

The Biblical Truth about Houses of Worship from the Father of Modern Day Acoustics

*In the Scriptures there is the Holy Grail of
Modern Church Acoustics and Audio.*

It has always been with us.

*Every believer who goes to a
House of Worship should know this.*



By Joseph De Buglio

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Introduction: Wallace Sabine

In the field of acoustics and sound, many have said that Wallace Clement Sabine¹ is considered the father of modern-day architectural acoustics. His scientific work was not only the foundation for concert hall acoustics, but few are aware of how his work has impacted the church community around the world. According to several sources, he was raised in a protestant home, but as an adult belonged to no church and professed no religious faith², yet his work has impacted churches in ways even Wallace could not have imagined. Wallace's work included figuring out a prediction model of how to apply absorption to tame a room. He also proved that the reverberation time alone is not enough in helping performance spaces with their sound needs. He laid down a foundation, showing that you need much more detailing and care to create suitable sounding spaces, not just for concert halls, but for full Christian worship too.

$$T = \frac{V}{A} \cdot 0.161 \text{ s m}^{-1}$$

T = the reverberation time
V = the room volume
A = the effective absorption area

This is the equation Wallace created. It was never meant to be a shortcut for church acoustics. It is actual the final step of detailed plan navigated with an experience acoustical expert.

Shortly after his discoveries and successes, most acoustical experts, Architects, engineers, and audio experts have focused on one thing, the reverberation time of a room – ignoring much of his actual contributions to modern acoustics. When Wallace created the first equation to calculate how much absorption is needed, most people thought that this equation was something magical. It was almost as if a single number could solve all sound problems for concert halls and performance spaces. While such a numeric value is essential, it was a small part of a much larger picture. Sure, Wallace did devote a lot of his time to such studies. Unfortunately, the absorption calculation moved from being a small tool as part of a broader view of performance acoustics to becoming the only thing that mattered. This equation gained mythological-importance to the point that for many laypeople, there was no way to convince them otherwise of what truly matters in managing sound.

Myths vs Facts

Soon afterward, well-meaning people adopted this way of thinking as a shortcut within the church community over 100 years ago. This single number myth has blinded so many churches that it has kept most congregations from undergoing the full range of worship as described in the Bible – as God calls for us to participate. For



Figure 1 Kingston Road United Church is used for live concerts once a month since acoustical upgrading in 2008

many churches, past and present, this single number myth had created more significant problems in managing church sound than before such an equation was created. Wallace Sabine's genuine contribution to sound in large rooms that supports churches as well has mostly gone un-noticed or dismissed. Instead, two other myths are perpetuated to this day. The two myths are about managing the acoustics of a church as being too complicated or too expensive – of which neither is true except for those who profit from the few churches with deep pockets.

What Wallace Sabine did was establish the groundwork for knowing how to manage sound in large performance spaces. He is best known for the Boston Symphony Hall. This concert hall is, at present, considered one of the best³ live sound performance spaces in the world. As a scientist, Wallace wrote many short papers including details about the Symphony Hall. These papers were compiled into a book printed in 1922 after he died. He did a lot of research from 1894 to 1919. In reading these papers, it becomes easy for anyone to overlook essential truths about his work.

His research should have led to improving church acoustics – not just for concert halls. Wallace's work was as important as it is very relevant in helping modern churches today. Sadly, most of his real work was ignored or dismissed. In reading his work, two key features are very relevant to modern churches today. The first is in managing sequences of sound reflections in a large space for a specific level of performance and the second is what frequency to measure reverberation time with. (A third detail that is only being mentioned here is that when you add absorption, you have to plan where you install it much the same way as preparing a room to control the reflections of sound. Blanketing walls with absorption undermined worship and often increases deadspots.)



Figure 2 Custom made diffusers built by a church member. Aesthetics should never get in the way of preaching the Gospel

The Boston Symphony Hall

When you examine his work, it becomes apparent that he began by preparing the spaces he experimented in to create the first-ever calculations in predicting the absorption rates of various materials both porous and solid. While studying his book of collected papers, he used the terms diffusion and diffraction only once. However, he used the term reflect, reflection, reflecting and reflector 176 times. He used various shapes, flat surfaces, and soundboards to control and direct

reflections of sound for a specific goal of performance. He did these changes whenever he could or was allowed to in all rooms before testing with absorptive materials to see how they worked and how to use them.⁴ This pattern of investigation in his work was repeated frequently, as described in his papers. (One story that cannot be verified was that in a library that he did many experiments in, he adjust the books on the shelves pushing them in and out so the book spines would redirect sound in a controlled pattern.)

Another important detail is that Wallace Sabine used 512 Hertz as his reference point. He wrote the following over 100 years ago.

“The first five years of the investigation were devoted to violin C, the C an octave above middle C, having a vibration frequency of 512 vibrations per second. This pitch was chosen because, in the art of telephony, *it was regarded at that time as the characteristic pitch determining the conditions of articulate speech*. The planning of the Symphony Hall in Boston forced an extension of this investigation to notes over the whole range of the musical scale, three octaves below, and three octaves above violin C.”⁵

While Wallace was super focused on creating a prediction model in understanding and knowing how to use absorption, he was implicitly concerned with speech intelligibility using 512 Hertz as a reference point – even for the Boston Symphony Hall. What he was doing was re-discovering what the Bible described in managing sound in a large room 3400⁶ years earlier. If anything, he paved the way in knowing how to translate into science the most important parts of what the Bible already documented to be the ideal space for music and speech in a worship setting.

He was the first to attempt to put the absorption part of a total room sound management system into mathematical terms so it could be shared with others. With the limited tools and technology of the day, Wallace was the first to use quantitative acoustics in designing a concert hall. At the time, absorption was the only thing that could be calculated from his equations while working on the Boston Symphony Hall. The rest of the acoustical design of the concert

hall was based on his research of other facilities and personal experiences. He learned firsthand how to use surfaces to direct, control, and manage sound reflections. There was no way to quantify sound reflections which meant no equations for that and there still isn't any today either. He did a lot of hard



Figure 3 half round diffusers in three sizes to manage and equalize sound from 30 to 800 Hertz in a converted commercial building to behave like a proper church.

work from what he learned from trial and error experiments to prepare a room for sound with surface shapes, adjustable panels, and reflectors. It was his combined experiences that created the best concert hall in the world, and not a single mathematical number dribbled out from an equation. Wallace described how he shaped the sound first to create a specific performance pattern before using absorption. Sadly, little of it was documented sufficiently enough to help us with predicting sound today.

Wallace repeatedly demonstrated how changing the room allowed the mathematical equations to work. In the last 120 years, he and others have written equations in a way for others to re-create and have repeatable results when the right conditions are in place. Without shaping the sound first, these calculations extinguish the possibility of creating a good or great sounding space. Newer equations for reverberation



Figure 4 Example of part of a 500 Hertz 25dB wall absorption wall part of a 4000 seat room

and absorption are getting better, but the results are always most accurate when large spaces have their reflections sequenced into the right order for the kind of venue being fixed, corrected, or planned as new spaces.

As it turned out, this way of thinking wasn't exclusive for performance spaces. It was for any place where the sound was interfering with any form of verbal or musical communication from simple conversations in a restaurant or living room at home to high quality performing concert halls. The vital key here is that for his calculation of reverberation time to work correctly; a well-diffused space had to be created first before adding any absorption. These equations cannot, nor meant to address performance issues when applying absorption to a confined space. None of the current modeling and simulation programs adequately tackle this. They don't tell you how spoken words will behave between two people at 3 feet away, 6 feet away, 12 feet away, or 60 feet away, during a conversation. (Note: Acoustics simulation software is a great tool, but the software is as good as the person programming it. No software exists that will tell you what materials to use, how to shape a room, how to direct sound to follow a specific pattern or how to design a space. Some of these programs even attempt to offer the ability to hear how a room will sound before it is fixed or built through headphones or stereo speakers. Having tested such programs myself and from other experts, there has not been an instance of where

the simulation and the real-world performance of a room were identical or close. Such programs cannot be relied on to guarantee any predictable results.)

When it comes to entry-level simulation programs, most of them focus on amplified sound where the sound source is directly injected to the sound system – not of a person talking to an open microphone within the same place. Have you ever wondered why so many sound systems seem to be on the verge of feedback all the time, even when a high-quality headset microphone and wireless system is being used? What Wallace did was groundbreaking, and what he did was more than just scratch the surface of large room acoustics performance standards. Whenever possible, what he did was prepare rooms before adding absorption. What he didn't say, but it is evident when you study his work, is that without preparing a room in the first place, his equations cannot be trusted.

Room Shape, Controlling Reflections, Architecture – In that Order

Wallace Sabine established two essential principals that lead to successful results. As a scientist, he understood that sound always behaves the same way. He recognized that there is a limited way to create the best experience for hearing music and or for hearing speech. His papers show that there is a restricted number of room shapes and geometry that matches how humans are designed to hear and experience sounds to communicate for music and speech. All other room shapes will have large areas of the seating and stage areas violating the Laws of Physics for human communication and bombarding us with inadequate sound details, limiting the usability of an ill-conceived space.

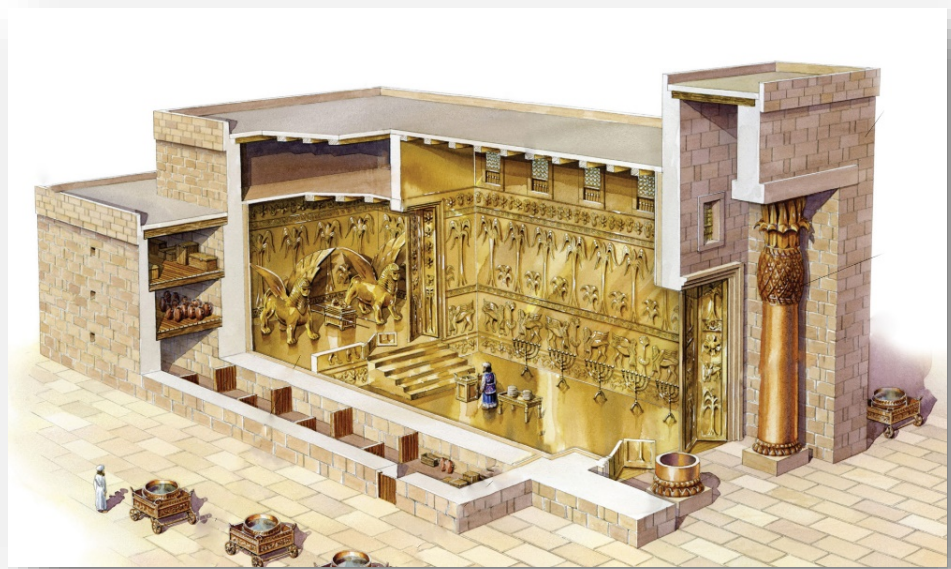


Figure 5 Solomon's Temple was never about showing off wealth or power. It was about having a place where you can hear God's word that brings you closer to Him.

From his papers, it becomes apparent that for a new performance hall or *new church for that matter*, start with the seating capacity of the room needed or of what you can afford. Then lay out all of the different ways the room will be used. The use of the room with the ways people hear and experience sound will establish the room shape. Next, control how the sound will move around the planned room

including from where the sound starts to how it is received. After all of the hard work of planning is done, give it to an Architect to design the shell around the hall or worship space. For a church, the shape and aesthetics need to be hammered out before starting any discussion with an Architect. Instead, talk to a builder who can give you a budget cost so that you can keep the Architect under control and force them to design what you need, not what they want or what society wants. A church should be designed around what is needed to best communicate the Gospel. If that is not your goal, then what are you building a church for?

The Three-Step Program

For existing churches, he demonstrated the need for a three-step process to manage sound in large spaces. The first step is control. The second step is dampening with absorption and the third step is sweetening where minor room anomalies can be corrected with minimal room tweaks at the end of the process. This progression has never changed and when it is followed, it is the touchstone standard for walking into any performance hall with near-perfect sound on the very first day of performing.

When it comes to churches, the same process is correct. Not only did Wallace Sabine establish a successful three-step process, he proved two essential things that the church community should always follow. The first step is to prepare or design a church to have control of the sound with the right sequence of reflections. The second is to use 512 Hertz as a reference for reverberation, not an average of 1000 Hertz as many in the audio and acoustics industry do.

Wallace's equation proves that when a performance space is absent of any sound shaping in the first place, regardless of music styles, and you use 1000 Hertz or 20 to 20,000 Hertz averaging as reference points, using any absorption calculations and trusting the numbers alone, it will – 100% of the time, lead to an over dampened room.⁷ This leads to the common expression of “killing the room” which works against everything of what a concert hall needs. These details apply to churches equally. Unplanned sound is a recipe for failure and it is always correct when absorption is used as the first line of attack to manage excess reverberation/noise. What Wallace Sabine did was expose the musical or speech qualities of a room before dampening to separate the noise from the reverberation. Because of



Wallace Sabines work, we discovered that not only can you control existing spaces after a building was completed, but we learned that it costs less to make these changes before a building was constructed.

There is a remarkable discussion to this day in the secular community about diffusion. Experts in acoustics are all over the place. It seems that there is an almost 50/50 split of whether to even use diffusion to manage sound, let alone knowing how to use it. Fortunately, there is some ancient documentation that has a solution to this debate. There was an old temple that had half-round diffusers with flat spaces between them and it works almost perfectly for churches today. This method of managing sound has been tested and the results prove that it works!

Acoustical Needs of a Church

This brings us to the most important book for the Christian and for Judaism – the Bible. The Bible has a lot to say about acoustics. Where in the Bible does it say anything about acoustics and how did Wallace Sabines work supposedly support what the Bible teaches? To start with, the Bible tells us all of the ways a worship space needs to perform. These requirements are not an option, they are mandatory. The first is hearing sermons and teaching in large groups of people. Jesus brought people to places where speech can be supported without amplification to thousands of



Figure 6 Evangelical, Mennonite, Reformed, Alliance churches, with similar fixes customized to draw out the best performance of each shell.

people at a time. (Matt 13:2, Mark 6:30-35, John 6:3-5)⁸ Next, there is singing in worship (Col 3:16, Hebrews 2:12) There is singing and open prayer for one another (James 5:13-16.) Finally, they used musical instruments including trumpets, cymbals, psalteries, and harps, (2 Chronicles 29:27-29) Churches and Synagogues are the only places where all of these activities are expected and there is only one room in history that has enough documentation to meet all of these requirements. We should not be surprised that it is the only room that can meet all of the needs for modern worship today. It is sufficiently detailed in First Kings chapter six so that it can be tested. It is King Solomon's Temple⁹ and tested it has been.

If you break down all of the details of Solomon's Temple, Wallace Sabine, the father of modern-day acoustics, he unintentionally validated the Biblical story of Solomon's Temple. The only difference is, Wallace Sabine was limiting his thinking in terms of concert hall performance for large spaces.¹⁰

Where concert halls come up short is in audience participation

for alternate speaking locations and congregational singing. Concert halls are designed to give an immersive experience of music for the audience from a stage. Churches need to have an immersive experience from both the audience and the stage¹¹, and Solomon's Temple accounts for that. History has no other records of a house of worship or temple or a building from any other religion that has as much detail that points to how a worship space should sound. Solomon's Temple is the only religious building that points to an acoustical performance ideally suited for both speech, music and congregational singing as outlined in the Bible for large group gatherings.

Wallace Sabine confirmed many requirements that support what the Bible teaches. For this article, we are looking at how he established the need to manage reflections in a controlled manner and to use 512 Hertz as a reference for calculating sound. How? The Bible describes palm trees and cherub carvings on the walls. These carvings would have been limited to 4 to 5 inches in depth. The planks on the walls of Solomon's Temple were around six inches thick before being covered with gold. The carved shapes can do two things simultaneously. They can scatter and absorb sound very well. Hard surfaces can reflect and absorb sound at the same time via phase cancellation. The sizes of the carving work very well around the 500-Hertz range. This method uses 4 different properties of physics.¹² The



Figure 7 Compressed cardboard paper is powerful, effective and most of all, affordable. Shaped and cut into half rounds there is nothing more powerful in controlling the acoustics in a church.

telephone companies, Wallace Sabine and who knows how many experts over the years, all agree to this requirement to create a performance space, and nobody noticed that was ideas were already detailed in the Bible.

In cases anyone notices, when you use 500 Hertz as a reference point, and you achieve that goal, almost always the room will have a relatively flat frequency response. When Wallace Sabine used 512 Hertz for the Boston Symphony Hall, he was making the room to have a flat frequency response from 64 Hertz to 4096 Hertz. This is exactly what a house of worship needs. When the shape of palm trees are used properly, it achieves this level of performance every time. How did King Solomon know this unless God told him how to finish the walls of the temple? This leads to the question, has this information been tested? Has it been tested in churches?

Is there Proof that the Bible's plan works?

Now, if five or six churches applied half-round shapes as it was detailed in Solomon's Temple to their worship spaces and it worked, one would think that this idea has some possibilities. If twenty or thirty churches did this with very good results, one could think that more churches should try it out. Today, there are over 450 churches¹³ that have had their acoustics significantly improved with half-round diffusers with flat spaces between them to create the right sequences, the right frequency response and the right amount of reflection, and frequency-specific absorption to support congregational singing, the choir, and worship team singers. Considering the number of diverse shapes and sizes of these known 450 church examples, it seems that one can conclude that this method of managing sound in any existing church is the best solution possible. Furthermore, it gives us a blueprint for any future creations of a new church building.

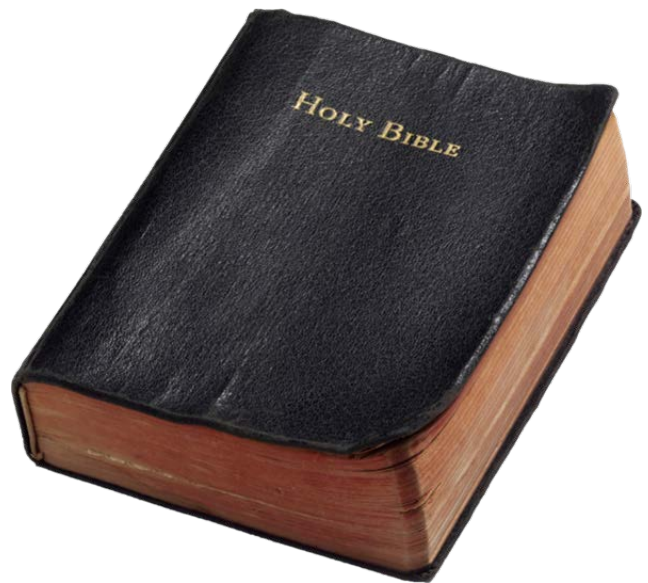
From these 450 churches, we have learned a lot. For existing worship spaces, it brings all of those random architectural room shapes up to their maximum level of performance. It unmask and exposes every ounce of musical and speech qualities a worship space has to offer, no matter how poorly the sanctuary was designed and completed. All aspects of worship are improved or made almost perfect. This treatment significantly affects the performance of a sound system too. After the acoustical change that matches the methods used in Solomon's Temple were used, there were significant improvements of the performance of every sound system, whether the sound system were upgraded or not, surpassed any other sound system previously owned by the church.

Imagine this; in most of these rooms, a person can stand up from any seating position in the audience, and if the person speaks loud enough, everyone in a worship service up to a room of 500 seating can hear what is being said without the assistance of a sound system. This kind of room performance is beyond what is needed for concert halls or musical performance spaces. This means that it allows members of the congregation to stand up from any seating position and share prayer requests and for others to stand up and pray openly as the Scriptures teach. ***The secular community of acoustical experts rarely consider this as an absolute requirement for the performance worship spaces.*** Instead of following the Bible or even looking to the Bible to know if anything about acoustics is taught, the

church community on mass, solely rely on the secular ideals of a performance space. People who are given the responsibility for the acoustics and sound of a church are all caught up and drawn into a trap with one goal, reverberation time or creating a room with a sound effect that in the end, has nothing to do with worship – rather mostly for entertainment. It is as if this number is the Holy Grail of acoustics that will make church worship perfect. The truth is, there are thousands of worship spaces that have the “right reverberation time,” but the performance of the sanctuary fails to meet many of the requirements for worship, and when the congregation sings, the people cannot hear anyone else singing. They feel like they are all alone in a room full of people. At the same time, you have a hard time understanding other people when they are ten feet away and when the sound system is on, no matter how good the equipment is or how well the system is designed, engineered or tuned, it is still hard to understand everything that is being spoken.

Anything Better?

For those who are skeptical, consider this, a number of these 450 churches had already been treated with absorptive panels to manage sound. For these churches, they thought what they had was the best fix possible. After testing these rooms and looking at the properly acquired measurements for performance attributes or lack of them, it was necessary to remove most or all of the absorptive panels and exchanging them to diffusers as a system for managing all of their sound needs. After the changes were completed, the church members and the leadership of the congregation were astonished at how musical and calming the spaces became. Hearing speech was effortless and much more accurate. Even those with hearing aids using a loop system or wireless system noticed the improvement in sound. Every part of the worship was improved. No longer could anyone use the acoustics of the worship space as a reason for missing out on church. All this to say, until your sanctuary follows the acoustical planning detailed in the Bible, no matter how good or bad you think your worship space sounds today, it can still be considerably improved.



When you look past the gold¹⁴, the items for rituals and ceremonies, and follow the details of Solomon’s Temple purely from a scientific and acoustical performance point of view, you have the perfect worship space for Christians and Jews all over the world. The Bible teaches us to trust God for many things. When we put our trust in God, those things that are of God become real to us. ***Over 450 churches have already put their trust in God as an act of faith, and not one of them has been disappointed.*** Other churches that have copied this system as a leap of faith have similar results. Who knows how many other houses of worship have discovered and understood what the Bible teaches about church sound and have acted upon it in faith?

What matters the most is that the sea of air between the minister preaching the Gospel and the person listening, there should never be a barrier between them. Poorly managed sound can change words, the meaning of the Gospel or being in a deadspot where parts of words aren't even heard so that the message cannot be understood. Transforming spaces into Gospel preaching and congregational singing spaces are the two most important goals every house of worship must attain. As so many churches do, they dedicate their houses of worship as Houses of God or to God. What better way is there than to complete the picture and to Honor God with a house of worship that meets His standards?

Footnote.

1. As mentioned earlier, when most people are given the task of fixing an acoustical problem, almost always, they are focused on the reverberation time as if something magical will happen when that number is achieved. That number is a myth of what many claim that it represents. In a time where churches are promised fantastic result by spending countless dollars on technology or promises that technology can solve any sound problem, where fake news, fake websites, fake businesses, and fake reviews crosses our paths every day causing misplaced trusts, as a Christian if you are to put your faith into anything, trust the Bible. Fixation on reverberation alone is a lie and many well-meaning people keep that falsehood alive. If anything, if you are not going to believe the Bible, you should trust the man who invented the ability to measure absorption, and Wallace Sabine said to fix the room first. The reverberation time of a room shouldn't even be talked about until the sound is sequenced correctly. In the churches that I have fixed over the years, after they had been corrected, in most cases, the reverb time was not changed. All we did was remove all of the bad parts of the reflected sound energy, changed the way how sound moved around the room, passively equalized the room, and expose and preserve the unique tone qualities of music and speech every room has. It doesn't matter how long the reverb time a church has. A church can have great speech and music, at any reverberation length as long as the room volume can support a long reverb time, it is properly sequenced, it has the correct frequency response, and the signal to noise ratio to have a separation of 25dB or more. Wallace Sabine knew this from his own research, and as it turns out, Solomon's Temple had the same level of performance too.
2. For what it is worth before the Boston Symphony Hall was designed, the Architect, the musical director, and the acoustical consultant visited several concert halls from around the world. They explored all different room shapes. After 10 years, they settled on the idea that the best performing rooms were rectangles with the same length, width and height ratios that follow Solomon's Temple dimensions¹⁵. In Wallace Sabine's research, he concluded that the same ratios are ideal for hearing speech.

What I find as remarkable is that many new concert halls that show promise or have good performance qualities begin as rectangles. Then they have a lot of diffusers, hard panels with shapes on them and reflectors. There are a number of secular acoustical experts that do understand how important diffusion is in performance spaces. Over the years I have been told countless times how churches ask these experts for help. What puzzles me is, either secular acoustical experts are purposely not designing diffusion into their acoustical plans for churches or churches are rejecting the acoustical proposals they hired and paid an expert for deeming the acoustical design work as too expensive, or the Architect refused to allow anyone else to decide any of the aesthetics of the room. The truth is, including or adding any acoustical design that matches

all of the performance requirements for Christian worship cost much less to include and there is a monetary return on the investment every time.

3. After Wallace Sabine's success with the Boston Hall become known, he was hired as a consultant for many buildings including churches. With several collaborations with others, he helped develop absorptive tiles that were porous enough to manage reverberation time well, they could be installed into churches without impacting on the aesthetics. While these tiles did a great job at reducing the reverberation of the room, in many cases, it did not help enough with the spoken word, but it did help with the music. From the way the panels were designed, I don't think Wallace was permitted to change how sound should move around in those churches he was hired to help. Much of Wallace's work was fixing existing churches with one of his hands tied behind his back.
4. For churches that know they have acoustical issues but keep putting it off, there is a financial benefit to having your church brought up to Biblical standards. I have been gathering data from hundreds of churches of both before and after of either acoustical changes, sound system changes or both. I have also studied churches with poor acoustics where they were not interested in fixing their worship spaces or who found making any changes to the aesthetics of the church would be detrimental to the church's future. The data I used the most was from churches where there was no leadership change for three years prior and five years after the acoustical treatment was applied. There is a consistent pattern after a room is fixed. Church attendance after 3, 10, and 20 years is consistently higher - up to 25%. This is not a growth per year, but the sustained growth from years of having a church with poor sound to years of a church having good sound.

If we take a conservative increase of just 10% in attendance and only \$10.00 per person per week for their support or tithing, for a 350 seat church, the income is between \$75,000.00 to \$190,000.00¹⁶ over ten years, for a 600 seat church the acoustics has added \$150,000.00 to \$360,000.00 over ten years, and for a 1,200 seat church, it has added \$1,200,000.00 to \$2,100,000.00 to their bottom line when compared to churches of equal size and attendance 10 years earlier that did not make the changes to improve their sound.

With actual numbers of a local small-town community church of before and after acoustical changes, in just the first and second year where there were no leadership changes, their average tithe and offering worked out to \$21.00 per person for every adult and child per week. This church of only 230 seating capacity realized a 12% increase in attendance and a \$21,000.00 increase in the first twelve months. What surprised everyone that, along with the higher attendance of just 17 people, the giving per person increased to \$23.00 per person which is what made up for the higher income. For that church, their acoustical fix only cost \$8,500.00 and they replaced parts of the sound system to meet the higher demands. The church spent about a total of \$13,000 for consulting, sound and acoustics, and in the following year, the added income was high enough to pay for fixing the acoustical performance of the church. Another way of putting it, the acoustical and sound system changes paid for itself within 8 months. If this pattern continues for the next 10 years, this church can potentially earn an additional \$210,000.00. What can anyone invest in, that can turn \$13,000 into \$210,000 in just 10 years? That is equal to an investment return of 32% annually. Where can you legally get an annual return of 32% on investments either through banking or stock investments over 10 years?

5. For this acoustical system to work, all of the walls have to be treated. Secondly, it is not about the materials but the shape. The half-round shape can be made of anything including wood, plastics, steel, hardened foam shells, acrylic glass, plaster, concrete or paper. Fixing the acoustics of a church is so affordable that every congregation can great sound. There is an acoustical proverb that says, *if the acoustical system doesn't work, it has to look great. If an acoustical system works, no one notices how it looks.*

6. Churches often ask for acoustical help for a variety of reasons. Often, the sound system operators want the room fixed to get better performance out of the sound reinforcement system or to better control the sound on stage. If you use the methods as to how Solomon's Temple was managed for sound, it will always improve how the sound system performs without changing or improving congregational singing. Some churches want the reverb time reduced to improve speech intelligibility. If you use the methods found in Solomon's Temple, you will always improve speech intelligibility that surpasses any other method without giving up any of the musical qualities the room has for congregational singing. Since God designed the temple through King David and Solomon, wouldn't stand to reason that God knew our needs today 3400 years ago? Since God designed this system, isn't it He that is making a promise to us that following this technique of managing sound will work and meet our needs every time? One more thing. If this method of sound didn't work, then the story of Solomon's Temple could be a myth, a fable or just a made-up story. Since this method does work, it is either a real place and recorded for our benefit today like the rest of the Bible or who, other than God would have had the scientific knowledge to create an imaginary temple and describe acoustical principals that affect the audio performance of sound systems 3000 plus years before the sound system was invented?
7. These days, when it comes to the worship space within a church, many times I hear people saying, "It's just a building. We can do whatever we want in it." With that attitude, are we saying we don't respect the space, there is no such thing as Holy Ground, which we don't have to show reverence within the walls of the space that is dedicated to God? Moses had to take his shoes off when in the presence of God. The Levite priest wore a special garment. In Exodus 28:3, Aaron was to wear this special garment when he was in the service of God. Yes, Jesus did change the way we come to God, but Jesus came to fulfill the law. We don't get dressed up to obey the law, we get dressed up to show respect, to show love, to be a light in the world for others to come to. When we treat a church building as nothing more than a common structure, are we telling people they have no reason to come? Are we saying that God is not here unless we decide it? How can we put up a cornerstone or plaque that says this building is dedicated to God or Preaching of God's Word and then have a cavalier attitude of how the worship space can be used for anything, Christian or not? If the houses we dedicated to God don't matter, if the activities in that house don't matter, then why did Jesus go to the different synagogues to teach so many times? Jesus taught in the synagogues more often than when preaching out in the open. As it was custom to wear something on your head to enter a synagogue, Jesus did the same. Otherwise, he would not have been allowed in. If we are followers of Christ, are we not also to show the same respect and reverence as he did? How can we say, it's just a building, dedicate it to God and then treat the space as if you can do whatever activity you want to do in it?
8. Church acoustics is first and foremost about creating the right room to preach the Gospel and creating a space where the spoken words of the Gospel cannot be altered by poor acoustics regardless if a sound system is used. The power of God's Word, the Gospel, will draw people to a church no matter what. The power of the acoustical performance of the room has a huge impact as to whether a person comes back or not, regardless of first impressions on how well a person is received or welcomed on their first visit. We should stop looking at the money a church will cost but plan on building a church with how it affects the souls of people. It is about investing in the future of the church and in the people who get to hear the Gospel so clearly, that it becomes easier to understand the spoken words to be part of the church community and congregation. It is about being part of the family of God's people in the Kingdom of God. God has designed for us the perfect space for preaching the Gospel, and we should be using it all the time. When we obey God, he gives us back exactly what we need.

By Joseph De Buglio

The most successful Church Sound and Acoustics Professional

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Physics – Engineering – Sound - Technology

End Notes

¹ Wallace Clement Sabine (June 13, 1868 – January 10, 1919) was an American physicist who founded the field of architectural acoustics.

² <https://www.encyclopedia.com/science/dictionaries-thesauruses-pictures-and-press-releases/sabine-wallace-clement-ware>

³ Concert halls with strong lateral reflections enhance musical dynamics by Jukka Pätynen¹, Sakari Tervo, Philip W. Robinson, and Tapio Lokki <https://www.pnas.org/content/pnas/early/2014/02/26/1319976111.full.pdf>

⁴ Wallace Sabines collection papers page 148

⁵ Wallace Sabines collection papers page 199

⁶ This is about the time when King Solomon's Temple was built

⁷ This is based on live tests conducted by Joseph De Buglio and Blake Engel in over 20 churches between 1997-2003

⁸ Scripture verses are from King James Version

⁹ 1Ki 6:29 "And he carved all the walls of the house round about with carved figures of cherubims and palm trees and open flowers, within and without."

¹⁰ Wallace Sabines collection papers page 199

¹¹ For many denominations, church members participate in worship by standing up in their seats and share prayer requests, they may pray for those requests, sharing testimonies, and make announcements. Worship spaces are often used for church business meetings where anyone can contribute with questions and ideas about church affairs.

¹² The four physics principals are, phase cancellation, sound scattering, breaking up larger frequencies, making the sound travel further around the room to allow air to absorb some of the sound (increasing the path length of the sound).

¹³ There are over 450 church that are known to use half round cardboard tubes or tubes made up of other materials. 50 of those examples can be seen on the web service of Flickr. <https://www.flickr.com/photos/jdbsound/collections/72157627021000982/> Joseph De Buglio has been in over 1200 churches concerning acoustics around the world.

¹⁴ The covered floors and walls had gold leafing added to them. This thin layer of Gold was used to keep the temple clean after the blood from the sin sacrifice was cast onto the walls and floor. Gold is the only thing that will not be stained with blood and it only takes water to clean the blood off the gold.

¹⁵ Boston Symphony Hall – Length including stage 156 feet, Width 75 feet, Height 59 feet. Total room volume 649,000 cubic feet. Page 64 of Wallace Sabines collection papers.

¹⁶ Book - Why are Church Sound Systems So Confusing? 2004 Page 438