Episode 9

Legacy

THE GREAT TABERNACLE

[BEGIN MUSIC]

NATHAN WRIGHT: One of the most remarkable aspects of The Church of Jesus Christ of Latter-day Saints is its unique history. Throughout the world, great stories from faithful Church members have only added to that history. This program shares some of these incredible stories of faith, perseverance, hope, and inspiration. You're listening to Legacy, I'm your host, Nathan Wright.

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NATHAN WRIGHT: It's one of the most recognized buildings in the world. Some visitors around the beginning of the 20th century criticized it as a prodigious tortoise that has lost its way. But famed architect Frank Lloyd Wright dubbed the Salt Lake Tabernacle as one of the architectural masterpieces of the country and perhaps the world.

Joining us in studio today are Kirk Henricksen and Randall Dixon. Kirk is the senior exhibit planner at the Church History Museum, where he's produced exhibits for over 20 years. He's spent over two years in intense study of the Salt Lake Tabernacle in preparation for the exhibit, The Salt Lake Tabernacle: Gathering the Saints Under One Roof. And Randall Dixon is senior archivist at the Church History Library where he has been employed for over 30 years. Areas of expertise for him include early Salt Lake City architecture, specifically the Salt Lake Tabernacle that we're discussing today. Welcome gentleman, very much to the show

RANDY DIXON: It's good to be here.

NATHAN WRIGHT: A lot of people perhaps believe that the Tabernacle was a one grand vision, one perfect idea that Brigham Young came up with and it was just built. I would like to get that clarified. What really happened on the planning?

KIRK HENRICKSEN: Well, let's talk just for a minute about the word tabernacle that is so common today that we think of The Tabernacle and we automatically think of that one building. But, in 19th century terminology tabernacle is used by a lot of people for a variety of different buildings. And the exchange of the word temple and tabernacle in Mormon speak was not always as clear, clearly defined as it is today. That in many ways the Kirtland

Temple was, could be referred to as the Kirtland Tabernacle because it served the purposes that we think of as the tabernacle, as a general gathering place. And for that matter, even the Nauvoo Temple, two of the floors were common, intended to be common gathering spaces for congregational worship, much like the Tabernacle. It was just the upper floors of those temples that were reserved for the sacred covenantal temple ordinances. So, temple/tabernacle was not as defined originally as we think of them today. And, see even today on Temple Square, what we have are two buildings: the Salt Lake Temple and the Salt Lake Tabernacle. Which in many ways function as, I don't want to say brother and sister, but more, I think, President Gordon B. Hinckley referred to them as mother and father, that the Temple is the father structure: where the Lord speaks and His voice is heard. And the Tabernacle is the mother structure that then communicates that word out to the public, the nurturing mother that expresses her love widely to the whole church. Now, I kind of skirted around your question about the antecedents to the Tabernacle maybe Randy could respond to that a little bit.

RANDY DIXON: The building that we see today was preceded by several structures on Temple Square.

NATHAN WRIGHT: And all of them, probably considered tabernacles.

RANDY DIXON: And they were, at least they were large meeting places when the Saints first arrived in Salt Lake they, they even though they divided soon divided up into wards, they continued to meet together as one people. And in 1849 for example, they started, they put a stand, they called it, on the Square. On Sunday they would gather to meet there. Eventually, it was, they turned that into a bowery so that they could shade the congregation during the hot, from the hot summer sun. And, so they built this large, a large building with posts and branches to cover the top. Eventually, they kept improving it. They added walls and windows and doors and so it could be used during the winter also. That building after a few years was replaced by another building called The Old Tabernacle that was designed by Truman Angell and fortunately we still have some of the drawings that were made of that building which opened in 1852. Perhaps Kirk could describe that a little bit, he's done a lot of research on that.

KIRK HENRICKSEN: It is interesting because today we call it the Old Tabernacle

NATHAN WRIGHT: I doubt it was called the Old Tabernacle then

KIRK HENRICKSEN: But when it was new, it was called the new tabernacle in 1852 because we just heard even before the Old Tabernacle, as I prefer to call it the adobe tabernacle, there was a bowery that people referred to as a tabernacle. And that bowery was enclosed and became I guess even before that there was a tabernacle in Kanesville and Winter Quarters they called a tabernacle. So, the term had been used by church members previously.

NATHAN WRIGHT: If we could take one quick side road to the word bowery. Is that based on boughs, limbs, etc. to get that name?

RANDY DIXON: Good point. Bowery literally means covered with boughs from a tree. The word in Spanish is ramada, the same thing, meaning the ramas, or the branches of a tree. The Mormon Battalion members that left Winter Quarters gathered in a bowery for their Winter Quarters Departure Ball. They had built, so they were building boweries even back in Ohio they built a bowery in front of the John Johnson's home where the church gathered on Sundays and Joseph Smith would stand on the front porch of the home and speak to the people that were in the shade of the bowery. In essence, it was an artificial forest. In Nauvoo, they gathered in the grove of trees, so they had a live grove of trees to provide shade for comfort for the people. So the boweries were an artificial Sacred Grove, in some ways you can think of it.

NATHAN WRIGHT: Good, thank you.

KIRK HENRICKSEN: So, the first building that we really do think of as the tabernacle and now refer to as the Old Tabernacle, or the adobe tabernacle, was a remarkable building for its time. It was acclaimed as the largest gathering place west of the Mississippi in 1852. Well, there wasn't a lot of other competition at that time, but it was designed by Truman Angell who had been one of the architects, of the, a worker I should say on the Kirtland Temple and the Nauvoo Temple and was under the direction of Brigham Young. And Brigham Young specifically requested that Truman Angell design a building that would have no interior posts to block the view of the people, to create true sight lines and a place where they could hear, that had better acoustics than the open-air bowery. So, his, the primary problems addressed by this structure were comfort, get people out of the rain, out of the cold in the winter; sight lines, where they could have eye contact with the speaker; and acoustics to hear. And at the same time be as large as they could build. It was never large enough to hold all of the members of the church, but remarkably, the capacity is said to 2,500 people. That was a lot for a building at that time. The dimensions of the building were 126 feet long by 64 feet wide. If you can imagine that as roughly the size of a stake center today with the cultural hall open and all of the people in both the chapel and the cultural hall expansion space. But they did not sit in that arrangement with the pulpit on one end and the back row 125 feet away. It was theater in the round. It was patterned after what Brigham Young was familiar with in England. In Preston, England a building they called The Cockpit, I believe. Is that true Randy? In Preston, England where they actually had cock fights, but the seating was in the round. And, so, in the Old Tabernacle, the pulpit was in the center of the 125 foot wall. And, so, in either direction the furthest a person was from the pulpit was approximately 60 feet. And, they faced the two sides and the long direction all towards the pulpit, so the speaker was standing sort of surrounded, although there was a bench behind them, and a wall behind that.

NATHAN WRIGHT: Kind of like an amphitheater.

KIRK HENRICKSEN: Yes, thank you, that is a good description. And the seats were in tiers. It was dug into the ground to place it below grade partly for convenience in building and insulation in the

winter and cooling in the summer so that they were underground. They had a domed, a partially domed, roof overhead, I should say a single direction arch overhead so as the speaker spoke, the sound was carried back down the ceiling to the opposite side of the speaker's stand. But, that arrangement was not the final arrangement. The Old Tabernacle was remodeled in 1858; the rumor of Johnson's Army coming to Utah led to the closing of the Old Tabernacle. They took the windows out, the glass panes out, they boarded it up, and as we've heard many times, they plowed the ground on Temple Square and filled in the temple foundation that was under construction. But the Old Tabernacle remained on Temple Square. It was in the southwest corner, approximately where the Assembly Hall is located today, but, oriented the other direction. So, in 1858 it was closed down for about a year and a half. After the threat of the U.S. Army passed, they reopened the Old Tabernacle and refurbished it. But within approximately, well less than a year after that, Brigham Young announced that they were going to remodel the Old Tabernacle. And this time it was not just a refurbishing, but a complete remodeling. They tore out all of the seating, they added an addition on the north side of the tabernacle that looks like what we think of today as a band shell. A hemispherical dome, half dome, quarter dome, on the north end of the tabernacle. That has been well-documented with photographs of the exterior of the tabernacle. That is where they put the stand so that the speaker and the choir behind the speaker were in, sort of, an acoustical shell to project their voice. What hasn't been so well-known or understood until recently is that inside of the tabernacle they also remodeled the south end and added a similar quarter-sphere on the south end so that the interior of the ceiling was now rounded on all four sides down to the walls. And they shifted the seating arrangements so it was now from front to back, you know, the full distance so that the back row was over 120 feet away from the pulpit. But it didn't increase the number of seats available. It still only held about the same amount of 2,500 people. At the rededication service for the Old Tabernacle, the Deseret News quotes, says that President Brigham Young made some remarks on the vibration of sound, the advantages and conveniences of the tabernacle now over what we had enjoyed before. Brigham Young was proud of this new renovation. It was in essence a test of an acoustical plan that he had that would allow people to hear better and now at the opposite end of the hall, 120 feet away, people could hear as well or better than they used to could hear when the tabernacle was oriented the other direction and people were only 60 feet away.

NATHAN WRIGHT: So it's sounding more and more like an evolution took place over the years, just experimenting what was working, what wasn't, and eventually we came to what we have.

KIRK HENRICKSEN: When Brigham Young stepped on the Temple Square territory in 1847, and we've heard many times how he placed his cane and said, Athis is where we build the temple of our Lord, Wilford Woodruff records that at a slightly later date, Brigham Young said that he had always seen in vision the temple and the tabernacle located where they are today. And that from the very beginning he had envisioned a sister building to the temple on the spot where it is now located. And so he reserved that space and didn't build buildings on that space until he had the resources, both financially and physically and engineering-

wise, to build a large enough building to gather all of the saints under one roof. So, from the very beginning, the Old Tabernacle was not intended as the permanent gathering place for the saints that Brigham anticipated building a grander structure at some time.

I guess this would be a good point, a good place to bring out also that many of the quintessential Tabernacle talks that we hear about in the Journal of Discourses, for instance, Brigham Young standing up in Conference and saying that my discourse for today will be to bring in the handcart pioneers that are on the plains, and the debates between Orson Pratt and others that we call the tabernacle debates took place in that Old Tabernacle not in the new tabernacle. A good portion of the Journal of Discourses were speeches that were given in the Old Tabernacle, not in the new tabernacle.

RANDY DIXON: It might be good to also mention that Kirk mentioned how the Old Tabernacle couldn't contain more than 2,500 people, and of course there were many more people than that in the city. And so in the summertime they would meet outside, still meet outside, and they built another bowery north of the Old Tabernacle, a large bowery where they could meet outside, where it would be cooler, and get more people gathered together.

NATHAN WRIGHT: And about how many that new bowery would hold?

RANDY DIXON: Well, I think it's probably… I'd be guessing on that, but more could fit outside than would fit inside.

KIRK HENRICKSEN: It's hard to believe, but there are some references that said 8,000 people would gather on Sunday in that grand bowery, which was on the very property that the great tabernacle was eventually built. I think maybe 8,000 people is stretching the point. Certainly 8,000 people couldn't hear the speaker. They may have come for the first 10 minutes, and then filtered (laughter) off as the sermons went on longer through the morning or afternoon. But, Randy, why don't you talk about Sunday on Temple Square. That's really interesting subject of …

RANDY DIXON: What I mentioned that the Saints, even though they were divided into congregations, they, as they had in Nauvoo, they had met together, they would meet together on Sundays at the grove near the Nauvoo Temple. And, so that continued in Salt Lake for a good number of years. They started, it developed that they would have a morning meeting in their local congregational, in their ward, and then the afternoon they would meet at the tabernacle for a general meeting. And that continued until the 1880's, I believe.

When in Nauvoo also, there was a plan there to build, what has been called, the canvas tabernacle. And it was intended to replace, to give a better place to meet, than just out in the grove. So this tabernacle was intended to be right in front of the Nauvoo Temple. And there are, there's a plan that kind of shows the outline, showing that kind of almost attached, probably attached, to the temple and maybe the steps of the temple would be where the, would be more the rostrum or podium. The plan never reached fruition. The

exodus from Nauvoo occurred before that happened, but you can almost imagine that canvas tent being a forerunner of what we see as the tabernacle. It's a giant tent in wood and shingles and stone. And so it's kind of a combination of a progression and perhaps that tent, that Nauvoo Tent was kind of a first plan and then Brigham Young over time with his experiments with the Old Tabernacle, developed more ideas on how he wanted it to be arranged and what would work for the tabernacle that was started in 1863.

KIRK HENRICKSEN: And in some ways, that is where the Saints originated the word tabernacle. They thought of the Nauvoo Tabernacle, this tent, as similar to Moses' tabernacle in the desert. That canvas structure that they packed up and moved with them as they crossed the Sinai and rebuilt it at each new camp where they stopped.

NATHAN WRIGHT: So having that much canvas on hand about the time they left Nauvoo, what did they do with all that?

KIRK HENRICKSEN: Well, it's a bit of a mystery, it's not well-documented. But, the assumption, and I think it's a safe assumption, is that the tabernacle canvas was quickly re-appropriated for wagon covers and tents for those leaving Nauvoo. It's a bit of a stretch, but I like to think of the Saints on the plains setting up their tents on gathering their wagons in a circle on Sunday, recreating the tabernacle in the desert using the canvas that was intended for the tabernacle in Nauvoo. That's sort of a romantic idea, no one ever wrote it down, but it does connect the Saints who had lived in Nauvoo and then came to Salt Lake would have recognized the connection between the location of the temple and the tabernacle on Temple Square; that they were on axis with each other, directly east and west. It was intended to be that way. Brigham Young also stated that right in between the temple and the tabernacle he envisioned a tower, a bell tower. Well, today, we have a flag pole there. And that would mark in essence the center point, the axis mundi is what cultural anthropologists call it. The point where heaven and earth comes together and horizontal and vertical are all connected. The umbilical, the navel of the world, and today on Temple Square, luckily, we see that in the new paving that they've reconstructed they did recreate the compass points, the four corners of the earth, right at that center point between the temple and the tabernacle to mark, in essence, what Brigham Young called, the center of life on earth, where heaven and earth comes together. So, you can't talk about one building without the other. And I think now it's about time to start talking about the Great Tabernacle, or what they then started calling in 1863, the New Tabernacle.

NATHAN WRIGHT: So they have come to this point, they've built and renovated and remodeled the Old Tabernacle. Learned a few things, and Brother Brigham says, it's time to move on. Is that sort of right?

KIRK HENRICKSEN: Within a year, I need to get my exact months straight, but I believe its 1863, the First Presidency announces that we are now going to build a Great Tabernacle that will hold approximately 8-10,000 people. That was just a year and a half after they had

remodeled the Old Tabernacle. So obviously, they were thinking at that time about the new tabernacle. Because when they announced that it's time to build, they already had the plans in mind. They didn't announce it and then say, now we'll take five years to figure out how to do this. They had been contemplating the Great Tabernacle, I think, since the day they arrived in the valley. And then all of the boweries and the previous tabernacles were not experiments, but learning experiences. Brigham Young would, I think, have quoted the Doctrine and Covenants where it says, we will learn line upon line, precept upon precept, and knowledge comes to us when we ask of God, he gives us the answers. So, as a builder, Brigham had been asking for a long time, how do we build a structure large enough to accommodate the saints? I believe that the people who came to Salt Lake City came because they wanted to hear the prophet of God and the apostles speak. And it was only fair, in Brigham Young's mind, that he provide a place where they could hear their leaders speak to them. And, so, it was important to have a single gathering place. Other churches had circuit riders that would go from congregation to congregation; in essence, give the same message over again. Today we have high councilors, and in essence, they sort of do that same thing in a stake. But, when the prophet spoke, people wanted to hear him. They didn't want to get it second hand. So, he wanted a place big enough that, as big as possible we'll say, because it was never big enough for everyone in Salt Lake to gather in under the roof of the tabernacle. He called on his former architect, Truman Angell, to remodel the Old Tabernacle. Truman Angell had designed the Old Tabernacle, but when it came time to build the new tabernacle, there was a recently arrived architect in Salt Lake, William Folsom, who was not new to the church, he had actually worked on the Nauvoo Temple, but had remained in Winter Quarters and had worked on several buildings in the Midwest and had delayed coming to Utah. He brought with him new energy, new information, new architectural knowledge, and was assigned as the church architect for the new tabernacle. Truman Angell had been the architect on the temple, and frankly, he was worn out. He admitted personally that he was having physical problems and he was very happy to have the assistance of William Folsom to now take over the design of the new tabernacle. William Folsom was a progressive architect, he was very aware of the styles of the time. I'm not sure how well traveled he was, but there were several other buildings in England being erected about that time that competed in size with the Great Tabernacle. But, Brigham Young's requirements for the tabernacle, the new tabernacle, were as grand as any building in the world at that time. There are a few drawings of the original plans for the Old Tabernacle, but unfortunately, the bulk of whatever drawing William Folsom did was destroyed, reportedly, in a fire in his studio several years after the fact. His family says that they tried to put out the fire, but it had destroyed the drawings of the tabernacle. But there is one drawing that exists that shows the sandstone piers for the tabernacle and the arrangement of those piers in an oval shape. And that drawing also shows a cross section through the floor that takes advantage of the natural incline of the Temple Square slope. So that there is a low end and a high end of the tabernacle, so the people on the back row are elevated above the stand. That was the natural city creek drainage running from east to west. So, he took advantage of that and so the sandstone towers on the west end needed to be taller than the sandstone towers on the east end. The interesting thing about

that plan is it shows nothing of an organ and a grand choir. It shows a very simple little box-like structure, kind of tucked in to the very west edge of the tabernacle, a stand not much larger than the old stand that they had in the grove in Nauvoo.

NATHAN WRIGHT: So, much like, perhaps, the balcony, some of these things came later.

KIRK HENRICKSEN: Yes. And, so, we don't have drawings, but we do have a Deseret News article that quotes William Folsom and gives a description of the plan of the new tabernacle. This is in 1863, June of 1863, and it says, if I can just read it, dimensions on ground: 150 feet wide, 250 feet long. Well, those are, roughly, the dimensions of the tabernacle today. With semicircular ends, making 100 feet of straight work on sides of building. The roof will be supported on 46 piers, 3 feet by 9 feet and 20 feet high, from which an elliptical arch will be sprung on 44 foot rise, meaning that the arch itself will clear 44 feet above the sandstone. From door, from floor to ceiling, 64 feet, so 44 feet plus 20 feet makes 64 feet of interior clearance. The width in the clear, 132 feet length, 232 feet in clear. This is where it gets interesting. So far that describes the tabernacle as we know it today. I'm skipping over a little bit here for expedience. It says, the sides of the building, outside, will be 45 feet high from floor level to eaves of cornice. Roof quarter pitch with attic in center: 50 feet wide by 150 feet long on which will stand three octagon domes or ventilators. The arches will be formed with lattice work: 9 feet deep in the smallest part with an increase in the center and outer end forming and corresponding with the pitch of the roof. Well, it goes on says the roof will be self-supporting without a pillar. Well, that's the only thing that we recognize by that description: a self-supporting roof without a pillar. The rest of that is a completely different structure than we are familiar with. There's a mention of an arch for the interior, but it doesn't mention a domed roof. It mentions a pitched roof. And it mentions an attic. Not just meaning a crawl space, but an actual room 150 feet long and 50 feet wide with three large octagonal cupolas on top of that for ventilation. William Folsom was designing a building much like the Great Albert Hall in London. Very Victorian in its appearance; walls 45 feet tall on the outside that would have obscured the view from the ground looking up at the roof. There would have been no visual indication of the dome of the roof from the outside of the tabernacle. That would have been exclusively an interior experience. What he was describing was the Old Tabernacle four times as large, you know quadrupled in size, with a pitched roof on the outside and a domed interior.

NATHAN WRIGHT: And so the difference between what he described and what we actually have today is, my basic question, how do you reconcile the inspiration that Brigham Young had with an architect with what he had in mind?

KIRK HENRICKSEN: Well, and I think this is when the story gets really interesting because for me, truth is stranger than fiction, and more relevant. We all grew up hearing the story of Brigham Young sitting at the breakfast table and cutting an egg in half and saying, a ha! This is how I will build the tabernacle. I don't really have a doubt that Brigham Young cut an egg in half for his daughter and used it as a demonstration to show her what the

tabernacle would look like. But, the timing of that is what is in question. His daughter, I believe it's Clarissa, who gives that quote, would not have been old enough at the time of the building of the tabernacle to have experienced that. That is a quote that is coming from her life after they are in the process of building the tabernacle. So, to begin with, Brigham Young bought off on William Folsom's plan. They built the sandstone piers, as William Folsom planned it, William Folsom had to have been asked by Brigham Young in 1861 to build the Salt Lake Theatre, he built it in 9 months. It had a pitched roof with a tripped attic on top of it. And it fits the description of the tabernacle equally well as the Old Tabernacle that William Folsom was designing a building now that was a hybrid between the Salt Lake Theatre and the Old Tabernacle. William Folsom, also at that time, was asked to build the Salt Lake City Hall which had an octagonal cupola on top for ventilation. All of these buildings came together in William Folsom's plan for the tabernacle. But after raising the sandstone piers, there was a period of, over a year, when construction stopped. Now, many people have said, well, that is because they needed the foundation settle. Let all of that heavy sandstone sink in the ground so that it didn't move. Well, that's true, that's a good building process or procedure. What I think was really happening was Brigham Young was having second thoughts. And it was during that time that he consulted with another master builder in Salt Lake, Henry Grow. In 1860, Henry Grow had been asked by Brigham Young to build a bridge over the Jordan River. And Henry Grow had, a patent, as he called it, rights to a patent for a lattice truss bridge that he had built and been involved with building for railroads in Pennsylvania. He built a bridge in Brigham Young's backyard, literally, right behind the Beehive House in between Brigham Young's white house and his Beehive House, and they built the bridge in pieces from sticks of wood and then took it apart and moved it down to the Jordan River and reassembled it. Brigham Young was the general contractor, Henry Grow was the builder, the bridge builder. Brigham Young was very familiar with that bridge, so he went to Henry Grow, I believe, in '64 after the sandstone piers had been erected, and said I'm not so sure about William Folsom's plan. If we simply quadruple the size of the Old Tabernacle, I'm afraid the roof may collapse. There will be too much snow on it, the wind load, I don't know how structurally astute he was, but Elwin Robinson, a structural engineer today, has evaluated William Folsom's plan and said if it would have been built that way, it probably would have been a disaster. Maybe not immediately, but eventually. So, he went to Henry Grow and said, do you think you could adapt your bridge plan and make instead of a straight span, and arched span? And Henry Grow said, "Let me give it a try. I will build a model." A fairly large sized model. And he again built it probably in Brigham Young's backyard on the Church Office Building block today. And he altered his bridge plan to form an elliptical arch. And they tested it and said, this will work. And so Henry Grow was then assigned as superintendent of construction and William Folsom began to take a receding role in the planning of the tabernacle. The arch was never an objection to William Folsom. But I do believe that William Folsom was a little bit disturbed at the idea of leaving the arch exposed on the outside. That was just not appropriate architecture at the time. You began are interview today by quoting Frank Lloyd Wright, and talking about the Tabernacle as one of the greatest architectural landmarks of the 20th century. Well, it's a

19th century building. It didn't fit in to 19th century architecture. It was very progressive for the time to expose the domed roof on the exterior. Form follows function was a 20th century, a mid-20th century, architectural maxim that wasn't subscribed to in the 19th century. William Folsom wanted, I believe, the tabernacle to have decorative elements. To have details, ornamentation on the outside, but the practical builder, Brigham Young, opted for a practical shaped building. The outside of an egg, as well as the inside of an egg. And that's how they built it. And that's what has been recognized throughout the world today as a unique structure and in many ways it remains a unique structure in the world. It is, as far as I have been able to document, the largest, single-clear-span, wood timbered structure in the world. At that time there were some railroad stations in England that used iron structure that are larger than the tabernacle. There is a racetrack in St Petersburg, or in Moscow, I'm not sure, but in Russia that is larger than the tabernacle built about the same time. But it also has different engineering and has different structural steel members in it. The tabernacle was built, as we like to say, entirely out of wood. There are millions of nails in the tabernacle. There are metal parts. But, it relies on the structural integrity of wood against wood to span a space as big as a football field. Which was an achievement that no one had done in the world up to that point.

RANDY DIXON: Maybe it would be good to hear that there were no nails in the tabernacle and that it was basically built of wood with rawhide…

NATHAN WRIGHT: With pegs, etc.?

RANDY DIXON: …strips and that kind of thing. And it was true that from the beginning, they used bolts and nails and the rawhide was used to strengthen the beams where there may be some weaknesses and cracks and they would wrap rawhide around those. But it was more complex than some stories have let us to believe. And in the recent renovation of the tabernacle, it was very clear as they examined the building and did repairs and added strength to the beams that they found the metal, some of the metal that they used was scrap metal from, that acquired from like horseshoes or you know that were used in, obviously reused metal. But even though the stories that we hear are not always exactly true, there's often an element, a seed, of truth.

KIRK HENRICKSEN: Stories get better with age, and everyone improves upon them. The wooden structure for the bridge is a lattice work that uses several layers of overlapping of wood timbers. And so those, to make an extremely long timber, you need to butt-lap and overlap two pieces of wood. In essence, its three pieces of wood. Two coming together making a butt-joint and overlapping that with the third piece and then alternating the lapping joints at those places where the butt ends of the wood come together, where the timbers come together, they included metal bolts to keep those members from separating. And they had metal bolts from the very beginning at the places where the lattice work comes together on diagonal. If you can imagine this on the radio, the angular joints, all of those joints, are connected with wooden pegs and the rational for that is often, well they didn't have very much metal. Elwin Robinson, the engineer that worked with Randy

on the book about the tabernacle that is being published right now, analyzed the wood vs. metal question and concluded that in this case, wood against wood is actually stronger than metal against wood. That if they would have used metal bolts in all of those connecting points, every time the wood flexes a little bit, the metal would have cut into the wood. A metal bolt running through that hole would have made that hole a little bit bigger every time winter and summer conditions changed. Every time the wind came along and fairly soon those holes would not be tight and as the bolt gets looser in the hole, it puts more stress until they could have actually torn their way through the wood and split the wood apart. But a wood peg in a wooden hole gives with the temperature changes and it actually tightens with time because the wood that they used for the main timbers of the tabernacle structure was fairly new. They were cutting it in the forests above Salt Lake and giving it about a year to cure, but that's not really long enough to completely cure. So, it's continuing to shrink some. The wood that they used for the pegs, they very carefully harvested off of old growth on the Oquirrh Mountains on the west side of Salt Lake. They would cut the branches off of the pine trees that have very tight rings and have grown with very little water, so the growth ring that is on those branches are very tight. In essence, it was the Utah alternate for oak. So the pegs were made out of a harder, denser type of wood than the timbers. So then as the timbers continued to shrink ever so slightly, they would tighten up on those wooden pegs and cinch itself together over time. Those timbers have stayed together now for over a-hundred-and, I have to do my math here (laughter), it's not 150 years yet, but over 130 years. And they still hold very tight. The pegs themselves were driven into the holes on site, up in place. They actually drilled the holes horizontally after they had hoisted the timbers into place and then pounded the pegs through and each peg had a slit on the end and a small wedge was then fit into that slit of the peg and driven simultaneously from both sides, two men working together, to tighten up that peg and expand the outer edge. One thing that is noted in the structure today that every one of those pegs is positioned so that it is perpendicular to the grain of the timber. If it was parallel to the grain of the timber, as it expanded, it would tend to split the timber along the natural grain. But they're turned just right so they don't force the grain to split as they are expanding in place.

NATHAN WRIGHT: It's amazing.

KIRK HENRICKSEN: The trusses themselves in the recent renovation were used as built. They did no structural improvements to those wooden trusses. In the renovation what they did was tie the wooden trusses, the wooden arch trusses, to the sandstone piers more securely than they originally were. They were afraid that in an earthquake, they were not afraid that in an earthquake, the dome of the tabernacle would collapse. But what they were afraid is that it may shift an inch or two on the sandstone piers and slide, and it would need to slide off of the truss completely, but if it just slid a couple of inches, the plaster would crack and things would fall down and we'd have a panic situation and so they did not need to structurally reinforce the roof structure so much as tie it to the piers and then reinforce the piers so that the sandstone would not crumble in an earthquake.

NATHAN WRIGHT: I presume that both of you men, with your involvement with your research and probably the recent remodeling, that you've spent some time in the tabernacle. Probably up in the roof and down underneath. Can you describe to me your feelings as you traverse the ins and outs of the Great Tabernacle?

RANDY DIXON: I had the privilege a couple of times over the years to go up into the trusses up above the ceiling of the tabernacle, and it's very interesting and inspiring to be up in there. In fact, it used to be that there was a stairway, an outside stairway, where people could come and visit, you know, come up into the roof and to the top and view the city from the top of the roof. And there still, you can still see where those stairs used to be. And there are accounts of visitors who would visit the roof, of course we have a number of, over the years, quite a number of photographs from early years of life that were taken from the top of the tabernacle roof, so that would be how they gained entrance into that area. It's interesting to see the work that Kirk described, the pegs and the bolts and the timbers and the stairs that you can walk up over the curvature of the ceiling, you can see the plaster, you can see the vent holes in the plaster ceiling, and then as you get to the top, you can look down through the skylights, the two skylights, that exist in the ceiling. It's pretty amazing to do that. And you can, I have not been up there since the renovation, but I suspect that now you just see the same thing, but with a few modern additions.

KIRK HENRICKSEN: It's very interesting that Brigham Young wanted people to have the experience of climbing through the tabernacle roof. My understanding is that as a missionary in England, as a member of the Quorum of the Twelve, Brigham Young spent more than a day inspecting St. Paul's Cathedral in London and one of the things he did was climb the stairs and ladders that took him into the recesses of the dome of St. Paul's. He wanted people to have a similar experience when they visited Salt Lake. And he was, I don't want to say proud, he was justifiably interested in engineering and he wanted people to see what held this roof together over their heads. The surprising thing for many people is the roof structure is 9 feet deep. You can actually walk inside of the roof with plenty of room to spare. You don't have to climb on your hands and knees. It is a house in and of itself up inside the structure. The alignment of the criss-cross truss work is so precise that in the renovation today, they could run inch-and-a-half even three-inch rigid conduit perpendicular through the trusses for the new electrical wiring and hit every hole the full length of the tabernacle without having to drill new holes to run that conduit through it. It's an indication of how careful they were in building the trusses. Some of the photographs of building the tabernacle show a covered area on the east side outside of the tabernacle that is obviously a workspace. What we have all but concluded, we can never be absolutely conclusive, but I would stake my reputation on this judgment that underneath that covered workspace there was a template on the ground of the roof truss structure. And so every truss was built based on that template and they built it first on the ground, exactly following the pattern that they followed for every truss after that, so that they were sure they would all be exactly the same size and all match when they hoisted them up. Because they had to hoist each timber, which is approximately 2 inches thick by

12 inches wide and 16 to 20 feet long, it's a heavy timber, they hoisted each one up individually, held them in place, and then drilled the holes and assembled it. One of the stories of the tabernacle is that those curved trusses were bent in the Salt Lake hot springs. In examining the actual artifact, it's clear that those truss pieces are not bent. They were cut out of a plank that was possibly 24 inches wide to begin with and then cut on a curve to make it 12 inches wide on a radius. And you can see the saw marks and the cut marks and the grain of the wood runs straight. The bending in the hot springs possibly applies to smaller pieces of wood used in possibly the curved window sashes or the banisters or other parts of the tabernacle. But they did not bend the wood of the tabernacle in steam. It would not have held the shape even if they could have done it. It would have changed over time.

NATHAN WRIGHT: To finish up, what spiritual lesson can we learn from the Great Tabernacle and its predecessors?

KIRK HENRICKSEN: I guess I like to say that inspiration comes to those who ask for it. Or another way to say it is chance favors the prepared mind. That Brigham Young, yes did receive inspiration on how to build the tabernacle, but it came to him line upon line, precept upon precept as he studied it out in his own mind the answers came to him as he needed the answers. And for me, that's helpful, because that's how I solve problems in my own life. I wish that the Lord would tell me the answer to everything all at once and then know with confidence that all I need to do is follow that plan that he gave me that one night in a dream. But if it didn't work that way for Brigham Young, I don't see the Lord making it work that way for me. And it requires patience and diligence and persistence in paying attention to the directions that are given. It's sort of like walking in the dark by candlelight, you take each step and the next step is into the dark and you need to have the faith to proceed. The other message that I get from the tabernacle is I believe that the Lord wanted the tabernacle to be built. He wanted a place where the Saints could gather together and hold their conferences and hear the word of the Lord as it was given by the prophet. After dedicating their lives to cross the plain, giving up everything in their homelands to come to this remote, as some people called it desert wasteland; he wanted the people to be rewarded for their efforts. And their reward was to be able to go to the tabernacle and hear prophets and apostles speak and [BACKGROUND MUSIC STARTS] be gathered together with the Saints and feel the community of the Saints in their conferences. And their conferences were every Sunday, not just April and October.

NATHAN WRIGHT: Thank you very much. We've been visiting today with Kirk Hendrickson and Randall Dixon, both of the Church History Department. Thank you very much for being here today.

KIRK HENRICKSEN: You're welcome. It's a pleasure.

[END MUSIC]