



Akustiks handled sound at the Schermerhorn Concert Hall, Nashville.

Sound Advice

Refined line arrays and 'electronic architecture' changing the tune at performing arts centers

BY LISA WHITE

With today's high tech home entertainment systems, audiences have become more discerning when it comes to spending money on a show at their local performing arts center. And acousticians have met that expectation with a variety of high tech innovations and modifications.

Paul Scarbrough, principal, at Akustiks in South Norwalk, Conn., said resident companies performing in single-use PACs have specific requirements where acoustics are concerned. "With these venues, acousticians can develop a design that responds uniquely to the character of the community and the ensemble," he said.

This has raised the bar in terms of acoustical quality. Akustiks was involved in the

acoustics at Schermerhorn Symphony Center in Nashville. Scarbrough said the goal of this project was to create a hall that was the next step up in acoustical development. "We have acoustics reminiscent of the great European halls."

The Center's Laura Turner Concert Hall features 2-inch acoustic isolation joints designed around the rectangular hall to prevent any vibration from the offices or event spaces from entering the concert space. In addition, an automated sound-deadening system of acoustic draperies and absorption panels can be quickly deployed along the walls to allow performers to tailor the reverberation and resonance of the space to their needs for amplified pops concerts and other non-symphonic events.

For years, performing arts venues did not include big sound systems in their designs because touring shows would bring their own and they didn't want to make the investment. This created problems properly setting up and working portable systems, particularly with the more acoustically challenging spaces.

By contrast, today's performing arts centers are putting in their own sound systems and tuning them in properly, said Philip Giddings, P.Eng., president of Engineering Harmonics in Toronto, Ontario, Canada.

Engineering Harmonics works closely with acousticians, especially in single-use venues. "It is much more of a challenge to put a sound system in a dedicated concert hall than a multi purpose venue because the acoustics are largely conceived for an acoustic type of performance," Giddings said.

For this reason, many firms like Engineering Harmonics have taken a different approach to speaker systems, like using more line arrays. With the appearance of a big log speaker system, line arrays typically measure 12 feet tall, 4 to 5 feet high and about 4 to 5 feet deep. Systems cost between \$100,000 to \$250,000.

Line arrays control sound and direct it at the audience rather than up to the ceiling or down to the stage. Benefits, according to Giddings, are that there is less feedback resulting from the sound going towards the stage and increased clarity for the audience.

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There are new challenges with this technique. For example, if there are any reflective surfaces in the audience where sound travels through the air and then hits a wall and is reflected back to the stage, then there will be strong sound reflections. This creates a delayed sound, which is perceived as an echo.

Giddings said the industry has been working to solve the problems presented with this new and promising technology. "The designers and manufacturers of these products are getting a better handle on how to predict their behavior and adjust it. It is being refined," he said.

Commercial line array versions also have become popular for public address paging systems in big rooms. These are controlled by digital sign processing or DSP. "DSP is a modern day version of an equalizer, but it is much more sophisticated," Giddings said. "It provides incredible control over electronic signals. By using DSPs, a product can control the line array pattern by aiming it up or down in a broad or narrow pattern. This is all done electronically without moving speakers.

Engineering Harmonics recently designed a public address system using this technology in the Metropolitan Kansas City Performing Arts Center, which is scheduled for completion in 2008.

Although this DSP technology has not yet been applied extensively to the large music systems due to interference between the two speakers, Giddings predicts the challenges in making it work for this application will soon be overcome. "The challenge is whether these large music line array systems' performances can be refined through use of DSP. This is probably the next bit of evolution we'll see," he said.

To get a high reverberation time from the natural acoustics of a room, a large amount of room-volume is required. "This can get expensive due to the cost of the increased size of the physical building and the infrastructure (HVAC) required to support a larger volume," said Jack Hagler, principal at Schuler Shook, a Dallas-based theatre consultant. "We are now seeing many acoustic consultants' designs for performing arts venues move

away from varying a room's acoustic reverberation time by deploying or removing physical absorption materials such as heavy curtains. Instead, they are achieving the same results by deadening the natural reverberation of the room then using an electro-acoustic enhancement system to artificially add back the reverberation."

These electronic systems, also referred to as "electronic architecture," are not the same as the hall's sound reinforcement system. They are specifically designed to enhance a room's acoustic environment by simulating different acoustic environments of different size halls. The amount of reverberation used for a particular performance is dependent on the type of work being presented, Hagler said. "For example, operas or lectures would require less reverberation than what a symphonic or choral performance would require," he explained.

This is done through a series of microphones and speakers placed around the room with much digital processing in between. The system can be programmed to recall presets having different amounts of reverberation depending on what is best suited for the performance and the art form being presented.

Some acoustical consultants extend this electronic architecture onto the stage. "So when the orchestra is playing within the orchestra shell, there are microphones and speakers over the stage to pick-up and reproduce, for the artists on stage, the same simulated environment that the audience is hearing. Tastefully incorporating all of this technology into the physical orchestra shell can be challenging," explained Hagler.

Still, Joseph Solway, senior acoustic consultant at Arup Acoustics in New York City, is seeing an increased use of these sound enhancement systems in today's performing arts centers. These shouldn't be confused with amplification. "These systems subtly change the acoustics in a room," he said.

Joseph Myers, principal acoustician for Kirkegaard Associates in Chicago, said he is seeing interesting uses of cast plaster as a finish. The company incorporated this in Omaha, Neb.'s Holland Performing Arts Center and the Overture Center in Madison, Wis. "This is a material that can

easily provide high frequency diffusion while being supportive at low frequencies. The Holland's sidewalls have a shallow relief that varies in depth from the bottom and top of the room for areas where we want varied diffusion. At the Overture Center, the upper side walls of the main performing space have a low relief pattern done in cast plaster and also a deeper relief plaster used on the rear wall," he said.

Canvas also is being revived. Kirkegaard is working on the renovation of Royal Festival Hall in London that encompasses a canvas reflector over the stage. "This is innovative because canvas has not been widely used in recent years," Myers said. "This fabric will reflect high frequency sounds and allow low frequency sounds to go through it."

Ronald Eligator, principal consultant at Acoustic Dimensions in New Rochelle, N.Y., has seen a continued emphasis on multi-use spaces that require flexibility for a wide variety of programs. "As a result, we are using new and traditional materials in new ways to achieve excellent acoustics integrated with each venues' architectural design," he said.

Another trend is the increased use of new computer modeling software that provides an acoustical analysis of venues. Eligator also is seeing a stronger emphasis on environmentally-friendly design affecting the design of mechanical noise control systems. As a result, there is a push to eliminate the use of duct lining. "We are using new sound attenuating devices that don't have duct lining. We also are looking at duct fabrication and insulation to permit quiet rooms without duct lining," he said.

Sound systems are changing to accommodate a wide variety of performances in multi-use venues, as well. "We're designing systems with adjustable signal processing that can support sound reinforcement for instruments, speech, movies, drama, sound effects and film presentations with surround sound needs. We need systems that can be changed over from serving one type of performance to another in a short period of time," Eligator said.

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