

Church Sound and Acoustics

What Happens when
Technology, Science
and Knowledge catches
up with the Bible?

Looking under the hood of Solomon's Temple

By Joseph De Buglio

Introduction

The battle for a person's soul is a constant war on many levels. The Bible, ministers, preachers, scholars, experts, archeologists, historians, and educators provide different ways of bringing the Word to people who come to know Jesus. Most Christians believe in the sufficiency of scripture¹. Many believe that the Bible is the inspired word of God and never question it. To that end, in the Biblical record, we are still discovering ways how God's book is relevant today. The things that we are learning are in both the New and Old Testament.

In recent times, it has been brought to my attention that the Bible has universal solutions to a number of church problems. Most, if not all, churches experience a cluster of issues at some point in the life of their building. The Bible does, in fact, have answers to such problems. They are in the details of King Solomon's Temple. The Bible, the inspired Word of God, provides a set of solutions that any church can test and take advantage of.

As we dig through the Bible, there were two things that God designed. They are the Ark of the Covenant, and King Solomon's Temple or The House of the Lord. The Ark of the Covenant was a symbol to show people that God is not limited to an idol, a box, or a location. Instead, God is everywhere and that God can be worshiped from any place. However, Solomon's Temple is something unique. When you look under the hood, the temple reveals something unexpected. When you apply knowledge from a current and critical scientific point of view, we begin to realize that God gave us something unique and special. It is something that every church around the world can use today if they haven't already done so.

History

To see if Solomon's Temple is more than just a monument stuck in time, a wonder of the world, a show of wealth, power, and a symbol for who Israel worshiped, we have to start at the beginning of how Solomon's Temple came to be. The temple was to be a replacement for the tabernacle, which was a very sophisticated tent for the Ark of the Covenant that moved many times before they built a permanent resting place for it. The tabernacle was inside a fenced-in area of heavy linen. The new temple was to be something more. It was to be a permanent place to house the Ark of the Covenant. The rest of the building was to support all of the needs of the Levites, who were the priestly tribe and leaders who tasked with the responsibility to perform sacrifices, rituals, teaching, learning, singing, and music within the main temple worship space. The temple was to be a testimony for the rest of the world to see the Israelites faith in an unseen God who is everywhere.

While I am not an expert in ancient temples, I have scoured available resources on the internet, libraries and contacted some scholars, if there were any temples at the time of Solomon to have similar details. There were other temples at the time that were bigger, taller, and elaborate, but none of them had any resemblance to what Israel built. Other temples had statues for idol worship in the middle of the main building and would have rooms off to the sides. In Solomon's Temple, the symbol of power was placed in a smaller room, sealed off to the public, and the main worship space was mostly empty. The animal sacrifices were made outside, and only the blood was brought in as used for the final part of the atonement ceremony.

There is no other written record before 500BCE that details a temple as such. Perhaps such details do exist, but they are not readily available for public access. This makes Solomon's Temple unique. While there have been attempts to copy it since then, none were completed as detailed in the Bible. If they had, they would have discovered what I learned in the past 25 years.

The design of the temple began with King David and ended with King Solomon. The main part of the temple was designed by King David, but David said he didn't do it alone. David said in 1Ch 28:19 "All this," said David, "the LORD made me understand in writing by his hand upon me, even all the works of this pattern." Think about that for a moment. David said that God put his hand upon him. David is the

only person in the Bible, where God guided his hands in the design of anything. There are other examples of the hand of God, helping others for guidance and strength, but David's hands were guided in the design of God's House. What was so important about the design of this temple that it was necessary for God to stretch out His hand and guide David? Consider this; God knew that the temple would be destroyed someday in the future. What would it mean if the temple was something to be repeated or duplicated? What if the temple was a template for all of God's people to use as "houses of worship," first for the Jews and now for us- the gentiles? Let's find out.

Details of Solomon's Temple

Dimensions

Let's start with the dimensions in imperial measurements². The dimensions were given in cubits. To keep sizes simple, the short cubit³ is used, which was 18 inches or 1-1/2 feet.

The Holy of Holies – the room the Ark of the Covenant was kept in for 400 years was a cube. 20 x 20 x 20 cubits or 30 x 30 x 30 feet. These dimensions seem to be inside measurements. The clue to that is in the Holy of Holies. In that room, it says in the Bible that two cherubs were carved out of olive wood. Each cherub was 10 x 10 cubits or 15 x 15 feet. 15 feet high, and the wings were 15 feet wide. Then it says that the wings tips of the two statues were touching each other, and the other side of their wings touched the walls. Therefore, that could only happen if the dimensions were inside measurements. There is no possibility for the wings to have been corner to corner because later on, it says that the Ark of the Covenant was placed in the middle of the room in front of the door that was in the middle of the wall, and the two cherubs were on either side of the Ark.

The Holy Places, which I will refer to as the Sanctuary was 40 x 20 x 30 cubits or 60L x 30W x 45H feet.

If this was a church today, it would seat⁴ about 160 people comfortably. Questions: Is there any significance to the dimensions of God's Temple?

Is it a teaching space that captures everyone's attention?

The sanctuary of the temple was primarily used for the rituals and ceremonies surrounding the sin offering. It never said that the duties of the Levites were to be carried out in silence. The room had to be maintained. Those cleaning the temple may have prayed out loud when alone, or reciting scriptures in unison with others, or even sang songs of worship. It is human nature to turn a repeated task into something enjoyable by communicating in some way with each other or with God. We don't know.

There would have been a constant cycle of teaching younger priest the scriptures, the routines, and steps in carrying out those duties given to the Levites. While the temple at the time of Solomon wasn't a teaching or worship facility as we would think of how a church is used today, the performance of the room for teaching, learning, and communicating is exactly the same.

Teaching is teaching regardless of how many are being taught. It doesn't matter if the classroom has 50 or more students, one on one training, or small group instructions. The same elements of the performance of a room are required. It is about physics and the natural requirement for mouth to ear communication in a large space. Remember that the main room was empty except for some candle holders and a small altar of incense. Other temples at the time would have statues or idols in the middle of such a room. In Solomon's Temple, the room was an open space so that people could focus on God without distractions.

As it turns out, the length and width of the Sanctuary had a 2 to 1 ratio. It is ideal for teaching, preaching, and learning. In such a space, the sightlines are ideal for lip reading for people with various levels of hearing problems and as people age. In a room of that shape, there are fewer distractions, which means better attention spans. It is ideal for the person teaching as they can make more eye contact with the most significant number of listeners or longer eye contact when there are fewer listeners. This is key in helping

people to be focused on the message, not the person. In wider rooms, many people are seeing the back of the minister's head up to 50% of the time, which makes lip reading difficult to impossible. This becomes a distraction to the listener, and they will be less focused on the message and more focused on the person.

In a rectangle room with a 2:1, there is less effort for the person lecturing to speak for long periods, as the room will do some of the work for you. These dimensions also make it easier for a teacher to hear the students when responding to questions. Many acoustical experts also agree that lateral/side reflections help to reinforce speech both in loudness and clarity. Fundamentally, it is the best shape for hearing, learning, and teaching. How do we know this?

We have the American educational system to thank for that. Many college and university educational facilities have lecture halls. Years ago, before there were sound systems, there was research done to see what room shape was the best for learning. The 2 to 1 ratio wasn't specified as such, but they did recommend spaces to be 50L x 25W feet⁵, or 70L x 35W feet, and so on. When you dig a little deeper into that reference, those recommendations failed to mention an important detail. Those room specifications were based on spaces where there was a lot of artwork on the sidewalls, room dividers, or something physical that divided the room like folding doors that made two square rooms for smaller classes. This omission has led too many believing that the 2 to 1 ratio was a bad recommendation.

From working with many churches with a 2 to 1 ratio, whenever there was no acoustical relief on the side walls in the worship space, there were a lot of problems with hearing. The problems included deadspots and hotspots. When some kind of acoustical management system was applied, usually something that diffused sound, nothing would perform better than a rectangle with a 2 to 1 ratio for speech and higher learning. The preferred method of treating such a room is with diffusion. More about that later.

Today, much of this early learning has been forgotten as technology has driven different learning methods. It would be logical to declare that Solomon's Temple was designed to deliver the spoken word in the most effective manner to capture everyone's attention as much as possible without the need for technology. The number of people present in the room did not change the room's performance. This combination puts a person in the best possible situation for learning and participating.



Figure 1 Photo by Joseph De Buglio

Today, technology has been used to complement the learning process. Unfortunately, evidence suggests that in other room shapes where people spend most of their time sitting, listening, and taking notes, the level of learning is declining than when there was no technology other than paper notes and a chalkboard. In the end, it seems that the rectangle shape room used lengthways and is properly diffused, offer the best space for learning, and hearing whether sound systems, visual aids, computers, or other technologies are used today.

Is it the ideal space for good congregational singing?

The two to one ratio is not limited to teaching. It is also applied to music spaces. The best recital halls and concert halls use this ratio around the world. The two best-known music halls in the world are La Scala in Milano Italy, and the Boston Symphony Halls in Boston, MA. Both of these performance halls

have shells with a 2 to 1 length to width ratio. The shell of the Boston Symphony Hall is 156L x 75W x 59H feet.⁶ Those dimensions are similar to many other celebrated concert halls and opera houses.

This then brings us to the height of the room. It seems that any height of 45 feet, or higher is ideally suited for singing. Specifically, 45 feet is ideal for congregational singing. For musical instruments and opera singing, they prefer a higher ceiling to create specific sound effects that are great for musical performances. Still, in a church setting, it interferes with congregational singing.

It would be fair to say that Solomon's Temple was more than just a showplace. It was designed as a multipurpose space intentionally for learning, teaching, music, and congregational singing. The secular community bears this out as referring to spaces designed this way as being the best. There are many churches out there that have these similar dimensions, but many congregations are not happy with what they have. It is most likely that something is missing. You could say that for these churches, they are not complete - no matter how old they are. Think about that. You can have a church that is 200 years old, which has all of the dimensions of Solomon's Temple, and no one likes the space for hearing the Gospel, but the room has good sound effects for the pipe organ or children's choir. Now it is possible to turn all of those churches into masterpieces of Christian worship. How crazy is that?

Building design, construction costs, maintenance, lighting, sanitation, and environmental controls

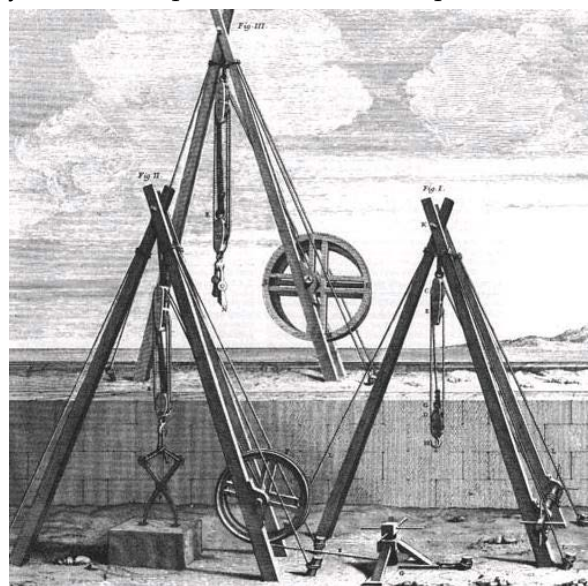
Building design and Construction Materials

The next thing to look at is building materials. The three main elements were stone, wood, and gold. The stonework was the foundation and outer shell of the two main rooms of the temple. The wood was to create two essential functions. The wood was also the best surface to cover with gold. The types of wood were specific as to their functions. The floors were covered in fir, and the walls and ceiling were cedar. Wood on the floor also acted as insulation from the colder stones below. The fir is ideal for someone to walk on. It doesn't dent easily, and it returns to its original shape and size if it gets wet. These wood types are ideally suited to be covered in gold in an arid climate. The walls were in cedar, and cedar has less weight, and it is easier to shape and carve

In 1 Kings 6, it said that the walls and floors were covered in Gold. Why Gold? Was the purpose of the gold to show off, or were there other functions for covering the floors and walls in Gold? If the gold was there to show off or make a political statement, then why was the temple inaccessible to the public? After the temple was completed, the only people allowed in the sanctuary were the priests - the tribe of Levi. Without public access, no one would be able to see the gold. Why cover the walls and floors of the Holy of Holy and the Holy Place if no one was ever going to see it? Was there another reason for the Gold?

Prefab Construction

Solomon's Temple was perhaps the first building to use the modern method of prefabricated buildings in history. According to some sources, the first prefabrication of a building for construction was recorded in 1624. Solomon's Temple prefabrication was much more advanced. In 1 Kings 6, it says that all of the stones used to build Solomon's Temple were quarried, cut, shaped, and completed at the quarry and later brought to the temple location and assembled on site. In modern construction, precast





concrete walls are built at a factory, delivered on-site, and then assembled. Prefab construction is known as being a cheaper, faster, and safer way to build.

When you assemble a prefabricated building, for some methods, you need special tools. Again, in the Bible, it says that no iron tools were used to assemble

the building. However, you would have need wooden poles or long wooden handles to steer and maneuver the finished stones into place. The temple had chambers around the outside of the inner structure on three sides. Each level would have created a platform from which to lift the stones into place. Each lift would have been no more than 12-15 feet at a time. Therefore, you didn't need any special heavy-duty cranes to do 45-foot lifts of the larger stones. Furthermore, as the building became taller, the finished stones became smaller.

Interestingly enough, precut stackable columns were first used by the Greeks in the 8th century BCE. That is about 200 years after Solomon's Temple was built. These columns were cut and stacked using wooden or metal dowels or pegs. Early columns from Egypt were small blocks of stone made up of many pieces stacked and cemented in place. Then they cut and shaped as they were building the columns. If you look at other massive stone buildings throughout history, they brought roughly cut stone on site, placed the stone into position, and carved and chisels the rock to make a perfect fit.



By prefabricating the stones at the quarry, the same skilled stones cutters who cut the blocks also finished the stone before sending it out. That meant you only needed one team of stone cutters rather than having two teams in two different locations. With all of the stone cutting and finishing done at the quarry, parts of the wall could have been pre-assembled to make sure they had a perfect fit before shipping it out. This saved time and cost. Isn't that what modern pre-fabricators do?

The whole concept of how Solomon's Temple was built was years ahead of everyone else and is commonplace today.

The Chambers

The following detail of how Solomon's Temple was built was in building the chamber around the three sides of the temple. The temple walls were built to form three steps on the outside view of the temple walls and flat on the inside. The first level had the ceiling resting on the first step of the outside temple walls. The ceiling of the second level rested on the second step, and it was the same for the third level too. The beams of each ceiling did not connect to the inside walls of the temple. That meant that the first 8 feet of the temple walls were much wider than the next 8 feet and so on. Between the heavy stones and how each of the three levels of the chambers was built, several things took place.

First off, is soundproofing. What is a better way there to keep unwanted sound from entering or leaving the temple? This is another way to keep distractions to a minimum from the outside world. This is another indication that worship is about prayer, listening, learning, and sharing. Spending time with God is something we should not take lightly.

The second reason is the cost. By making the walls wider at the base, there was no need for adding pillars to support a roof so high. These days to have a clear span of 30 feet requires a lot of trusses and, in most cases, a lot of steel to support walls so high. If we look at this simple section view of Solomon's Temple, there would be no need for steel or trusses to make the span. Given that 3500 years ago, they didn't have HVAC systems and other mechanical devices on the roof, 35-foot beams of cedar with whatever was used to make a roof waterproof was more than enough to make a safe span. In today's way of building tall buildings with thin walls and lots of steel, it is very expensive. However, if a church were to build a structure like this today, it would be less expensive⁷ to build and be very compatible with modern building codes in most countries.

The other thing that I have noticed is that these days, we use cranes, lifts, and scaffolding to build high places. If you make a new building like this, you only have to scaffold the outside walls. The roof of each level of the chambers becomes a deck to building each portion of the inside walls. Furthermore, from the roof of the third floor, it is only 9 to 10 feet to the roof of the sanctuary. This makes the whole building easier to construct, with less use of heavy equipment when building this high.

Room Lighting - The Windows and Walls

With the way the temple was designed, there was only a small section of the outside wall where you could place windows. The temple had small windows high up the walls near the roof. Some translations state that walls around the windows were narrow to the outside and wider on the inside. In modern design, we would call that a beveled edge. Due to the way the temple was designed, the center of these windows would have been 40 feet high. One possible and most likely reason for gold on the walls is that gold is very good at reflecting light, and it doesn't tarnish. Back in the days of Solomon, all gold would have been the purest gold possible. Mixing gold with alloys was not a fine art skill to make consistently. Only the best quality gold could be used in a space where there would be little to no access to maintain and clean. Gold would be the best surface material to bring light into the room to reach the temple floor. Dust does not stick to gold very much, and since it does not tarnish, it would not require much cleaning, which means little to no maintenance. Therefore, a partial reason for gold-covered wood was to light up the room and to keep the room clean. With the windows being so high, it would suggest a space where there is as little distraction as possible. Again, this implies a room designed for teaching, learning, and prayer.

In the temple were a number of candlesticks and bases for them. Candles create soot. Soot does not stick very well to gold in a dry room, and if it does, it easily wipes off with a wet cloth. All other surface finishes at the time of Solomon's Temple would not last long and be too expensive to maintain. How do you clean temple walls covered in Gold 45 feet high? Alternatively, what do you cover the walls with so you do not have to climb up 45 feet to clean?

Sanitation - The Floor and Blood Sacrifices

Next are the floors. This may sound strange, but they covered floors and walls with gold for sanitary reasons. In the sanctuary, on a regular schedule, the priest had ceremonies and rituals that included casting blood in sprinkles on the floor, which would also spatter onto the walls. This ritual was started in the Tabernacle before Solomon's Temple was built. In the desert, all you had to do was kick sand over the spilled blood, and the desert would kill any bacteria, germs, mold, and smell that would come from accumulated blood. Those same rituals would have been done in the new temple sanctuary often, and no one was ever allowed in the Holy of Holies except for a priest once a year on the Day of Atonement. One of the excellent properties of gold is that it doesn't stain from the blood. To keep the sanctuary clean from accumulated blood, all you need to use is a wet cloth. This was most likely done after every ceremony where blood was spilled. The blood would have to be cleared to make the House of God ready for another sacrifice. Washing the blood away with a wet cloth didn't wear out the gold either.

If you want to attribute this to any symbolism, consider this. In the New Testament, Jesus spilled His blood as the perfect sacrifice for us, and we are baptized in water to show the world that we have started

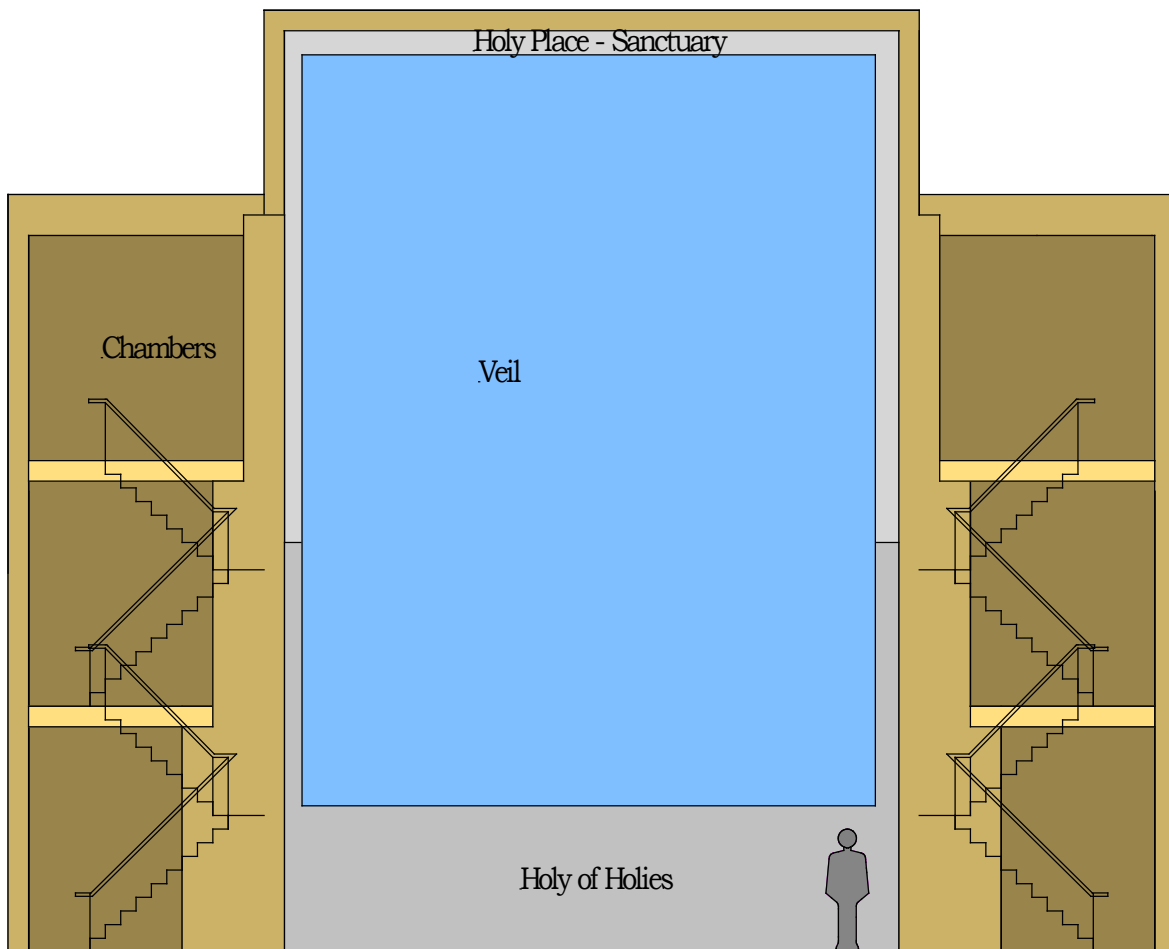
a new life in Christ. A public declaration of washing our sins away. Jesus equals the sin blood sacrifice, and washing the blood away with just water is the baptism, beginning of the new, regenerative life in Christ. Once we become Christians, and when our old sinful nature causes us to sin and make mistakes again – intentionally or not, we can come before Jesus, repent and pray for forgiveness to keep building our treasures in heaven.

Heating and Cooling

When it comes to heating and cooling, the chamber rooms around the sanctuary will perform as an insulator for the sanctuary and Holy of Holies. Between the thick walls and chambers, the temple would remain relatively comfortable all year round for both in the hot and cold seasons. Since the floor of the sanctuary is also isolated from the outside climate, the ground temperature would keep things cool. The wood on the floor would act link insulation to the colder ground temperatures making it comfortable when walking in bare feet or thin sandals. The open windows up high would allow convection cooling or warming, and it was all controlled with the front doors of the temple.

Use of the Chambers

The Bible does hint at what the chambers were used for. In 1 Chronicles 9:26-27, it mentions offices and storage rooms for their treasury. The offices were above the treasury. It also says that these porters lived in the temple to prepare the temple and open the doors for the activities of that day. In verse 33, it says that the singers who were chiefs of the fathers were there night and day. There are a number of other



CAD drawing by Joseph De Buglio

activities that suggest that the chambers were more than just storage. These rooms were living quarters, storage of food, tithes, and the articles and vessels of the rituals. These rooms were used for making the ointment of the spices. Other rooms were used for making and cooking food and shewbread, for preparing it every Sabbath. The temple was a hive of activities, and all of the chambers were used. Some were also rooms for learning, prayer, and teaching. When you add up the square footage of the temple chambers, the area would be comparable to the same size of the associated space most churches build around a typical sanctuary. These days, most churches don't finish their buildings. They often build the sanctuary first with a few offices and a foyer. Later, they build the rest of the building. When you add up all of the space they consider as a complete church building, often, it is less than the proportion as outlined in Solomon's Temple. What I have noticed is that when a church building has the same proportions as Solomon's temple, they usually are healthier than churches that have less space available to support the congregation. How did Solomon know how much supporting space a congregation needed before churches were ever created? Is this another design feature built into the first House of God?

Excellent Acoustics to complete the building

The next thing to look at in the construction of Solomon's Temple is something that seems benign and out of sorts. In 1 Kings 6:29 it says that all of the walls within and without were carvings of cherubs, palms trees, and open flowers. The wood on the walls were planks. In the days of Solomon, wood planks would have been 6 to 8 inches thick. The thick wood on the floor would help to keep the temperature comfortable. The same thickness of wood was used on the walls. The thick wood also makes sense because it is less likely to expand and contract during the short periods of rain and humidity. If the wood was thinner, it would expand too much and cause the gold to constantly flake off and be reapplied. This detail is important as this gives the following ideas a solution to a very important problem the temple would have without this detail. Most of the Bible translations say carvings of palm trees. There are some translations that say engravings of palm trees. This detail is significant.

When building rooms with high ceilings, everyone who has been part of such a building program, knows there comes the point in the construction where the noise⁸ in the room is so bad that hearing each other is almost impossible. It would have been the same in Solomon's Temple, with everything in the temple being a hard surface. If the walls in Solomon's temple were left flat or if the carvings were just an engraving, it would have been impossible for two people to communicate beyond one cubit or about 2 feet at best. There would be no way to carry out rituals, prayer, reciting of the scriptures, and singing praises to God. Sign language wasn't a thing in those days. With that much noise, it would drive everyone crazy, and no one would have wanted or been able to live in a space that sounds that bad. Something was needed to manage sound in such an important place.

When the walls were up and the ceiling completed, it says in 1Ki 6:11, "And the word of the LORD came to Solomon, saying", here God is making a promise to Solomon. How Solomon experienced the "word" is not stated, but, after this, we read about the wood on the floors and walls. Was this part of the original plan from King David, or was this something that God told Solomon to do when the Word came to him? We may never know, but either way, God is the designer of these details. God ordered the carvings of palm trees, cherubs, and open flowers. With planks of wood being 6 inches or greater, the word "carving" allows for the depth of the carved wood to be around 4 to 5 inches.

Palm Trees! Seriously!

When we look at what was carved, it is easy to understand the cherubs which were winged creatures were to protect the followers of God. We understand the open flowers, the springing of new life, new beginnings. However, what are palm trees doing in Solomon's Temple? There is nothing spiritual attributed to the palm tree. Consider this, if you were in Solomon's position, would you pick palm trees to decorate the walls of a temple to God?

The palm tree had no spiritual symbolism whatsoever at the time the temple was built. These carvings went onto all of the walls in the Holy of Holies and in the Holy place, plus it was added to both sides of every door. There is no description of the carvings being in repetitive, staggered, or group patterns or sizes. We don't know if the carvings were done in rows. We do know that the carvings were plural for the doors. This would suggest smaller or variable sizes and lots of them. Since the palm trees are out of place for a Holy temple, perhaps they had a purpose – a purpose that can be relevant today.

Testing a theory

The palm tree has no branches, but it has a frond of palm leaves at the top. These carvings would all have to be vertical as a palm tree. Experiments were done in the late 1990s in Chicago, IL⁹, and Toronto, Ontario, Canada,¹⁰ to see if the palm tree carvings had a purpose. The testing was to see if the shape of the palm tree had any effect on the sound. From earlier experiences with the half-round shape of the palm tree as it would have been carved on the walls, another company that sold a product known as ASC Tube Traps^{TM11} made and sold tube traps diffusers that were half rounds. Their sizes were 7 to 17" half rounds, which gave these researchers a starting point. These Tube TrapsTM worked really well, but for most churches, they were not affordable. However, this size gave a starting point to experiment. About the only thing that was cheap and easy to cut were cardboard tubes used for making concrete posts above and below ground. They came in 8 and 12-inch diameters that were readily available. The cardboard tubes were light and easy to cut. They came in 8 and 12-foot lengths. With over 250 units assembled, several churches allowed their worship spaces to become test rooms to see what would happen.

When these tubes were brought into the first church and randomly propped up against all of the walls, right away, you could hear the acoustics of the worship space changed dramatically. In that first church, the sound was hard to understand when you were more than 15 feet away. Right away, you could hear clearly end to end of the 60-foot long church. This same test was repeated in dozens of churches of different sizes and shapes. At first, the tubes were placed randomly around the room. Later it was discovered that when you organized the tubes in various patterns, you can increase their performance and equalize the room at the same time. What was most startling was how it affected the performance of whatever sound system was in place.

They Work!

In churches that have hotspots and deadspots, these effects are all caused by the room, the sound system, or both. These half-round tubes on the walls eliminated all of the hotspots and deadspot regardless of what caused them. They also improved all of the different sound system designs that were out there, whether they had the right sound system for the room or not. There were many other ways these tubes on the walls helped, and there are far too many to mention here.

The other thing that we discovered is that if a church had carpeted floors and padded seating, the half-round tubes worked perfectly. If the floor was bare and the seating was hard-surfaced, you needed to add the same amount of absorbing panels on the walls that would equal the size of the end wall of a rectangle-shaped¹² church.

This led to the concept that the carvings on the walls of the temple were for sound management and not decorative. Without the carvings of the palm trees, the temple would have been a place where teaching, learning, and rituals could not have taken place.

It must be pointed out that they tried smaller half-round diameters, but as they got smaller, their effectiveness became less. As it turns out, for churches under 300 seating, all you need are 8 inch half rounds, which has a depth of 4 inches. This matches up perfectly with Solomon's wall carvings, where you can carve into a wood plank 4 inches without compromising the strength of the planks.

The next item of importance was the veil or curtain. The veil is mentioned only two times in the Bible in relationship to the temple. It is mentioned in 2 Chronicles 3:14 as being in the temple, and then in three of the Gospels where the veil was ripped in two when Jesus died. Other historical records say that the veil,

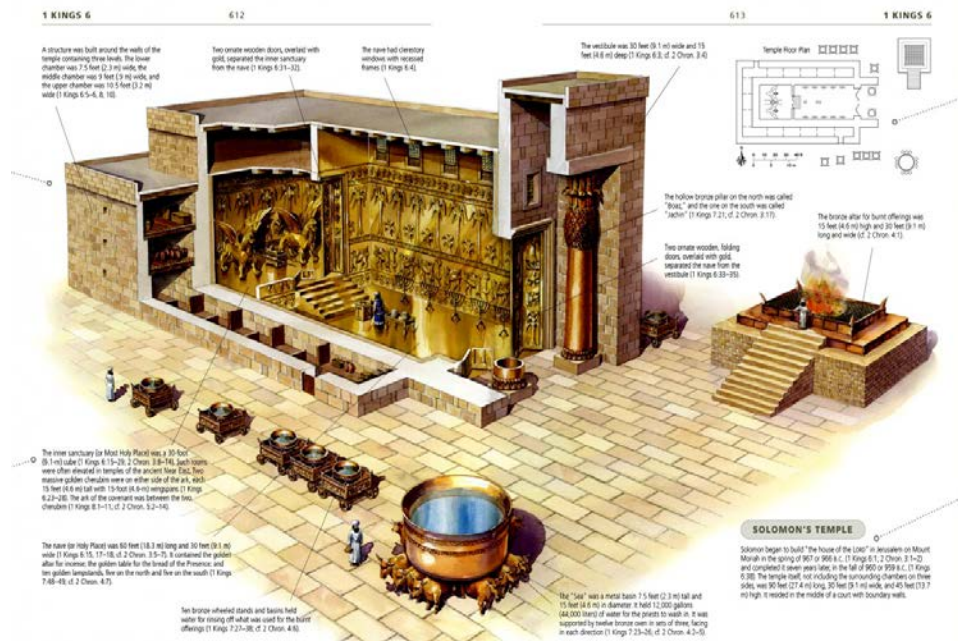
which was over the door of the Holy of holies and went to the ceiling, was between 4 to 5 inches thick. The thickness of the veil as described would have provided the right balance of absorption for the sanctuary to complete the acoustical performance needed to carry out all of the functions that would take place in the sanctuary. The veil was something that God asked to be mounted in front of the Ark of the Covenant when the people were in the desert. A new veil was mounted on the wall in front of the Holy of Holies in the new temple.

Answering the Question

Just about everything in the temple had a purpose. The Temple design was more than just a remembrance of the past. That now brings us to what the temple has to do with God's authority today. When you combine all of the elements of Solomon's Temple, look at the science, would such a space work today as being the perfect place for people to worship? Would any other room design, dimensions, and wall coverings sound any better? Can we design a church that has a different shape that will sound better, perform better, and be as affordable as Solomon's Temple would be? An honest answer would be no. The performance and acoustics of Solomon's Temple are the best for everything a church needs. Solomon's temple will have a balance between speech and music and congregational singing that seems to allude churches outside of this design.

There is good news though. If you have the courage to apply the half-round shapes of the palm trees as God commanded, made of whatever materials you have available, it will allow all of those existing churches to perform to their maximum potential. Without this detail, existing churches of other shapes are working at less than 50% of their potential. When they are fixed, although they will not be as good as a rectangle, speech and music articulation can be the substantially improved, considering that it was a space that was never designed to support Christian worship in the first place.

There are already over 450 churches of all shapes and sizes that have half-round tubes on all of the walls. This system is turning bad sounding churches into great sounding sanctuaries. It doesn't matter what the walls are made of. Take any existing church where the sound is an issue, add the half-round tubes, and hear the amazing transformation. This is not something that happens some of the time; it works 100% of the time. As mentioned before, the tubes can't do everything alone. They have to be combined with absorption, and for most churches, carpeted floor and padded seating is enough.



Can you predict the results? Computer Modeling

For people who have doubts in a God or God's authority, you can take cheap cardboard tubes, lean them against all of the walls of a church and hear the change instantly. However, there is more to how special

this ability is. Since the middle of the 1980s, experts in computers, math, and acoustics have been trying to create a touchstone standard for computer modeling of the acoustical spaces of churches. While the software has gone through many generations of development, to model in 3D of an existing room, it is very good. Still, to model a predictable solution, and one that meets all of the needs of Solomon's Temple in the past, or houses of worship today, the modeling programs have a way to go. Furthermore, while there are mathematical equations that explain how the diffusers work, the equations have not progressed enough to help in the prediction in real-world results. Yes, you can break down the properties of physics being used at the same time which includes, sound scattering, wave disruption, phase cancellation, increasing the length of time for sound to return, which turns air as an absorber, but, when you have this many events happening at the same time, there is no software yet that combines them into a prediction model. Part of the delay is because the variables are almost infinite.

Churches Acting in Faith

This then begs the question. Which takes more faith? Trusting in computer modeling that has a very high failure rate, or trusting the Word of God that has no failures? You see, all of those churches that have already put half-round diffusers on their walls did it in faith. Perhaps the salesman or consultant was good enough to convince them that they were not peddling snake oil or a false promise. For many of them, they went and visited other churches that have these tubes on the walls and experienced it for themselves. Some churches went out and bought a number of full-round tubes, placed them around the room to see what would happen. Days later, they are cutting the tubes into halves and mounted them on the walls. I would like to think that the solution speaks for itself. In the end, it is not people with creative ideas who solve the sound problems; it is God who is fixing churches today.

For churches that have a very tight budget, getting affordable cardboard tubes, cutting them in half and leaning them against the walls of the church is a great start. Try moving them around to see if one pattern works better than another. When you find the right results, paint, decorate, and mount the tubes on the walls and experience the promise God has given us in the Bible. For churches that have the resources to have detailed plans ready-made from proper acoustical evaluation, there are acoustical experts that know how to take advantage of all of the acoustical benefits this system can provide in a DIY plan.

Designing, building, and completing a church, as described in the Bible, is the best example of how you can show God's authority as being relevant in modern churches. Only the Bible has a plan for room shapes, sanitation, soundproofing, lower building costs, and room acoustics.

In conclusion, Solomon's Temple is a blueprint for modern churches to follow if they choose to. The design can be scaled up to any size, and because of the sound system, we can make some modifications with little compromise. It also offers a universal solution for fixing existing churches of other shapes and dimensions. It would also mean that if your church has a similar shape and dimensions as in Solomon's Temple, and the sound isn't so great, now you can complete the church by adding to the walls what God designed in His house for His people to make the message clear. For Christians, the design of a new church should not be an option, rather an act of obedience to God. The optional part of a church should be the foyer, the landscaping, the gym, and the fellowship hall. Let the exterior of a church represent your denomination and beliefs. Make the outer shell of the church uniquely yours. Leave the worship area of the design of a new church to God.

Who designed the Temple?

Here is where Jesus fits into all of this. John 1:1-3 it says that Jesus was there as God was in the past. It also says that all things created were by the Word, Jesus. In Matt 5:17 Jesus had to say he came to fulfill the promises He made from the past. It also means that, technically, Jesus designed the temple. The design of the temple is the perfect room for sharing the Gospel. The temple was never meant to be just a relic of the past. Just as God cannot be contained in a box, the temple was designed to be copied to show the world that God is everywhere. While we have churches all over the world that are called houses of

worship, how many of them can say that their church is the best version of a sanctuary to show God's omnipresence?

The Bible teaches that salvation is a free gift. When we accept that free gift in faith, it will show the fruits of our beliefs by our works, likewise, for churches that have sound problems, this solution is free, and if you act upon it in faith, you will hear God's work in action, not from a person of math, science and hollow promises. What better way is there than to use a house of worship to explain salvation through faith by sharing how the church accepted in faith and obedience that God's 3000-year-old plan would make the church sound amazing? How much more can God do for you? Not only can you test what God has designed in the past, but you can also declare His Authority and experience it right now.

The Third Temple

Since it is reasonable to conclude that Solomon's Temple is a template for modern churches to use today, what does it say for those who believe in the third temple being a symbol to usher in a new era in the yet to be written Biblical calendar? According to the New Testament, there is no Biblical direction to build another temple for animal sacrifices. Rather, in John 2:21, 1 Corinthians 6:19 and 1 Peter 2:1-12, all describe those who are believers and followers of Jesus Christ, their bodies have become temples unto God. The idea of restoring the temple and returning to animal sacrifices is not based on any scriptures. Perhaps this is because some have this notion that restoring the temple will bring God back. God never left, but man has turned their backs on God over and over again. Those believing in faith see God everywhere, whether Christian or Jew. Without faith, you cannot see, and when you cannot see, you cannot see the hope and God's promises.

There is something else that seems to be left out of all this talk of the third temple. Even before King Solomon died, he turned his back on God and was worshiping false gods. God didn't destroy the temple for that. Three Hundred years later, a king of Israel introduced a new altar and an idol into the sanctuary of the temple. God didn't destroy the temple for that either, but it was what contributed to the end. The fourth last King of Israel, Josiah, tried to restore the nation to become followers of God, but the people did not share his commitment and allowed him to die in a battle with a king from Egypt. The next three Kings turned to evil, each being worse than the other. It was almost like it was in the days of Sodom and Gomorrah, where there were none left who followed God. No one left to admit their sins, repent, and follow God. Any rituals practiced then were to appease the conscience, not their guilt. That is when God allowed Babylon to destroy the temple. The temple was for the people, not for God. If the temple were an exclusive place for God and where He dwelt, then God would have protected the temple, including preventing any idols or fake altars to other gods in the first place within its walls. God doesn't care about the building, he cares about us, and he allows us the freedom to choose. When there are none left following Him, he will enable calamity to bring his children back.

The Temple of God, which is referred to as Solomon's Temple, was not meant to be a temple to God or a place to contain God. God intended the temple to be for the people. It is a template to be copied.

How can the Bible be the Inspired Word of God?

For those who dismiss the term "The inspired Words of God." Consider this. Until the Israelites returned to Israel and started to rebuild the second temple, there were no written records before that time. It was mostly aural history. If the temple was just a monument, a singular wonder of the past, then why preserve those details such as the carvings of palm trees on the walls of the temple?

From studying the acoustics of hundreds of churches, when a new church copies the design of an older church and the designers come across something that they didn't understand the purpose of it, that detail was often seen as too expensive and or unimportant. It would be left out of the copy. As in one example, older buildings would have a 45 degree cut in the window frames that extended from the window to the inside edge of the finished walls¹³. This feature was a small help with the acoustics of older churches. As each generation of a particular church design was copied, more and more details were left out until the

room is stripped of any acoustical performance it might have had. It is human nature to take short cuts and to find cheaper ways to build. When the scribes returned to Israel, there was no reason to record such details about the walls of Solomon's temple as there would be no significance for it. The only way such information could have been persevered is by God inspired someone to keep those design details in the scriptures.

If we take it a step further, there is no mention of wall carvings or the wooden planks in the second temple. Why they were not included, we don't know. The historian Josephus makes a brief description of carved wood on the ceiling of Herod's Temple. Also, it seemed that the temple was open to more people than just the Levites as the tribes of Israel were scattered. The temple was not exclusive to just the priests, which would suggest that details of the wall carvings were not included in Herod's version of the temple. Otherwise, how would Josephus have known of what was on the ceiling? I would think that if Josephus saw carvings on the walls in the temple, he would have recorded it, or if someone told him how the temple was finished on the inside, carvings on the walls as it was in Solomon's Temple would have stood out.

The Palm Tree - The most potent shape to manage Church Acoustics

The humble palm tree, a tree that is poor for lumber, it doesn't burn, and once damaged, it cannot repair itself. Some have fruits, and others have nuts. The rest of the tree is useless. Of all the things to be preserved in the historical details of Solomon's Temple, why the palm tree? If the palm tree didn't have anything to contribute for the present, then why was that detail preserved. If you have read this far, then you should see that Solomon's Temple is as much about the present as it was for the past. By following and obeying God's design for His churches, we have a better opportunity to preserve the Word of God aurally as well as in writing to expose the wolves in sheep's clothing. We can be making the Gospel so understandable that it becomes harder for the deceivers to continue. True, there will always be those who are masters of deception leading a congregation of their followers, but there will be fewer churches for them to dwell in where they won't get caught.

There is a heaven and hell battle for people's souls. Many are unaware or blind to it. God has given us His knowledge, wisdom, and tools to give all those who thirst, a new life. I see the template of Solomon's Temple as another tool to give more people the same living water Jesus spoke of. For all of those people who are broken and in need of the truth, hearing God's message is a lifeline when it is not corrupted. John 3:16 is perhaps one of the most quoted Bible verses the unsaved public has been hearing in the last 40 years. For those who have read it as a slogan, they don't have a clue of what it means. People need to hear the rest of the verses that come before and after that verse so they can understand and take that leap of faith that will change their lives forever. I pray every day that the acoustics and sound systems in churches out there don't get in the way of that lifesaving message.

Hotspots and deadspots get in the way of the Gospel. Too much reverberation is distracting, as it means that people are spending more time trying to hear rather than understanding what was said. Watching people coming and going in these wider rooms are distracting, and many wind up taking their eyes off of the minister much longer than in a rectangular-shaped room. For people with hearing issues, seeing the back of the minister's head for half the sermon is not good communication.

Church acoustics has a direct impact of church attendance up to 8% and an indirect impact of up to 25%. What can happen with 8-25% more people attending your church? A clear and fearlessly preached message of the Gospel will do the rest. When it comes to preaching the Gospel, we need to stop compromising the rooms we worship in.

Conclusion

While there is no direct comparison of how Solomon's Temple was used 3500 years ago to how Christians worship today, the ability for the design of Solomon's Temple to be perfect for modern worship today is remarkable.

Faith comes by hearing. The question is, will our faith in God's authority be enough to take people to the next level? To a place where they can come to the saving grace of God through Jesus Christ by hearing His Words without interference from unwanted sound effects? For the churches that have already applied this method of managing sound, they will tell you it has aided in making them a stronger and healthier congregation.

God has given us advanced technology that is relevant today. That knowledge has been with us for over 3000 years. The scriptures have been in a common language for everyone to read for the past 500 years. Do we follow it or continue to discard such important information?

In the Old Testament, we were given commandments, rules, and laws. These teachings were *to keep us safe*, not to break us into submission or to enslave us. God cares more about people following Him in faith and teachings because of love than those who shadowed the laws as a way to earn or buy their way into heaven. God's love for us continues regardless of how often we stumble and fall. Jesus came when the teachings of the Old Covenant was absent from the priesthood. When the Jews were free after returning from Babylon, most of them didn't keep the laws in faith. Eventually, the Israelites became so corrupted that they no longer had any relationship with God. Later, when the Jews were under the captivity of the Romans, the Israelites cried out to false gods. When that didn't work, the cries of the people turned to their true God. Shamefully, they were demanding and begging to be delivered. The priests returned to reading of the scriptures in a desperate hope that God would destroy their Roman masters. Somewhere in all of that, there was a growing number of people who began to live a life of faith with God no matter their circumstances. Perhaps those were the people who God listened to, as it was in the time of Moses. That could have been when it was time for Jesus to come. This is all speculation, but it does suggest that the Old Covenant was so forgotten that the practices of the Priest and Pharisees were polluted and totally meaningless.

Imagine people coming to the temple with their sacrifices of faith to be dishonored and trampled by the religious leader they were taught to trust with their acts of obedience and hope. Even the few religious leaders who did understand faith, they were forced into silence and submission. Their voices were unheard because it was only the sullied priests who held power. The Romans appointed power to the corrupted Pharisees. Under all of that, there was a flame of hope, and perhaps, it was that courage that ushered in a New Covenant.

Today we have a New Covenant. Jesus paid for our sins of the past, present, and future with his life as the perfect sacrifice. We are free from the things of the past. Without the sin sacrifice ritual, we no longer need the pure gold as it was in Solomon's Temple. Jesus makes us pure when we chose to become followers in the eyes of God. Underneath the gold is just wood with all of its blemishes and faults. However, the wood continues to function in what is required of it. Likewise, God accepts us as we are, including our iniquities and failings.

Without the Ark of the Covenant, we can now use the Holy of Holies as our quiet place to pray (Matt 6:6.) God wants us to love him exclusively as He shows His love to us. First in the creation and then in the sacrifice of His son to atone for our sins. Is it when we are in a quiet place when we turn to Him? We become a temple for the Holy Spirit when we become Born Again. In those quiet times, do you seek God or yourself and the things of this world? We don't need an Ark to know or hear God's will. We have his written words in the Bible to continue a life with Him.

Without needing the sanctified priest to bring our offerings to God, we can all now enter God's house washed in the blood of Jesus. When we truly understand God's love and the kind of relationship He

wants to have with us, it becomes easier to follow Him. Those trials and tribulations, no matter how easy or hard they are, knowing that God loves us, makes choosing to love Him at all times peaceful. Perhaps entering a house of God, designed by God, allows us to experience Psalms 100. *"A Psalm of praise. Make a joyful noise unto the LORD, all ye lands. Serve the LORD with gladness: come before his presence with singing. Know ye that the LORD he is God: it is he that hath made us, and not we ourselves; we are his people, and the sheep of his pasture. Enter into his gates with thanksgiving, and into his courts with praise: be thankful unto him, and bless his name. For the LORD is good; his mercy is everlasting; and his truth endureth to all generations."* (KJV)

Once you stripe away the things of the Old Covenant from the temple, what is left is a building that points to Jesus. It is also the best example of how a house of God should be. After 20 centuries, man has not been able to design anything better. Have we been so blinded by the gold, the Ark, and the treasures within that we never looked at what was under the gold? Have we been so caught up in the rituals, the garments, and the placements of physic objects that we have been blinded to the treasure the structure really is? Much of the Bible points to Jesus. Jesus said he came to fulfill. Jesus guided the hand of King David with a purpose. Was that guidance meant to be an example of stretching all the way into the current future? If it wasn't meant for us to use today, why is that design so perfect for modern houses of worship? Is this why all of those details were persevered for the last 3500 years? Should we be using it, or should we be continuing in designing churches that come up short in meeting our worship needs?

¹ 2Ti 3:16-17 All Scripture is inspired by God and profitable for teaching, for reproof, for correction, for training in righteousness; so that the man of God may be adequate, equipped for every good work.

² Being from North America, we still use imperial measurements for most construction projects.

³ The exact length of a cubit is unknown but there is strong support that the Royal Cubit was 20.76 inches as suggest in 2 Chronicles 3:3 and Ezekiel 43:13

⁴ It is general practice to use 12 square feet per person for estimating a worship space seating capacity includes doors, isles, altar/stage areas, stairs and access areas.

⁵ American Report of the Federal Security Agency: Office of Education, Volume 1, 1902 Page 1055

⁶ Collected Papers On Acoustics By Wallace Clement Sabine 1922 page 64

⁷ According to various Architects and Church Builders. Some also call this a variation of a lean-to design.

⁸ Noise is not reverberation. Noise is sound energy that arrives too soon and it is loud enough to interfere with the direct sound. Reverberation are reflections that arrive later and 15dB below the direct sound. High quality reverberation are reflections that arrive 20 to 25dB below the direct sound and the length of the reverberation becomes less important.

⁹ Blake Engel of All Church Sound

¹⁰ Joseph De Buglio of JdB Sound Acoustics.

¹¹ Acoustic Science Corporation ASC, Arthur Noxon, P.E.

¹² For other room shapes without carpet, you would need more absorbing panels than in a rectangle shape church.

¹³ Some refer to this as a beveled edge.

** Unless marked, photographs are from various website on the internet. Could not source the authors of the photos at the time.