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YOUR CHURCH

MUSIC & SOUND

Build for Sound

Notes from a consultant on how to build acoustics into a church
Vance Breshears

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"Hi, this is Bob. My church is building a new worship center, and the architect tells us it's time to get a sound guy involved. That's why I'm calling you."

I suppress a groan as the man on the phone continues. "Most of the building design is complete," he says. "Now we need someone to do the acoustics."

It's a sound consultant's nightmare.

How to Avoid Acoustical Nightmare

On the front end of most building projects, a church will hire a professional architect to work on programming and design. Prior to this, committee members will interview several architects to find one that meets various qualifications and will work well with the church.

After choosing an architect, the committee tours several churches. The architect takes note of committee likes and dislikes, then translates that information plus other data into plans for the new facility.

After completing the schematics, the architect realizes it's time to determine what type of finishes should be used in the room. This is the point at which most churches decide to hire an acoustical consultant.

The problem is that by this time most of the acoustics of the new facility have already been decided. A room's acoustics are determined by its size, shape, and finishes, but finishes are minor compared to the impact of the other two. Once a room's size and shape are established, it's almost too late to make significant changes to the sound of a room.

The best way to avoid this dilemma is to include an acoustical consultant in the building project from the start. That way, the sound person and others whose work impacts the basic design, such as structural, civil, and mechanical engineers, can address issues before design work begins.

Note: Though it's best to include an acoustical consultant from the start, it's never too late to call one in to evaluate your design in terms of sound. You may need to scrap some aspects of the room design or even start over. However, it's better to redesign a room before it's built than to build a room that won't meet the acoustic needs of the church.

Tips on Hiring a Consultant

How do you go about choosing an acoustical consultant? Some suggestions:

- *Research the market.* Resist the impulse to hire the first sound consultant you meet. There are good consultants and not-so-good ones. Take your time and interview several.
- *Check references.* Call churches that various consultants have worked on. Ask each if they'd

hire that person again.

- *Listen to their work.* Check out the work of a prospective consultant. Listen to the sound. There's nothing like experiencing firsthand the results of a person's work to help you make a decision.
- *Consider the program.* Make sure the prospective consultant has a clear understanding of your church's ministry goals and program.
- *Check the match.* See if you and other team members have a good working rapport with the consultant.

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Team up for Design

Before thinking design, a design team should articulate the church's goals for its new facility. To do that, the team should answer questions such as:

- Why is the building needed? What kinds of activities will take place in it? Will it be strictly worship space or a multifunctional room that hosts banquets, basketball, and worship? Should it direct worshipers to the pulpit or toward each other?
- Can the congregation function without this space? If so, why build it? If not, why not?
- How much space can the congregation realistically afford?

Answering such questions from the start should help resolve many design conflicts that may arise later in the process. If the team stays focused on the church's ministry goals, the design process can be a pleasant one.

Build for Sound

Since a room's size, shape, and finishes largely determine its acoustics, each becomes a critical factor in the architectural design of a worship space. In addition, different areas within this space, such as the congregational seating area, the platform or stage, under-balcony or upper-balcony seating areas, transepts, and overflow seating areas have different acoustical characteristics.

Above all, a room's acoustics should be based on the church's ministry goals. For example, churches that feature contemporary worship need a controlled acoustical environment for preaching and for sound reinforcement of vocals and contemporary worship instruments. At the same time, the congregational seating area requires a more live acoustical environment so people can sing, feeling like they're part of an ensemble.

So how do you design a room that gives 2,000 people that singing-in-the-shower sound while containing some of the enthusiasm of a praise-band drummer? Again, think size, shape, and finishes. Specifically:

Room size. The size of a worship space is usually determined by the number of seats in the room and the layout of those seats. The aspect ratio (ceiling height to room width to room length) is a critical factor in the room's acoustics. As sound bounces around a room, it is perceived as either reverberation (diffuse sound traveling in all directions) or as discrete reflections (echoes). The level of reverberation and the time it takes reverberation to decay is one factor in measuring the room acoustics; in general, the longer the reverberation time, the more challenging the acoustical environment.

Another factor is the level and arrival time of the reflections. The longer it takes for sound to travel to the back or sides of a room and bounce back to listeners, the more it sounds like an echo. Ideally, we want to provide early reflected sound energy to the seating areas and eliminate late reflections. Whether sound arrives early or late depends on how long it arrives after the direct sound. In general, the larger the room, the farther sound has to travel to be reflected and the later it will arrive back at the listener. The later it arrives back at the listener, the more it

sounds like an echo, which will disrupt intelligibility and distract the listener.

Any room that seats more than 1,000 will have some acoustical challenges because of its size. Rooms of 5,000 seats or more will have even more dramatic challenges. One way to allow for more seating in a room without increasing acoustical problems is to build seating in multiple levels, as with a balcony.

The room-aspect ratio can also contribute to the acoustical challenge of a room. For example, a 1,000-seat room with a 40-foot-high ceiling will have twice the volume of the same size room with a 20-foot-high ceiling. It will also have more reverberation and much larger surfaces that reflect the sound.

Room shape. The fan-shaped room is an acoustical challenge. Such a room characteristically has a concave curved back wall that focuses sound and reflects it, generally back to the center of the platform. This creates a nightmare of echo that can be very costly to fix.

One way to address the problem of reverberation is to cover the focusing surface with sound absorption panels, angling the panels to direct the reflection into an area where it will not create a problem. This will reduce some of the echo but will not completely eliminate it.

The rub is that when one element in a room is changed to fix one acoustical problem, it may create other problems. For example, adding absorption in the room to mitigate a focusing problem may inadvertently absorb the sound energy necessary to create a live environment for congregational singing.

Solving the problem isn't easy. But computer-aided modeling and design tools are now available to help determine the problem, analyze options for solving it, and predict the effects of proposed solutions.

When designing a worship space, aim for a shape that does not include concave or focusing walls or ceilings, parallel wall surfaces, or extremely large continuous surfaces.

Room surfaces. The key is to strike the right balance between reflective surfaces and absorptive surfaces, then to orient them properly. Since we are looking for early energy, not late energy, we generally want surfaces close to listeners to be hard or reflective and surfaces far from listeners to be soft or absorptive.

This is the opposite of what happens in most rooms. A typical room is designed so that absorptive surfaces, such as carpeting and padded pews or chairs, are closest to listeners, while reflective surfaces, such as walls and ceilings, are farthest away. This creates an environment in which there is little early reflected sound energy and excessive late sound energy.

A Complementary Sound System

Another element in a room's acoustics is how a sound system interacts with the size, shape, and finishes in a room. These are two somewhat separate issues, yet they are directly related because each one affects the other. Ideally, acoustical design and sound-system design should be planned together. This should minimize later problems.

There are several good sound-system designs, some better than others. Whatever the choice, it should be driven by the church's program. One of the newer techniques includes a multichannel (left, center, right) speaker system. Such a system is very complex in design and setup. But once it's up and running, it's fairly easy to operate.

Even the best speaker system in the world will sound bad in a room with poor acoustics, however. So build a room for sound, and complement it with a great sound system.

Whether you are building a new facility, renovating an existing facility, or fixing an acoustical problem, the challenges can be formidable. The key is to build right from the start by including sound in the design mix.

Vance Breshears is an acoustical consultant and sound system designer with Sound Technology Consultants in Alpine, California. Contact him at Vbreshears@CompuServe.com or at [3 of 4](http://www.Sound-</p></div><div data-bbox=)

Technology.com.

Helpful Resources

For more information on building churches with great acoustics:

- All Pro Sound 800-925-9822
- American Audio Systems 414-354-2440
- Boynton Studio 800-772-8916
- Bruce Wardell Architects 804-971-7160
- Concept Technologies Group 630-483-8895
- Ford Audio Video 800-654-6744
- Guitar Center 818-735-8888
- Hatfield Crookless Architects 214-363-9100
- Hull Stephens & Associates 810-635-4090
- Pelton, Marsh, Kinsella 800-229-7444
- Taylor, Kidd Architects 414-443-0830

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