



Is Church Acoustics truly that simple?

From the Biblical point of view, it is!

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9/16/21

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Introduction

Church sound is in a mess. There is an easy way to fix it, and the solution comes from the Bible. To read about “the simple acoustical fix,” skip to The Recipe section. The following are paraphrased testimonies in the form of questions from people’s experiences and a compiled outline of how the church community got into this mess. By bringing the Bible into the church sound equation, the solution becomes clear, making the Church¹ stronger.

Church Sound and Acoustics stir up many questions.

- Does sound have an impact on church worship?
- Does sound have an impact on congregational singing?
- Are Christians seeking a full-on Biblical Worship experience?
- Are Christians hungry to hear the Gospel message that is not watered down?

Many people think about these questions, and other issues almost every time they enter a church, if only for a moment. Other questions that often come up are, will someone be sitting in the spot where the sound is best? Will the sound system be adequately adjusted? Will the hearing aid be good enough, even with the loop system or headset? Will the congregational singing be better this time? Why do so many Christians feel so alone in a room full of people during hymns and worship music? Will the audience sing in harmony for the songs they are most familiar with?

Will the sound be clear enough so someone with minor hearing issues does not have to listen to the recorded message later to fill in what was missed?

Uh, oh, the sound is not very good in this spot. It will

be best to move before the sermon starts. Will others understand why some people change their seating locations before the sermon begins?

Proverbs 2:5-6, “Then you will understand the fear of the LORD and discover the knowledge of God. For the LORD gives wisdom; *From His mouth come knowledge and understanding.*”

These are just a few of the many questions many people at church think about often. However, they are rarely asked out loud because they already know they will not get an adequate answer. Just about every answer suggests that church sound and acoustics are so complicated that no one will ever get it right. Another standard answer is when a church elder talks to an expert or several experts and returns with the conclusion that the cost will be so high that the church cannot afford to fix it, short of replacing the building. (As one elder was told, about ten sticks of dynamite is a good place to start.) As a result, most churches just

remain quiet and give in to the notion that this is one problem the members will have to put up with forever. The church community on mass has given in on the belief that no one will ever figure out how to balance church sound for every part of church worship. Is this true? No. There is a solution, but before learning about that, it should be made clear is that church acoustics is unique to churches, and it is the type of acoustics that matters, and not some made-up, unrealistic standard, of the perfection of acoustics that a person may imagine.

Consider this; the Christian Church Community has been experimenting with church design for over 1700

years. After millions of buildings built as dedicated houses of worship to the God of the Bible to gather the followers of Christ and hear the Gospel, they all come up short. How is that possible? Are not all these churches in pursuit of discovering the perfect worship space? Is there a science about acoustics that is yet to be discovered? Is God purposely keeping this knowledge from the Christian Church community? Why are churches on this treadmill of an endless stream of accepting mediocrity when the Bible teaches the opposite? Why has the church message changed from; “preach the Gospel, and they will come” to “let’s entertain them, and serve them coffee and juice to keep them coming back? Are the botched acoustics of countless church buildings covertly driving all this worldly form of worship? Does this mean that the wrong type of acoustics allows false teachers to flourish within the Christian community? Questions, questions, questions, any answers?

Standardizing Church Design and Performance

Is there such a thing as a perfect church building for the Christian Community to worship in? If there is, where is it? The short answer is yes! Shouldn’t it be replicated for every denomination and independent church to copy and use if such a building exists?

WHOA! Is it being suggested that every church be the same? Yes. If the shoe fits, if it works perfectly, use it; if it isn’t broken, don’t change it. Standardizing doesn’t mean losing a unique identity. If anything, it makes the identity of the church community stronger.

Think about it; just about every independent church and denomination have, and do the same things. They all celebrate communion², they all have a pulpit, they all have an altar or stage from which to preach from. They all use the Bible and have Bibles. All existing church buildings have floors, walls, a roof, seating, doors, lighting, and share other building details. All churches are very similar, and after all that time, experts and laypeople have not figured out how to make them all sound the same so that anyone listening, talking, or

singing, can get the same quality of benefits in worship. What is meant by “all sound the same?”

Think about it, no matter what shape, size, materials, and architecture, in the end, everyone wants the same quality of sound and acoustics. Everyone in a large room wants a room to hear clear speech and have a satisfying experience of singing collectively for the congregation³. That is a universal request and requirement of all houses of worship. While tone differences are determined by the building materials used, the quality and performance of sound must be the same for everyone regardless of the denomination or association a house of worship belongs to.

Give the Body What it Needs

Human anatomy requires a specific set of physical properties and events when hearing sound in a confined space. Those properties are required in a home, an office, in an automobile, in any large room, performance spaces, and in a church. Whenever any of those properties are out of proportion or out of sync, sound quality is compromised. How much the sound quality is degraded is relative to how many of the laws of physics are being violated, preventing the ears from hearing the sounds that a person needs to convert the vibrations into something the audio nerves and brain can understand.

Consider this, the difference between a great and good concert hall is about 4%. A bad concert hall is often off by just 17-28%⁴ from being an excellent concert hall. Most of these lower-quality concert halls could have been made much better, but then, the shell of each hall would share the same design. On the other hand, when it comes to churches, the difference between a good-sounding church for worship and every other church is over 50%. It shouldn’t be that bad. The church community has had way more experience in dealing with sound than concert halls. That said, it should be made perfectly clear that concert hall acoustics is entertainment acoustics, making it unsuitable for Christian worship.

When it comes to building a new church, secularly trained Architects, who are taught that they are the

gatekeepers in molding our modern society, often want to make a name for themselves when given such a task. They often design and invent room shapes in a vacuum of specific direction from the church.

Even if a church board says they want good sound, Architects and acoustical experts don't have a clue in what kind of worship space is needed for Christian Worship. As a result, churches are designed in the absence of understanding human anatomy and with a complete disregard for the laws of physics pertaining to communicating and hearing in a large room. These ill-conceived shapes are usually designed around made-up spiritual philosophies giving the Architect the license to design whatever they want and not what the church needs. These random building shapes require extraordinary leaps through hoops from acoustical experts to solve an impossible problem. They force acoustical experts to invent new, one-of-a-kind acoustic solutions if they marginally work at all. Architects then fabricate explanations that sound as if they have the power to put the laws of physics on hold and take it on faith that after the work is done, the people will come regardless of how a space performs.

Sorry, but that is not how it works, but the entertainment community keeps trying to circumvent the laws of physics with technology, and they are excellent salesmen at convincing churches to buy into this false hope. Technology is getting better every day, but that invisible wall of physics can't be sidestepped. There is only one way to break the laws of physics, and God hasn't granted anyone a special exemption.

When headlines in church magazines about the latest and greatest technologies are profiled in a church, some of the boasts and claims seem like someone learned something exclusively new from God, and God has shown them a new trick in how to get around physics. The truth most often is that custom-made hardware was used to solve a specific problem. Because it worked, that hardware is immediately promoted as universal for all churches to use.

The false promises in church audio are as bad as the false teachings from fake ministers standing in pulpits

worldwide. Such ministers make promises to the audience that are not in the Bible, but they sound Biblical. They are enslaving followers by telling them that if they are not experiencing a Christian walk as the minister is claiming, the people are told that their faith isn't good enough. Or they have a sin that keeps them from that miracle, health, wealth, or prosperity. These lies that trap people into following false churches are the same lies that keep audio techs and church leaders chasing after that other false gospel, believing technology is the solution to their sound problems.

Is there such a thing as the perfect church?

Experts all over the world have been endlessly seeking solutions to the church sound problem. Why has a universal solution been so elusive? The church community is unable to find a solution to the sound problem issues because the church community has been looking in all the wrong places. Christians need to move away from seeking the help of the secular, worldly community of architects, acoustical experts, and sound engineers. When listening to experts about sound and acoustics, they paint a picture of hopelessness and compromise.

That is not what Christianity is all about, and Christians should never accept a compromise with something as important as the reading of God's Word, the preaching of the Gospel, or worship. Churches should always have the acoustics they require. Christians need to decide whom they will follow when it comes to church design and managing sound in existing churches.

The following is a harsh statement few Christians will want to hear, but it needs to be said. Knowingly worshiping in a compromised house of worship is like disrespecting and disregarding the death and resurrection of Jesus Christ, our Lord. While this knowledge is just now being understood, this harsh statement will and should un-nerve many as Christians move forward.

To that end, Architects and engineers are still needed to make buildings safe, which is what they are best at, but the design and function of a new church building must be done by church members and leaders or by a

Christian who understands worship space design from a Biblical perspective and not a worldly or new age viewpoint.

(1 Kings 6:29) "And he carved all the walls of the house roundabout with carved figures of cherubims and palm trees and open flowers, within and without."

the difference is that it was plain for him to see how the Gospel was being distorted. However, in the present, weak churches have given in to false teaching. The

The Bible has always had the answers to these questions and problems. Audio technology has only been around for about 100 years. Yet, the Bible has a 3500-year-old set of solutions that bridges all that technology into architecture effortlessly in the present. These solutions are specific enough that they bring everything about church sound and worship together seamlessly. Christians should not be seeking solutions to sound problems outside of scriptures. Instead, they should be studying what the Holy Book has been telling us all along.

Discovery begins with two words

It has taken a long time to understand how the solution to the church sound problem has been linked to two words. These two words have been misunderstood for centuries. In a casual read, these two words suggest an innocuous wall decoration. In fact, they describe a solution that brings together many of the laws of physics in such a way that man would never discover on his own. Two words in the Old Testament bring the laws of physics together in such a way, only God can imagine it, and it has taken us over 3500 years to figure it out. With two words, the most powerful remedy to church sound has always been in front of us.

Paul, the apostle, gave us a warning almost 2000 years ago. He said in Galatians 1:6-8, "I am amazed that you are so quickly deserting Him who called you by the grace of Christ, for a different gospel; which is not just another account; but there are some who are disturbing you and want to distort the gospel of Christ. But even if we, or an angel from heaven, should preach to you a gospel contrary to what we have preached to you, he is to be accursed!" (NASB)

This warning is as valid today as it was then. The evidence shows that the wrong type of worship space acoustics has given alternative forms of worship a foothold in the church community. To Paul the Apostle,

new teachings are -the watered-down Gospel, self-help guru-like teaching, progressive, and new age messages, or the notion of "what can God do for us," rather than what the true mission of "what Christians can do for God." This madness has got to stop, and the solution is simple when Christians do as the Bible teaches.

Part 1: The Scriptures are sufficient in all things

2 Corinthians 3:4-5 "Such is the confidence that we have through Christ toward God. Not that we are sufficient in ourselves to claim anything as coming from us, but our sufficiency is from God." (ESV)

Sound is an integral part of Worship, no matter where Worship is held. Whether the typical church member realizes it or not, the type of sound quality has a major impact on how Worship services are conducted. This brings us to the design and acoustics of any worship space. The Bible has a very clear and detailed plan for all worship spaces for followers of God that is timeless. Since true Biblical worship is possible, then why don't churches follow the Bible's teachings on this subject?

This brings us to a repetition of one of the most perpetuated common myths about church design, sound, and acoustics. It is a fiction created by the secular community who have been unable to solving church sound problems since the beginning. The experts, laymen, and Christians have been brainwashed into believing it is all a mystery. It is a black hole of knowledge that experts have yet to learn or master. Acoustics is promoted as being so complicated that it will never be properly controlled no matter how much money you throw at it. Many people think that sound is a big deal, and they spend millions in the pursuit of getting it almost perfect. Many think it is more of an art where even the experts seem to have no better results

than a layman adding random panels to the walls out of desperation.

Science Cannot explain everything, but the truth can always be found in God. ⁵

Strange as this may sound, the only reason sound seems so complicated is because science often points us in one direction to explore. Experts often limit themselves from going in different directions or combining other sciences to seek answers. In fact, some of the best-known things that people use every day were discovered by accident and not from a chronological pursuit of the sciences. Here is a shortlist of the many things that have been discovered in unexpected ways.

- The Microwave Oven.
- The Post-It Note.
- The First Artificial Sweetener.
- Penicillin.
- Chocolate Chip Cookies.
- The X-ray Machine.
- Super Glue.
- The Implantable Pacemaker.
- Dry Cleaning

These inventions were invented by people following science in one direction. Then, an accident, or as an act of desperation, they tried something that forced them to do something different. Those who teach the sciences and laws of physics want their students to believe everything invented today is the result of following a chain of knowledge to its logical conclusion.

Everyone has heard the expression, “think outside of the box.” This often means setting aside what is known and introducing the unknown or counterintuitive things into the process. However, sometimes, it isn’t just one thing to add. It can be several things to be added at the same time. Could it be that no one considered the possibility that the Bible could be a source for solving or preventing sound problems? That out of box kind of thinking that the Bible gives us solves the church design and sound challenge.

The Bible has a clear and simple solution to solving the sound problems any church encounters, regardless of if the sounds created are acoustic or are amplified. How

is that possible? Again, simple. What God designs works; what man designs does not. Man's approach to church sound does not work well enough for church worship, and the elusive goal of achieving sound excellence will always be a mystery and out of reach for them, regardless of the cost. It is man's way of dealing with acoustics that makes acoustics a mystery. It also creates two more myths. The first is that church acoustics cannot be made ideal for all aspects of worship, and the second myth is that church acoustics is always expensive. That is what happens when God is left out of the process of the design and sound of a new church.

For centuries, Christians have denied themselves the worship experience the Bible clearly describes. Why? Again, it seems that no one understood the clues in the

The laws of nature and physics don't create anything.

Bible. The quality of sound at any church can make the difference between filling a church with

disciples of Christ⁶ or a church full of converts following a pastor, a denomination, or on programs based on some kind of man-made philosophy.

Yet, every person who owns a Bible and every church building on the planet already has the answers to their church sound problems. However, because the solution is in the Old Testament, there has been no compelling reason to study the story of Solomon's Temple from a scientific point of view until now. When applying science to the details of the House of God that Jesus designed⁷, it becomes apparent that the first temple God designed for His followers offers a lot of knowledge in the present. God packs for us a vast amount of information from the details in 1 Kings chapter 6. From there, foundational knowledge about sound, acoustics, worship, HVAC, building design, energy efficiency, sanitation, and so much more. For almost 1700 years, in the pursuit of the perfect worship space design, man has turned church sound into a mystery. In comparison, man has been ignoring the solution to sound problems that have been gazing back at us since the Israelites first penned the details of the temple Solomon built for God, while being slaves in a foreign country. Such

details were left out of the second temple, which was later referred to as Herod's Temple.

More Myths

These myths also perpetuate the attitude, let's just finish building the church and see what happens. If the acoustics are bad, the experts can fix it later. This is insanity at the highest level. The church community has been using this building design method ever since Christians outgrew the pagan temples they took over in the fourth century. Blindly, every church repeats the same mistakes everyone else makes and hopes for a different outcome. Even worse, most of the church community is so embarrassed about these repeated costly mistakes that they keep it a secret. They accomplish that by not keeping any records of failures or successes related to worship space performance for acoustics. Without past records of church building projects, the church community cannot learn from past mistakes when building a new church.

Sound follows a set group of the laws of physics. Ignoring the laws of physics leads to poor results. It is like building a house on sand, and Jesus already warned us about that! Matthew 7:26 "And everyone who hears these words of Mine, and does not act on them, will be like a foolish man who built his house on the sand."

The notion that anyone can fix a church building later is a lie from the devil. The devil will do anything to distract Christians from the great commission. He is a master at spreading myths about church sound and waters down the impact of sound on worship. This kind of thinking has got to end.

Churches that are currently considering building a new church, or are in the building process, if the mindset of the pastor, elders, leaders, and building committee is a wait-and-see attitude, it is already too late. There are hundreds and thousands of failed churches out there. Every one of them did the same thing and expected a different outcome. Since the laws of physics don't change, neither does the continued cycle of their worship space failures. Ignoring the Bible will get them a failed result every time.

How many more church buildings need to be built before it is done right? When a congregation decides it is time to expand, they most certainly turn to the Bible and ask God for guidance to green-light the project. However, do they look at the Bible to know the design, shape, size, and performance of the whole building? No. They turn to Architects, and sadly, regardless of if the Architect is a Christian, they do not turn to the Bible for answers either. A secularly trained Architect will have secular results. The thing is, in one day, an Architect can be taught to design the proper building for a church, but will they have the conviction and courage to keep the building committee focused on the Bible's teaching, or do they turn back to worldly methods and goals?

There are only two options out there, follow the Bible or keep following the deceiver. Do Christians have to wait and build another hundred thousand churches, or can they just follow the Bible and begin worshiping God as the Bible teaches it right away?

God's House is for us today

The special two words

Then where does this idea show up in the Bible? In Solomon's Temple. The good news is that because of the details in the Bible; it lays out a specific plan for us to follow to get a basic level of high-quality worship space performance. These two words draw in numerous laws of physics at the same time. They can be found in (1 Kings 6:29) "And he carved all the walls of the house roundabout with carved figures of cherubims and **palm trees** and open flowers, within and without." Palm Trees. The palm tree is the most out-of-place item detailed in the Bible. The carvings were on all the interior walls and doors of the two main rooms of the Holiest building on earth. Why? Were these decorative or were they functional? After testing the idea of half-round shapes on walls of existing churches, it turns out that the carvings of the palm trees in the temple God designed with King David for Solomon to build were neither decorative nor spiritual. The palm tree is a very highly efficient system in managing sound in any large space.

The half-round shape was included to solve hearing issues in a room that should have been impossible to understand spoken words. This specific detail was that the carvings of palm trees, along with cherubs, suggest an alternating pattern. The open flowers seem to have been random. They were applied to all the walls and on both sides of the doors in both main rooms.

(From researching existing churches and comparing it to the Bible, the standard for the absorption to reflective ratio is 30% of the total surface area of the walls, floor, and ceiling. For most worship spaces, carpeted floors and padded seating is equivalent to 30% of absorption or equal to the size and thickness of the temple veil. This gives the church the ideal performance of a balanced room and an acoustical signature of the space sounding 50% full when empty.)

This is the starting point for the ideal recipe for worship space acoustics. More absorption kills congregational singing. Less absorption reduces speech and amplified music quality.

Part 2 - The Science behind this

Sound

Here is a quick summary of the main properties of sound and the things that affect it in a confined space.

- Air
- Frequency / Vibrations
- Distance
- Temperature
- Humidity
- Phase
- Time
- Surface materials
- Surface Shapes
- Room Shape
- Direction
- Obstacles

Imagine now an acoustical system that manages all these items in one step.

Physics

God's plan of managing sound uses an unconventional combination of laws and principles of physics at the same time. The following includes the physics and the

effects a system of half-round shapes has on sound.

There is:

- Phase cancellation
- Friction of air molecules
- Disruption of waveforms
- Disrupts and prevents standing waves
- Redirection of sound to travel further through the room
- Distance used to naturally decay sound energy
- It turns air into a natural sound absorber
- Air absorbs all frequencies at the same rate
- It prevents sound from following the walls to build up in corners
- 15 to 40dB of all bass energy, is canceled within a few feet of the wall before the surface can amplify them
- It prevents energy nodes from forming at all the wavelengths throughout the room
- Preserves high-frequency energy to support speech and music intelligibility and congregational singing
- It improves the signal-to-noise ratio
- It reduces ambient noise intrusions 10dB or more
- This system is less affected by humidity and temperature changes during worship
- This is a complete acoustical system

The notion of using phase cancellation as a sound absorber is very foreign to most sound experts. Also, by adjusting the patterns and spacing of the tubes, the major anomalies can be equalized out of the room passively – like a parametric equalizer. Another concept most experts have no experience with.

These two words, “palm trees,” draw in so many disciplines of sound that no one has discovered this method outside of the church community. Some have come close, but close is not good enough. Since the connection of the palm tree being connected to a modern method of managing sound, it is now understood that it is all about the shape and how to apply it. That said, the secular community is taking notice.

The reason for mentioning this is that God designed us a house of Worship that was all about getting the best worship experience imaginable and keeping the Worship Holy. The overall shape of the worship area is about laying out the best foundation for the ideal pattern of how sound is to move around a confined space from any location in the room. The half rounds complement the reflected energy to manage the sound

in the most compatible sequence to how humans hear in nature. The dimensions are to support the human need for collective worship with singing and music. The veil was to provide the right balance between reverberation, noise, and the need for clear speech over the length of the room. The whole package creates the best balance for speech, congregational singing, and all forms of Christ-centered music. The temple, which can be scaled up in size, is the perfect template for all houses of worship.

Now, the notion of adding half-round tubes on all the walls may seem to be an aesthetic issue. Moreover, for many existing churches, adding half rounds seems to give many interior designers and women nightmares of defacing their precious houses of worship dedicated to God. It should be of some comfort that the aesthetic issue was not a concern for God. God designed us a church to get us to focus on Him, not the aesthetics or some feel-good spiritual experience or philosophy of a worship space. Adding the carvings of the palm trees is to have a place where the Holy Spirit can testify Jesus and God. Without the half-round shapes on all the walls, all that remains is a room that makes noise.

The Wait is over

How many churches would it take to convince Christians that the half-round shape of palms trees is a solution from God? Would it be 10, 15, or 50 churches be

enough? Would a study of more than 400 churches of different sizes, shapes, and building materials where they all get similar results to be good enough? They have all experienced enormous improvements over any other way of managing sound in an existing church. These Churches testify that what the Bible teaches is true. Following the Bible makes every part of church sound seem easy compared to man's way of managing sound.

“Proverbs 30:5 Every word of God is tested; He is a shield to those who take refuge in Him.”

The Test

Yes, these are bold and broad statements, but before dismissing them, consider the evidence. Here is a simple test that anyone interested can do, and it works every time. Walk into any church of any size that has carpeted floors and padded seating. Look at the walls. Measure each wall length and height, and then figure out the area of 17% of the total wall space in the sanctuary. Not everyone can afford to do this, but if there is a budget for doing such an experiment, purchase enough 8- and 12-inch diameter cardboard tubes and cut them in half, and space them at 23-inch centers. From experience, the tubes must be tall enough to be 2/3rds of the wall height, and the tubes must be leaning against all the walls. This includes placing the tubes in front of windows and doors - no exceptions for this experiment.

Without installing these tubes and just leaning them against the walls, the tubes have fixed the acoustics of



Figure 1: Here is an example of doing a proper demonstration in an existing church. The acoustical change in performance was very dramatic. In the discovery phase of understanding how this acoustical system worked, many churches were gracious in opening their doors to allow us to do this kind of research.

that church. The worship space is now up to its maximum level of performance for congregational singing and maximum sound system performance. The only limitation to the performance upgrade is the room shape. Every room shape will have its own unique sound signature. This is not a bad thing.

Rather, it is like the difference between having a concert-quality violin or a high-quality trumpet. If the violin is the premium instrument, the trumpet, with its own sound qualities, can be enjoyed too, except it can't do everything the violin can do. Both sound good. Without the tubes on the walls, the room's performance is like having a broken instrument. The room shape determines the instrument a space represents. Without this type of sound management, the result is like having either a broken violin, trumpet, tuba, clarinet, and so on. The uncontrolled reflections in the room were masking the qualities of the room. Now that the sound is properly managed, the maximum performance of the room can be heard. Once again, it is all controlled by this unique combination of the laws of physics. That said, getting 100% performance from any existing church is better than anything the secular community will ever do with the current level of knowledge,

What to expect

The first thing people notice is that hearing speech over distance is easier and much more relaxed. When singing in the room, people notice that they can effortlessly sing and hear themselves and others if others are around to join in. Often the first thing some churches do is that they start singing in harmony. Many restore their choir. Within several weeks, the number of people singing often doubles, without any prompting from a worship leader.

Before, the room would quash congregational singing and make everyone feel alone. Since most Christians believe the myth that the acoustics of a worship space can't be fixed, it has led to the mindset that it is easier to deaden the room, provide secular-style entertainment programs, and call it Worship. ***Kill the room, kill the worship.***

Now, with the tubes on the walls, when the audio system is turned on, speech and music clarity from the sound system will be significantly improved as well. Without adding more hardware, most people notice cleaner-sounding bass, up to 10dB louder from the sound system. The sound tech guys will notice an



Figure 2 Typical installation of an existing church where the change brought in higher attendance within a year.

technology, and tools available in their toolbox.

(The reason for suggesting cardboard tubes is because they don't cost very much. For a typical 300 seat church, it costs around \$800.00 (2018 prices) to fix the room as a DIY project with this method permanently. That is less than the cost of a high-quality wireless microphone system.) If a sanctuary or church is not available, try a room larger than 40L x 25W x 12H and follow the same recipe.

improvement in gain before feedback, which means more microphones can be on at the same time. The listening experience will be more relaxed as every word and syllable will be clearer and cleaner⁸. For preachers who slur some words or phrases, it becomes easier for the listener to understand what is being said. The quality and coverage of sound become consistent throughout the room. The half-round shapes solve all these problems right away. This is confusing to a lot of

sound experts when they experience such an instant change that improves everything they didn't anticipate.

What this little experiment does, is it proves the Bible. It proves that God's way of combining physics is foreign to experts and scientists. Conventional science does not and will not lead to this type of sound management.

While the experts are trying to figure this out, the church community doesn't have to wait to upgrade every existing Church with the cheapest path to getting the highest performance possible, no matter how the worship space is designed – good or bad. The secular community has nothing comparable in performance. This test brings authentic Christian worship back into the worship space. There is no downside to this if the leaders and decorating committee can get past the aesthetic issues. If anyone tries to block such an acoustical fix because of aesthetics, forget it. The Bible makes it perfectly clear that worship space performance is more important than whatever issue the aesthetic police demand.

Having Fun

Psalms 1:1-2 How blessed is the man who does not walk in the counsel of the wicked, Nor stand in the path of sinners, Nor sit in the seat of scoffers! But his delight is in the law of the LORD, And in His law he meditates day and night.

Since these tubes are already leaning against the walls, have some fun with them before installing. Try this.

Remove the tubes from the back wall of the worship space. Echoes will be heard from the bare wall when clapping from the pulpit. Any reflections from the side walls or front wall will be gone. This is one test that unmask several of the layers of acoustic problems of the room. Think about that for a moment. With the tubes in place, there was no echo. Now, removing the tubes from the back wall exposed an echo right where it is supposed to be. It does not take any unique talent for anyone to gain this much control of the sound without electronic equipment. No other method of managing sound exposes and fixes acoustical issues

instantly. This is when people in charge need to trust their hearing. If they like the change, chances are, so will everyone else.

Next, put the tubes back against the back wall and remove the tubes from the side walls. Stand at the pulpit and clap. Now there will be flutter echoes side to side. At high frequencies, these flutters have a pinging sound. By making a bass sound from a kick drum or smacking two large books together, the bass will be heard bouncing side to side as well. Those are standing waves. When all the tubes are removed, the flutters go away or change direction at a lower volume, and the ability to hear clear speech past 50% of the room's length drops, and this effect becomes very apparent.



Figure 3 This is mid installation, before the tubes were removed, painted, and reinstalled.

Without such an immediate comparison, people don't notice such changes, and often, it is assumed that such a problem cannot be repaired.

It doesn't take long to learn that the half-round tubes don't just fix a room; playing with them some more teaches anyone interested in sound a lot about the room, its strengths, weaknesses, and sound in general very quickly. In a way, the half-round diffusers get the room to speak, and it points to the solution by listening. They expose what and where all the room problems are and how to fix them. It doesn't take a rocket scientist or an expert to decide what is a good sound for the client. With the half-round tubes, there is no need to second guess the results. People must trust their

hearing and not someone else's opinion of what is good sound. Today, with modern acoustical measurement tools, in the right hands, a person can tweak such an installation to get even more performance out of the same tubes. There is no other acoustic system that is field tunable.

Once experiencing sound like this and then repeating such tests in many churches, it becomes easy to hear the layers and masking that happens within a confined space. Most people who clap their hands to identify an acoustical problem just focus on what they hear. A trained person will also notice what is not heard, and as they look around the room, and after gaining some experience in working with the half-round diffusers, they will see why. The half-round shape distributed around a room is the only system that fixes multiple problems at the same time. This kind of learning, knowledge, and success is not found in any textbooks on acoustics or church acoustics⁹. Any acoustical expert who doesn't know about this method of managing church sound will not be able to help transform any existing or new worship space into a house of true Biblical worship. However, they will be really good at creating acoustical conditions for a low-quality worldly entertainment center. Yet, when given the opportunity, Christians will prefer the Biblically treated worship space once they experience it over any other space.

The significant part of this method of managing church sound is that while playing with the tubes, the pattern can be tweaked for the best performance for the worship team, the pipe or electronic organ, the choir, and so much more. Drummers may find that a drum booth is not needed anymore. Try different layouts for several worship services. Once the ideal pattern is figured out, that would be the best time to install the tubes. With the tubes flush against the walls, they perform even better.

This brings us to a bigger question. Many ministers, at some point in their ministry, will say – "what would Jesus do?" Applying the same question when it comes to designing and building a house of Worship, "what would Jesus do?" it becomes clear that Jesus has already given us the answer.

When building a church building, it is for the people, or is it for God? If it is for the people, then Christians can continue to build whatever they want with the current level of work of the Holy Spirit already does, as evangelism is not just from the pulpit. In fact, the Holy Spirit will do His work regardless. On the other hand, since the churches built are for God, and almost all of them have a cornerstone or plaque that often says, Dedicated to God, or Jesus Christ Himself being the Chief Corner Stone, or To the Glory of God, then why don't these buildings testify Jesus? Are these houses of Worship for the saved or for the lost? If it is for the lost, it is a clubhouse and an attraction for goats. If it is for the saved, it will be full of Christians who are like the sheep Jesus describes in Matthews 25:31-46, in the great judgment.

Doing acoustics and sound according to the Bible is simpler, easier to learn, easier to study, and it removes the guesswork as to whether the solution will work or not. God has already done the work for us. God's way of fixing a church is permanent. Stick to the formula, and trust God. If something goes wrong, it is because the system was compromised.

The Recipe

Here is a brief outline the Bible teaches for church sound management. This outline is a starting point of the absorption to diffusion ratio a worship space requires of all existing churches.

- 30% of the total surface area of the room needs to be absorptive.
 - For most churches, the carpet and padded seating are enough.
 - For taller spaces, you will have to add additional absorption high on the side of the walls to meet that 30% rule.
 - Often, that is, between 3 to 8% of the available wall space will need absorption.
- The average amount of diffusion from half rounds is 15 to 18% of the total wall space.
 - The length of the tubes needs to be 2/3rds of the wall height.
 - The ideal tube sizes needed are 8-, 12-, and 16-inch half rounds.
 - The tube spacing, groupings, and sizes can be combined to give the room the flat frequency response it is supposed to have, to correct any acoustical irregularities from

improper worship space building practices the existing space already has.

- o Tube spacing centers should never be more than 23 inches apart.
- o All the walls need diffusion, no exceptions.
- o The half-round tubes don't work if they are mounted horizontally.

Summary

In this article, did the first question get answered, *does sound impact church worship?* It certainly does. It is subtle, and in a way, many in the church community may be blind to it. More often, it is never considered as an impediment to church health and growth. The right type of sound quality can make the difference in having a church full of disciplined members or not. They will be people who love to hear the full, uncompromised Gospel message. With the wrong type of sound quality, such a church is most likely to be engulfed in questionable teachings, and where their light only shines on Sundays and during any feel-good community events who love themselves more than God.

Does sound have an impact on congregational singing?

It certainly does. When the worship space cannot support healthy congregational singing, it then requires someone to lead them, and try to motivate as many people as possible to sing out. When 10 - 35% of the congregation is singing, another 10 - 15% are just mouthing the words; the room is crushing their desire to be part of God's family in song and not just in prayer. When over 75% of the congregation is singing all the time, musicians are encouraged to complement the singing rather than dominating and drowning out the efforts of the congregation. Healthy congregational singing brings people together in such a way that it makes preaching the full gospel easier as it will be better received by everyone - except for the sinners who haven't come to the full understanding of grace and repentance.

Are Christians seeking a full-on Biblical Worship experience?

Christians are people who love God first. In a good-sounding worship space, every part of worship service will come easy and with a fuller understanding of the Gospel message. If a person just prefers the "Christian Lifestyle" without the commitment

of being part of something greater than themselves, there are many churches that serve coffee and donuts and preach a feel-good message.

Are Christians hungry to hear the Gospel message that is not watered down? Again, for Christians, the passion for hearing the whole Gospel never takes a back seat to any other form of teaching from the pulpit of a church. Unfortunately, these days many people travel great distances to hear a message that suits them. This is true for those wanting the full Gospel message as well as those wanting to hear something that tickles their ears. When congregational singing leaves people feeling alone, frustrated, and for some depressed, getting their ears tickled with a well-crafted, un-biblical feel-good message doesn't seem so bad to them. However, 2 Timothy, 4:3 says, *"For the time will come when they will not tolerate sound doctrine; but wanting to have their ears tickled, they will accumulate for themselves teachers in accordance with their own desires,"* (NASB)

Sound quality impacts every part of church worship, whether Christians realize it or not. The Bible provides a simple, easy-to-follow recipe to bring existing churches up to the highest standard possible and for new churches to be as perfect as anyone can hope for. There is a considerable amount of information on the internet for any church to move forward to upgrade their worship spaces. The projects can be a Do-it-yourself mission, or with assistance, or as a turnkey installation.

The Bible is about God, a God who loves man and a God who has given everyone ways in the past and present to show love to Him. In the past, followers showed their love to Him by following His commandments and obedience as best as they could, never rejecting God no matter how bad or good things were. In the present, followers of Jesus come to God by accepting His grace through the sacrifice of Jesus, dying on the cross for our sins and our sinful nature, and in giving up the old self through repentance, a person becomes born again, accepting the Holy Spirit who keeps His followers forever under His glory and protection until they go to heaven.

Conclusion

Church design, acoustics, and sound begin and end with the Bible. Careful research and applying modern science to the worship space God designed for His followers, being Christian or Jew, clearly exposes the extraordinary temple Jesus designed for King Solomon to build.

Solomon may have been a wise king when compared to other kings of gentile and pagan led nations, but in terms of being a great king like some of the other biblical greats like Moses, Joshua, Gideon, King David, and the prophets, Solomon was a failure. (1 Kings 11:11) Solomon's failure was in accepting idols of the gentile women he married in gaining political favor of the surrounding nations to protect his borders from invasions. The more Solomon is studied, it becomes apparent that he loved the idea of being a king over people than being a servant to God and the people.

If the temple was meant to be God's house as something exclusive, that building would have never been destroyed as God would have protected it to this day. By Solomon's own admission, Solomon acknowledged that this building was not a vessel to contain all of God on the day of dedication. Rather, it was meant to be a place where God could show His presence to the people who love and follow God. That only happened once. In less than a year after the temple was dedicated, Solomon and the people were already turning away from God.

If the temple was meant to be a blueprint for a future purpose for followers of Christ, it was the preservation of the details that mattered, and that is what gives testimony to the meaning of the scriptures being the inspired Word of God. The evidence is clear. The preservation of the details of the temple supports the Biblical narrative when it is applied to modern technology. Otherwise, such details could have never

been recorded, and it would have had no impact on the Biblical story.

The worship space was never meant to be a place where the unsaved become saved. Rather, the worship space is where the members become disciplined in becoming living witnesses to everyone they meet in their daily lives. Jesus said that when a person understands and lives as a born-again believer, the more they know and love God, the easier it is for the light to shine in how Christians live. The lost are attracted to the light, but if the gospel message is not being preached or watered down, the lost will not see any light in the real world. Without light in the real world, there is nothing for the unsaved to be attracted to, making it harder to get people to visit a church for the first time.

It is time for the Christian community to abandon the complicated and expensive secular methods of managing sound in existing churches. The Biblical method of managing sound is affordable; this suggests that churches today have no excuse for accepting mediocre or the wrong type of worship space acoustics. For new churches, in designing a new worship space, the church leaders and building committees need to take back control from the secular community of the building design to represent what a House of God should sound like and perform.

Furthermore, it cost less to build a church following what the Bible teaches. The sooner the church community begins to understand that they don't have to continue being owners of expensive sanctuaries that fail¹⁰ to meet all their worship needs, the easier it will be to make new disciples and fill the church with sheep instead of goats.

Start following the scriptures now. This should be clear to those who believe in the sufficiency of scriptures.

Sola Scriptura.

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Additional online information can be found at
<https://churchacousticsandsoundsystems.com/>

References

¹ The Church in this instance, is the body of believers and not a building, but over time, the reference to church now includes buildings.

² The Salvation Army does not practice communion. Here is a quote from the Book of *Sacrament "Of The Sacred Moment,"* "It is undeniably true that Salvation Army congregations do not celebrate Holy Communion with wafers and wine, but the Movement has never been hostile, nor even critical, towards those churches whose congregations do. The value of the ceremony has been recognized but judged non-essential to Christian faith."

³ Christians have the expectation that any rectangle, square, fan shaped, octagon, oval or any other shaped room should all have the same level of sound quality and performance. It seems like a nice idea, but impossible to achieve.

⁴ The values are subjective and based on the authors testing and experience in large spaces outside of the church community.

⁵ John Lennox – the questions of science and God video Jun 2018.

⁶ If we go by the example of Jesus, He never converted anyone, but He made a lot of disciples. In Acts 8:9-24, we read of a person named Simon, who was a con artist who was converted to Christianity under Philips teaching. This is an example of one person planting seeds when another person gathers the harvest. While Simon did get Baptized and followed the disciples for a while, he loved the attention to himself more than he loved Jesus. Simon's conversion changed his mind, but it did not change his heart. When the Apostles Peter and John arrived to complete the Gospel message, of those who understood the full meaning of the death and resurrection of Jesus Christ, they willingly, as an act of faith, were able to receive the Holy Spirit, and those people became disciples. Simon was jealous of the Apostles, who seemed to be giving the people the Holy Spirit on demand. Simon's heart was in the wrong place. When Simon offered money to buy the ability to give people the Holy Spirit, Peter and John immediately understood the sin that kept Simon in bondage to himself, and he wanted to use Christianity as a means for personal gain. In desperation, Simon asked Peter and John to pray for him. While the story ends here, what is clear is that Simon did not understand that to be a follower of Christ includes being dead to self. When a person is willing to die for Jesus and is willing to give everything up, that is when the Holy Spirit can move in and begin His work in them. Simon could not give up his need for attention and the wealth it brought him. This is like the story of the young rich ruler who said he did everything, but when Jesus asked him to sell everything and to follow Him, the man walked away knowing he could not give up his wealth.

⁷ Here is the logic to why Solomon's Temple is what Jesus and God's design for houses of Worship for man in the present. Read the following Scriptures. "Gen 1:1-2 In the beginning God created the heavens and the earth. The earth was formless and void, and darkness was over the surface of the deep, and the Spirit of God was moving over the surface of the waters. Joh 1:1-3 In the beginning was the Word, and the Word was with God, and the Word was God. He was in the beginning with God. All things came into being through Him, and apart from Him not even one thing came into being that has come into being. Col 1:15-17 He is the image of the invisible God, the firstborn of all creation: for by Him all things were created, both in the heavens and on earth, visible and invisible, whether thrones, or dominions, or rulers, or authorities—all things have been created through Him and for Him. He is before all things, and in Him all things hold together." Near the end of David's life and when Solomon was old enough to understand, David said to Solomon - 1Ch 28:19 "All this," said David, "the LORD made me understand in writing by His hand upon me, all the details of this pattern." Mat 5:17 "Think not that I am come to destroy the law, or the prophets: I am not come to destroy, but to fulfil." When reading the scriptures and listening to the explanation of the trinity, the picture that is always painted is that God, Jesus, and the Holy Spirit have always been and is God. That may seem confusing but remember that there is no separation of Jesus from God or the Holy Spirit or any separation of the Godhead. One never existed without the other. King David said that the hand of God was upon him, but God is Spirit, who does not take on physical form or can be seen, the Holy Spirit is Spirit who can become visible, but Jesus is both Spirit and physical. This means it was the hand of Jesus (who was not revealed until he was physically born into this world) that guided the hand of David. Jesus said in John 15:26 "But when the Comforter is come, whom I will send unto you from the Father, even the Spirit of truth, which proceedeth from the Father, **he shall testify of me.**" The acoustical system found in Solomon's Temple is a work of God, a work of Jesus and a work of the Holy Spirit. Those who are of the Spirit will know that this is true.

⁸ With much less distortion, the average person can listen to the person talking at a louder volume level without being offended.

⁹ Yet. It is hoped that the articles posted on the "churchsoundandacoustics" blog will be turned into a book on church acoustics based on the Bible.

¹⁰ After testing hundreds of random worship spaces between 1983-2019, 98% of them could not perform adequately for all parts of worship.