating. Listening to the beautiful sound and spectacle, the effortlessness of the musicians' skills, it can be easy to forget the hours, months, and even years of practice that make the memorable performance possible.

In a similar way, the factors behind successful auditorium acoustics often go unrecognized, including one of the most visible elements: the acoustical shell.

The most important considerations in a successful installation—acoustics, function, and aesthetics—all work in harmony to produce a beautiful result. These factors are all evident in Shriver Auditorium at Johns Hopkins University in Baltimore, Maryland.

“Our previous acoustical shell dated back to the 1950s—it had been custom-made by our in-house carpentry shop,” explains Thomas Wheatley, Supervisor of Carpentry Maintenance. He says it originally was a beautiful product, but had become difficult to work with. Wheatley adds, “The acoustics were horrible compared to what’s available today. It’s kind of like driving a Model T car when you could be driving a Cadillac.”

CHALLENGES FOR MUSIC

To understand the important role played by acoustical shells, it is critical to first consider the architecture of typical auditoriums. The stage and audience area are usually separated by a proscenium opening, which provides a “picture frame” through which the spectators watch the play, opera, or other dramatic production.

This is true of the 1,110-seat Shriver Hall Auditorium, home for the Shriver Hall Concert Series and Hopkins Symphony Orchestra (HSO). Like most proscenium auditoriums, it features a fly loft and rigging system above the stage, used for supporting lights, curtains,



and stage scenery. While this setup is ideal for drama, it poses several acoustical challenges for music performance.

The proscenium opening makes an acoustical separation between the stage area and the seats—effectively creating two different acoustical spaces. Instead of reaching the audience, much of the sound produced onstage ends up lost in the fly loft above the stage or in the offstage wing space. Such conditions make it difficult for musicians to hear themselves and each other; this setup also compromises and diminishes the sound heard by the audience.

UNITING SPACES

Acoustical shells help connect the stage and audience areas, creating one larger acoustical space. Most acoustical shells consist of two elements:

- sound-reflective side and rear towers placed on the stage floor to surround the performers; and
- ceiling panels suspended from the overhead rigging system.

Together, the shell's elements effectively seal off the backstage and above-stage areas, minimizing the leakage of sound into these auxiliary spaces and maximizing sound projection across members of the group and out toward the audience.

The benefits start onstage, where the music is created. The convex shape of the towers and ceiling panels helps scatter the sound. Both are constructed of a composite-panel honeycomb-core material that creates an acoustically reflective surface, effective across a broad range of musical frequencies.

This reflected sound enables musicians to hear themselves and each other better. In musical terms, the word *ensemble* means more than just a group performing together; it describes a well-blended sound that unifies the collective members.

While the full-stage shell creates a blending chamber for sound on stage, it also helps reflect that blended sound out toward the audience. The positive impact is measurable. One study showed acoustical shells increase the strength



of sound by more than 3 decibels (dB) at many seat locations in multipurpose halls, which is approximately equal to doubling the size of

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the performing group. The effects onstage are even greater—more than 5 dB—according to findings published in the *Journal of the Acoustical Society of America*.

OPERATING SMOOTHLY

Particularly in multi-use auditoriums, acoustical shells are reconfigured often to suit different performing groups. Therefore, shell features that enable easy operation and handling will speed transitions, facilitating a greater number of events and saving crew time and related labor expense.

“We looked at acoustical shells from several manufacturers, and user-friendliness was a big key,” recalls Wheatley. “This shell is extremely versatile and a pleasure to move,” he adds, explaining that the two ceiling panels and seven towers are used in a variety of configurations depending on the type and size of performance.

The Shriver’s old custom shell took three hours to set up for a crew of 4-5 people, but the new shell takes only one hour for a three-person crew. The shell is usually moved twice weekly. Labor costs are charged by man-hour, so the new shell should be more cost-effective; he estimates a 5-year payback in labor savings alone.

Storage space onstage is always at a premium. The HSO initially had some concerns about the shell because of how much space it took up on stage in the set position. However, their concerns were eased once they saw how the towers nested together compactly. The ceiling panels also store compactly, tipped and flown up in the rigging.

The HSO has between 70 and 80 members, making it challenging to fit so many musicians on stage along with chairs, music stands, timpani and other equipment. They never used the old shell because it was too confining. Wheatley’s staff devised a solution to open up the stage area: use the back panels as additional side panels and use the actual back wall of the stage instead of the back panels.

While a full-stage shell solution (overhead panels and towers) provides the greatest acoustical benefits, HSO chose this compromise for a solution based on space reasons; other venues start with overhead panels due to budget limitations.

CUSTOMIZED SOLUTION

While sharing many common characteristics, each full-stage acoustical shell can essentially be customized to fit the unique requirements of the space and customer, meeting the goals established by the project team. A high degree of repetitiveness in the engineering and manufacturing makes the process more cost-effective than a custom-built shell.

The Shriver’s towers and ceiling panels feature framework constructed of aluminum extrusions, which are lighter and structurally stronger than steel. As the aluminum extrusion serves as a truss, fewer hanger arms are required to secure the ceiling panels to the rigging. Durability and construction were also very important factors in shell selection. “It’s a long-term



The advertisement features a collage of various campus signs. At the top, a large sign reads "MERCYHURST UNIVERSITY". Below it, a sign for "Old Main" lists "Administration", "Christ The King Chapel", and "Admissions". To the right, a sign lists "Identification", "Wayfinding", and "Parking". In the center, the text "Interior and Exterior" is prominently displayed. Below this, there are two more signs: one for the "Public Health Department" listing "Classroom 312A", "James Teufel 312B", "Thomas Cook 312C", "Restrooms", "Classrooms 313, 314", and "Carpe Diem Academy 312E"; and another for "311" listing "Eileen Zinchiak" and "Institute for Public Health". At the bottom, the text "Campus Signage is Our Specialty" is written in a large, bold font. Below this, the "HOWARD INDUSTRIES PRIME SIGN PROGRAM" logo is shown, along with the text "Planning • Resources • Installation • Manufacturing • Execution". A toll-free number "Call Toll Free: 877/468.7000" is also provided. At the bottom, the "APPA" logo is shown with the text "LEADERSHIP IN EDUCATIONAL FACILITIES". To the right of the APPA logo, the text "Come See Us at Booth #110 in San Diego at The APPA Annual Conference and Exhibition" is displayed. Finally, the website "primesignprogram.com" is written in a large, bold font at the very bottom.

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investment,” Wheatley states. “I expect we’ll have this shell for the next 40 or 50 years.”

ENHANCING AESTHETICS

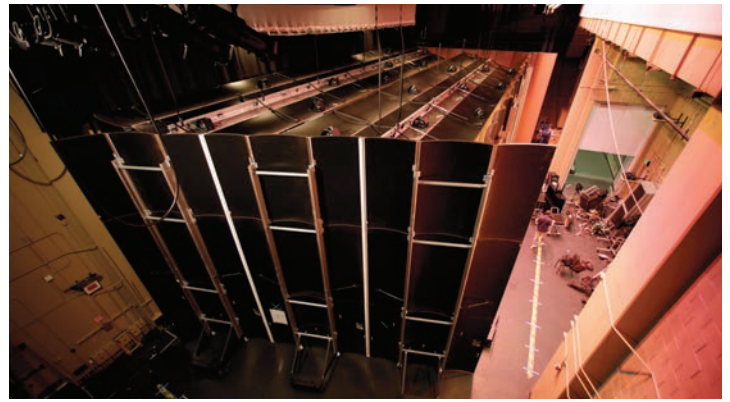
Acoustical shells are often considered portable architecture because of their exquisite level of detail and exacting construction standards. Such shells often serve as visually stunning “crown jewels” of the performance space, by visually complementing and reinforcing the auditorium’s overall design by incorporating similar materials, colors, and finishes into the construction.

Possible shell finishes include painting (from standard to ornamental), laminate or wood veneer. The Shriver shell’s finish is painted antique white and Wheatley says repairs or touch-ups are easy if it gets scuffed up.

For shells with a wood veneer finish, like Indiana Wesleyan University in Marion, Indiana, the natural look belies a complexity that blends both art and science. Wood veneer is comprised of flitches, which are longitudinal sections cut or peeled from a log, each with distinctive visual characteristics, like a fingerprint. Coordinating those flitches for a large acoustical shell is like assembling a giant jigsaw puzzle, with the goal of making the end result look as unified as possible.

BEAUTIFUL RESULTS

The best acoustical shells balance innovative, labor-saving technology with memorable aesthetics to create beautiful results, satisfying to both the eye and the ear.



Wheatley says HSO musicians are very complimentary about the shell’s acoustics. “They said it made the sound ‘huge’ in the auditorium, much better for the performers and the conductor; performers could also hear more clearly—they said the acoustics are 100 percent better.”

The collaboration involved among members of the project team—owner, architect, acoustical consultant, theatre consultant, and shell manufacturer—is similar to the musical teamwork that takes place onstage. 📌

ABOUT THE AUTHOR: Mark Ingalls is a product manager for the performing arts with the Wenger Corporation (wengercorp.com), a manufacturer of equipment and furniture for music education and the performing arts. During his 26-year career at Wenger, Ingalls has also managed the company’s applications engineering department.



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