

Case Study:

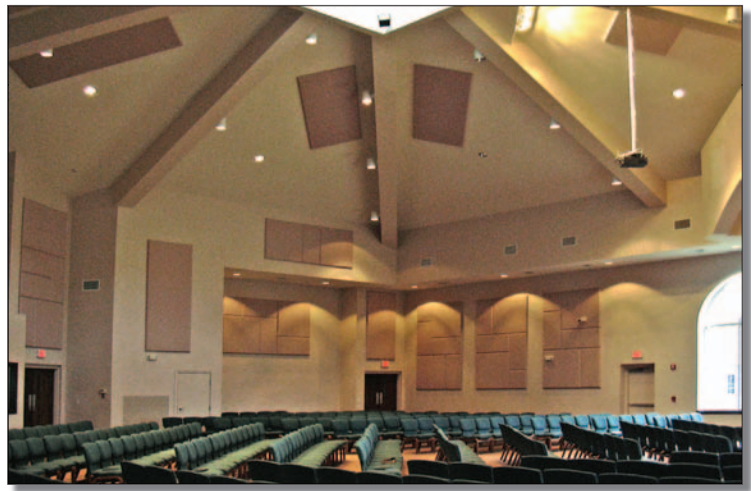
Grace Presbyterian Church

Auralex Acoustics was brought in to provide acoustical products and services for an existing House of Worship in Kernersville, North Carolina in order to improve the function of the sanctuary as it transitioned to a contemporary worship service. The primary areas addressed include:

A. Detailed Acoustical Analysis of the Sanctuary

B. Design of an Acoustical Treatment Solution to Enhance the Aesthetic Value of the Sanctuary

C. Project Management Provided to Both Dealer and Church through Project's Completion



Grace Sounds Amazing

Have you ever heard the phrase "whether the job be big or small, do it right or not at all"?

This phrase attempts to demonstrate that when critical factors are ignored, the job will never be right. This is a lesson that a majority of churches could learn when it comes to solving sound issues – more specifically, acoustical challenges.

A crying baby, tuning issues, air conditioners, excessive coughing and sneezing – the acoustics within a worship setting can have as much affect on the quality of a service as any other factor. Acoustics determine speech intelligibility and how well the lyrics, melody and harmony of music are understood. The quality of sound even contributes to a sense of envelopment, or feeling like a participant in the event as opposed to simply an observer.

Good Equipment + Bad Acoustics = Bad Sound

Unfortunately, most people assume that the best way to create quality sound is to invest in quality audio equipment. While this is true to some extent, even the highest quality audio equipment and instruments will produce bad sound in a "bad" room. So after purchasing several different loudspeakers and trying different monitor positions, someone usually realizes the acoustics are probably at fault and the experts are called.



Right Sidewall And Rear Corner

The good news is that acousticians are skilled at playing catch-up – fixing acoustic problems long after construction. Or, as was the case with Grace Presbyterian Church in Kernersville, North Carolina, not long after construction.

Saving 'Grace'

Grace Presbyterian has a congregation of 300. The church was designed with an acoustic element to it, but it was for a service that used the chorus and organ. In early 2004, the church made the decision to switch from a traditional to a contemporary service, replacing chorus and organ-based music with a praise band.

As popular as this type of transition has become, it creates significant acoustical challenges, namely, discovering that a facility cannot be optimized for both traditional and contemporary service. At Grace, the problem became apparent shortly after the transition when parishioners began noticing high levels of reverberation, or, echoes during band performances. The reverberation caused the music to sound garbled and the lyrics inaudible.

Not surprisingly, the problem was initially attributed to an insufficient sound system. But according to Jeff Hedback, Regional Manager for Auralex Acoustics, the real answer came not just from all around, but from above.

"The shape of Grace's sanctuary is somewhat unique in that it's octagonal. Because of that, the eight-sided ceiling came to a mischievous peak. Sound from the band's performance was hitting all eight sides of the ceiling and effectively bouncing around the sanctuary, echoing through the chamber. This wasn't a problem when the service consisted solely of a chorus and organ because reflections may actually enhance those types of performances. But when drums, bass guitars and amps are thrown in the mix, it creates a problem."



Octagonal Ceiling

Hedback and Auralex became involved after the church contacted Gary Bennett with Clark-Powell in Raleigh, NC. Clark-Powell is a provider of high-quality video equipment and services for the professional and corporate sectors. Bennett then turned to Auralex field representative Myron Surber at Quest Marketing. Together, they collected specific information necessary for Auralex to initiate the acoustical analysis and return a recommendation.

Auralex's initial assessment revealed that this architecture combined with the new style of worship was causing big problems for the services and not the sound system as originally thought. The sanctuary's design was causing "running reverberation", i.e., long reverberation time between when a sound is produced and when it decays to the point that it can no longer be heard.

Solving The Problem – with EASE

While the ideal Reverberation Time (RT60) for this space should be 1.5 seconds @ 500 Hz based on its function, Grace's predicted RT60 was three to four seconds. In addition to an unacceptable reverberation time, Auralex's assessment also identified other acoustical issues, such as speech intelligibility, flutters/echoes, excessive low frequency decay, and pings/zings.

So how does one go about discovering the inherent acoustical problems of a specific facility? In Auralex Acoustics' case, with the software package EASE. Or, going by its formal moniker, Electro Acoustic Simulator for Engineers. EASE is a software package that allows the creation of a 3D acoustic model of any room and the sound system in that room creating an acoustical blueprint. EASE relies on data such as room surfaces, sound equipment and acoustic absorption of materials already present. From this data, reverberation times and other acoustic parameters are calculated. Auralex then uses these results to test various modifications designed to improve the acoustics.

According to Jeremiah Flaherty, Acoustician for Auralex Acoustics, using EASE allows for room measurement and diagnostics without physically being there. "With EASE, we're able to experiment with acoustical materials until we return a schematic that is consistent with the objectives established at the beginning of the project. In this case, a 1.5 second reverberation time."

Of course, it doesn't hurt that this experimentation is highly economical. Thanks to EASE, Auralex is able to find the specific treatment plan to accomplish the goals set forward. This is especially true in the case of a retrofit. Flaherty explains: "With a retrofit we must work with what we've been given; but it's also easier to define the problem, i.e., I want to get from X to Y; can you get me there? Using EASE, all we need are the room specs and a few hours and we can provide you with a roadmap."

The Roadmap To Reducing Reverberation

In the case of Grace Presbyterian, the reverberation time needed to be reduced. Despite being a critical factor in achieving the ideal sound for a worship setting, many churches have difficulty controlling reflected sound. While there are many specific causes of unwanted reflected sound, it can be controlled through the absorption and diffusion of this sound energy. The solution to your acoustical problems may require one or both.

Absorption of sound waves can be accomplished through common room features, such as curtains, carpet – even the congregation. Adding padding to pews or seating is a good way to provide an accurate acoustic environment. And because a well-padded seat provides roughly the same absorption as a person, that environment is maintained regardless of a packed house or a small rehearsal.

Diffusion is provided by anything that breaks up a flat surface and directs sound waves in different directions. The placement of wall décor like window trim and statuettes are sometimes enough to provide adequate diffusion, depending on the style of worship.



Rear Wall From Stage

While common room features may help control acoustic anomalies, acoustic panels are usually needed to properly treat a House of Worship.

For Grace, the reverberation created a need for absorption – or absorbers – leading Auralex to recommend ELiTE Custom ProPanels. Auralex ELiTE ProPanels are high-quality fabric-covered fiberglass panels available in virtually unlimited sizes, thickness and finished appearances.

This type of absorber "dries" out a room by absorbing and trapping sound energy in its specialized fiberglass core, thus improving overall intelligibility by eliminating the echoes that could muddy speech or music.

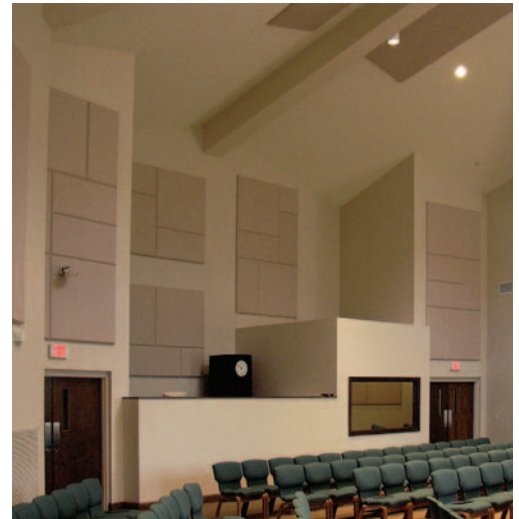
Sounding good is one thing; looking good is another. To safeguard the appearance of the treatment and maintain the aesthetics of the church, Grace assembled a committee to coordinate fabric selection. Following an extensive deliberation, the committee selected a directional fabric – a fabric with a uniform pattern to create a clean look.

According to Hedback, a directional fabric is where art meets physics – and where Auralex truly differentiates itself. "With us, the extra step is the next step. So to ensure that Grace received the look they were hoping to achieve, Jeremiah [Flaherty] designed a geometric pattern that would accent the clean look created by the directional fabric. If this had been left to chance, the variations in the fabric could have created a shadow affect – like lines when cutting grass – failing to accomplish the uniform look Grace specified".

Because of the shape Flaherty designed, Auralex built and pre-marked the panels (for easier assembly) at their home office in Indianapolis, Ind. then shipped them to the church installation team.

Auralex's role in the assembly process continued as the project team worked in tandem with the Clark-Powell installation team to see the design to fruition. According to Bennett, this attention to detail – both in design and installation – is a value-add customers should expect from their partners.

"Both teams [Clark-Powell; Auralex] realize the time and energy our customers put into their projects. They should expect the same due diligence from their suppliers. As is the case with all of our customers, we wanted to capture the look and feel Grace had requested. To achieve this, there's no such thing as too many phone calls, too many e-mails, to make sure everything is as it's supposed to be."



ProPanel Layout On Rear Wall

Another factor affecting panel design was Grace's low frequency issues. (Low frequencies in a large room are generally defined as anything below 500 Hz.) Many consonants in speech are in the higher frequencies, making it imperative to avoid "overkill" on absorption as it could reduce the audibility of consonants critical to understanding speech.

According to Hedback, "Our approach is to examine every aspect of the room before making a final recommendation. We focus more on the product selection process – how the product will affect all the nuances causing the problem – rather than the product selection itself. The character of the room is directly correlated to the ProPanel; items such as type and use of the PA system, nature of the sound system, functionality – these are the clues to achieving a holistic result."

For Grace, the result was 1,364 square feet of treatment by 2" thick ProPanels. The EASE analysis process determined that this thickness addressed the low frequency issues identified in the sanctuary. The placement of these panels on upper portions of specific wall surfaces and areas of the ceiling was designed to enhance speech intelligibility and promote an evenly distributed worship presentation.

Postlude

According to Hedback, the results were on par with the objectives established at the beginning of the project.

"We achieved our magic reverberation number of 1.5 seconds, but more importantly, we helped the church complete its transition to a contemporary style of worship. As quickly as they noticed a problem with the sound, parishioners noticed the vast improvement, allowing them to enjoy the praise band – hearing it the way it was meant to be heard."

Gary Bennett of Clark-Powell reports similar testimonials: "Randy Edwards [Senior Pastor] is more than pleased with the acoustical treatments. According to him, the treatments provide the intelligibility needed to enjoy the worship service properly. But he's not the only one that has noticed. Perhaps, more importantly, his congregation's toughest critics – the church ladies – have praised the aesthetic value of the acoustical panels in relation to the chairs and the carpet. In fact, it seems that almost every member of the congregation has appreciated this upgrade."

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Contacts

Jeff Hedback, Auralex Acoustics, 317.842.2600 (ironjaw@auralex.com)

Jeremiah Flaherty, Auralex Acoustics, 317.842.2600 (jeremiah@auralex.com)

Gary Bennett, Clark-Powell, 800.568.1099 (<http://www.clark-powell.com/>)

Ben Brugler, Malone Advertising, 330.376.6148, x.3107 (benb@malonead.com)