

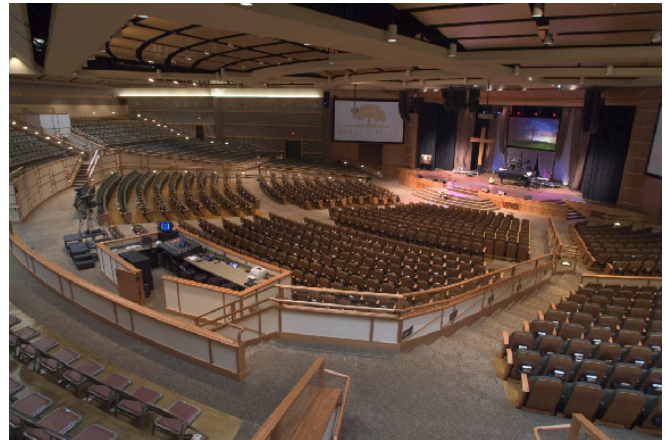
The Acoustics of Worship

By Vance Breshears

What makes a room work well as a worship space? Many people would say that song selection, musical arrangement or size of the congregation in attendance are the main factors. But a good worship environment is created by a combination of factors, many of which are associated with the room itself. These include the relationships and orientation of the seating, lighting to create a mood, good quality technical systems that are operated well, and a worthy architectural design. And while all these are important, one of the greatest factors in creating a good environment is the acoustical character of the room. If a room has acoustical problems, everyone is affected and worship quality can be poor.

Today's contemporary worship spaces require a wide variety of program functions with varied acoustical requirements. For example, there may be different instruments that might include organ, strings, choir, drums, guitars, percussion and horns, and would encompass different musical styles, from classical music to rock-n-roll, and everything in between. Sometimes completely different musical styles are used during the same program or service. Rarely will

you find the requirement for such varied musical styles within a short timeframe in any other type of facility; whether it be a concert hall, theater or auditorium.



Rolling Hills Community Church in Tualatin, Oregon was designed with vertically offset seating sections. These seating offsets introduce vertical surfaces that make the room acoustically smaller and more intimate for worship.

Some program functions and music styles work best in "dry" acoustic environment. Preaching, drama, and highly amplified music (contemporary or even rock-n-roll style) do well in a "dry" or controlled acoustic space with less reverberation. In contrast, a more classical music style that would utilize acoustic instruments such as strings, woodwinds, organ and choir, will provide for a better musical experience in a more "live," or reverberant space.

While the above mentioned musical styles place a great demand on the acoustical performance of a space, there is an additional requirement not found in any other type of auditorium or performance venue. Unlike concert halls, auditoriums or theaters, a worship space also requires the acoustical support of congregational participation in worship. The need to meet conflicting music style acoustical requirements, plus the requirement for congregational participation, is important in most contemporary churches today, yet is rarely achieved.

A worship space that has acoustical problems is usually found to have excessive reverberation or late arriving reflections that are perceived as an echo. The really bad rooms will have both problems. And while both of these problems involve too much acoustic energy, too little acoustic

energy may also pose a problem. Sometimes a room can be too dry, lacking adequate sound energy that would otherwise be pleasing for the style of music being played. A movie theater is a good example of a room lacking acoustic energy. Acoustic music and congregational singing don't sound good in a movie theater.

Some worship spaces are so dry and have so little reverberant sound energy that the reflections off of doors, or even small window surfaces, are noticeable. A worship space that is too dry will be unfavorable for congregational participation. When the congregation sings, they won't hear themselves or anyone else. Regardless of which side of the scale you are on – too much or too little reverberation – there usually is a combination of acoustical problems in any given room.



Crossroads Community Church in Vancouver, Washington was designed with "V" shaped ceiling clouds. The front facing surface of the clouds is covered with sound absorbing materials to help control the sound from the speaker systems. The rear facing surface is made of drywall to reflect congregational singing sound back into the seating area.

In acoustical terms, a good indicator of intelligibility or clarity in a room would be the ratio of the direct sound to the reverberant or reflected sound. This value is often calculated or measured when talking about sound reinforcement systems, but can apply to natural acoustics as well. In general, the greater the ratio, the better intelligibility and clarity will be. For example, you can have a very reverberant room with a long reverberation time, but still achieve good intelligibility by increasing the

ratio of direct sound to reverberant sound. With a sound system, this is done by using directional speakers or by placing speakers close to listeners.

Another method of evaluating the acoustical environment of a room would be to measure the ratio of early acoustic energy as compared to late acoustic energy. This early-to-late ratio is very beneficial in determining how well a room works for worship related functions whether acoustic music, reinforced music from the sound system, or congregational singing. For congregational participation, early energy is very beneficial in enhancing the experience. Ideally, people want to feel like they are singing in the shower. This singing-in-the-shower effect is created by early sound energy coming from reflective surfaces in close proximity to the listener.

When designing a room for worship, there are two architectural design concepts that help work toward achieving the desired acoustical goals. The first is to break up the seating sections with vertical offsets. The resulting changes in the floor level will introduce short wall surfaces between seating sections that will make the room acoustically (and visually) smaller, and feel more intimate. Close reflective wall surfaces combined with a hard floor surface under the seats, help to create the singing-in-the-shower effect.

The second architectural concept has to do with wall and ceiling surfaces and their orientation. Unlike a performance venue, the goal of a room that is designed for worship is for sound energy from the sound system to be directed onto sound absorbing surfaces while the congregation sound is reflected back into the seating area off of reflective or diffusive surfaces. Achieving these two design goals will provide for good clarity for reinforced sound while also enhancing congregational singing. This is done by shaping the walls and by using ceiling clouds that have the appropriate orientation and materials on the appropriate surfaces.

This is a brief and very simplified explanation of just a few of the techniques used to design a good worship space. Additional pieces are needed to solve the acoustical puzzle that encompass all design and construction aspects of the room. Careful planning and innovative design of a worship facility can dramatically improve the acoustics for all functions and music styles. Singing in a good acoustical worship space can be a wonderful experience – almost as good as singing in your shower.

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