THE CORNER BOARDS OF THE TABERNACLE

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After the Children of Israel left Egypt and received the Torah at Mount Sinai, they were commanded by God to build Him a portable temple, the Tabernacle [*mishkan*]. It consisted of a Tent of Appointment [*ohel mo'ed*], several furnishings (Ark, Altars, Menorah, etc.) and a courtyard [*ḥatzer*]. The Tent of Appointment of the Tabernacle was essentially a set of several special coverings which were spread upon a gold plated wooden framework.

Up to this day, the exact design of some elements of this framework remains a subject of debate among religious and secular Bible scholars, Jewish and non-Jewish alike. One such element, the corner boards, is especially problematic owing to a very obscure description provided in the original text, and because of its key importance to the entire structure from an architectural point of view.

Since it would be impossible to discuss every proposed solution to the problem within the scope of this article, I will concentrate only on the widely accepted opinion of Rabbi Neḥemyah in the Talmud (TB *Shabbat* 98) while comparing it to my own. I will also omit all irrelevant details of the description so as to make the discussion easier for an unprepared reader to understand.

According to Exodus chapter 26, the Tent of Appointment consisted of a wooden framework and several coverings. One of these coverings (*yeri'ot*), the only one relevant to our problem, was made of goats' hair and measured 30 cubits wide by 44 cubits long.[1]

The wooden framework of the Tent of Appointment, as seen from above, was essentially a Π shaped structure with its open side facing east. It was constructed by putting together identical wooden boards [*kerashim*], each of which was 10 cubits high, 1.5 cubits wide and of an unspecified thickness.[2] Each board stood upon two silver sockets [*adanim*] of unknown shape and dimensions, but of the exact same weight.[3]

On the south side of the framework there were 20 boards, making the southern wall of the framework 20 x 1.5 cubits = 30 cubits long, and the

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number of its silver sockets 20 x 2 = 40 pieces.[4] On the north side of the framework there were also 20 boards, making the northern wall of the framework 20 x 1.5 cubits = 30 cubits long, and the number of silver sockets 20 x 2 = 40 pieces.[5] On the west side of the framework there were six boards,[6] totaling 6 x 1.5 cubits = 9 cubits long (the width of the Tabernacle was thus 9 cubits, leaving one cubit or two half-cubits on each side unaccounted for), and two additional boards, the corner boards, of which we read the following: *And two boards shalt thou make for the corners of the Tabernacle in the hinder part. And they shall be double beneath, and in like manner they shall be complete unto the top thereof unto the first ring; thus shall it be for them both; they shall be for the two corners* (Ex. 26:23-24). The description of the western part of the framework concludes with the following statement: *Thus there shall be eight boards, and their sockets of silver, sixteen sockets: two sockets under one board, and two sockets under another board* (Ex. 26:25).

According to Exodus 26:13, the 30-cubit wide goats' hair covering would have to fully cover the resulting framework along its width. This included the 10 cubits of height, the thickness of the northern and southern walls, and the entire length of the western wall. This, in turn, would leave us with at least 30 – 10 – 10 – 9 = 1 cubit of empty space to fit both of the corner boards, or 1/2 = 0.5 cubit for each.

In brief, we end up with the goats' hair covering, 30 cubits wide by 44 cubits long, and with a Π shaped wooden framework, which was 10 cubits high, 30 cubits long and at least 9 cubits wide, leaving at least 0.5 cubits of space on each side of its western wall to fit the corner boards.

So what were the shape and the dimensions of these corner boards? According to TB *Shabbat* 98b, since only a half-cubit of space was left for the corner boards on each side of the western wall, and because Exodus 26:23 and 25 seem to imply that only two boards were dedicated for the corners of the framework,   these two corner boards must have been just like the rest of the boards (10 x 1.5cubits), and 1 cubit thick.

The Talmud calculates the thickness of the boards by subtracting the half-cubit needed to be filled by the corner board from its 1.5 cubit length. This makes the inner width of the framework 9 + 0.5 + 0.5 = 10 cubits and its outer width 9 + 1.5 + 1.5 = 12 cubits, with all 20 + 20 + 8 = 48 boards being

identical in shape and one cubit thick.

However, this solution has two major flaws: First of all, a wooden board 10 cubits high, 1.5 cubits long, and one cubit thick would weigh about ~683 kg.[7] That would put the total weight of wood required for all 48 boards at ~34 metric tons. Such a load would be far more than eight bulls could possibly haul, a task mentioned in Numbers 7:8 – *four carts and eight oxen.*[8]

Secondly, it is not clear why the value of one cubit was chosen for the thickness of the boards if, in proper mathematical terms, it could vary from 0.5 to one cubit under the conditions specified by the Talmud.[9] This is pointed out by Ibn Ezra in his commentary to Exodus 26:18. Note that the original text does not specify an inside width of the framework.

Some may argue that the Talmud uses the dimensions and description of the goats' hair covering (Ex. 26:12-13) to calculate the framework's inner width, and thus the thickness of the boards. However, this assumption is definitely incorrect, because the Talmud itself states[10] that the "curtain" of goats' hair did not cover the entire height of the northern and southern walls of the framework.

Instead, the Talmud simply assumes that the goats' hair *yeri'ah* would cover only nine out of 10 cubits of these walls, while the remaining uncovered cubit would have been hidden by the silver sockets of the boards, which are wrongly taken to be one cubit high so as to make all the measurements fit.

As an example, it is possible to make the thickness of every board 0.9 cubits without violating any conditions specified by the Talmud.[11] This will only affect the inside width of the framework, now 10.2 instead of 10 cubits, still allowing the goats' hair *yeri'ah* to cover only nine out of 10 cubits of the framework's sides and preserving one cubit for the sockets. Similarly, all other solutions that try to explain how the framework of the Tabernacle was put together suffer from one (or both) of these flaws.

I would therefore like to present my own solution, one that is not flawed by any of the aforementioned shortcomings. First, let us return to the length of the main portion of the framework's western side. According to Exodus 26:22, this covered only nine out of 10 cubits of its internal width, leaving us with at least 0.5 cubits of space on each side that was needed to reach its southern and northern walls. Now we know from Exodus 26:23 that two boards were designated for the corners of the framework. I propose that we

understand this verse to imply that two boards were required for EACH corner, rather than two boards altogether for both.

In support of this interpretation we can use the description provided in Exodus 26:24 that requires a "twinning" (*to'amim*) of these two boards to make a corner board for each of the corners. But since this verse also tells us that these boards were to be twinned "to one ring", I suggest that the correct interpretation must imply that we need to "twin" these boards together so that they form a single corner board of a tubular ("ring"-like) shape.

To do this, each corner of the framework would have to be composed of two regular boards that were bent into a semi-cylindrical shape and then combined ("twinned") to form a singular hollow column with a circular cross-section ("ring").

If you carefully consider such an arrangement, you will find that the internal circumference of the resulting tubular corner board will be twice the length of a regular board, or $1.5 + 1.5 = 3$ cubits, and its inner radius will be calculated by the standard circumference formula: $C = pi \times 2 \times r$ and equal to $r = 3/(2 \times pi) = 1.5 / pi = \sim 0.477$ cubits.

However, we must somehow find the outer radius of the boards in order for this solution to work. Luckily, we can easily do so by recalling how much space we needed to fill between the main portion of the western wall and the northern and southern walls of the framework. It was 0.5 cubits, and now it has become the outer radius for our tubular corner board.

Now that we have both internal and external radiuses, we can easily discover the thickness of the corner board. It would be equal to the difference between the radiuses of the corner board, or $[0.5] – [1.5/pi] = \sim 0.0225$ cubits (about 1.01cm based on a 45cm cubit; or about a fingerbreadth).
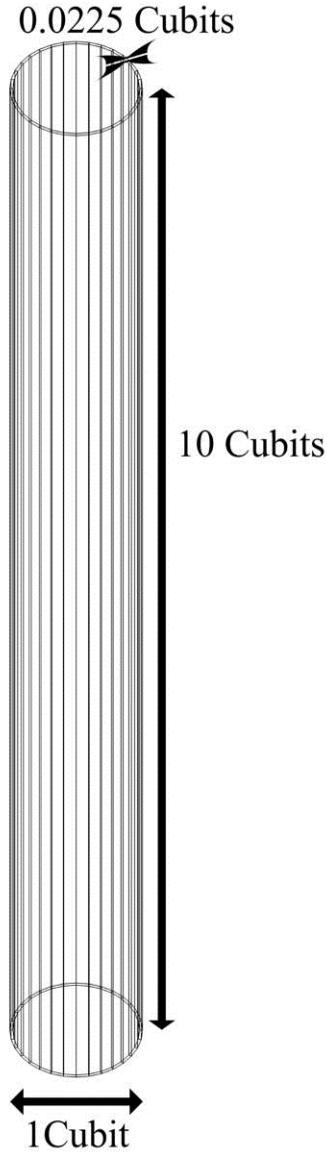
Illustration 1
"Twinned" Corner Board of the Tabernacle
Because our tubular corner board was essentially made out of two boards

that were identical to the rest of the boards, we can now rightfully say that we have found the thickness of all the boards of the framework. Each and every board of the framework was thus 10 cubits high, 1.5 cubits long and [0.5 - (1.5/pi)] = ~0.0225 cubits thick.

To summarize, the framework of the Tabernacle consisted of 48 boards. The northern and southern walls had 20 boards each, and the western wall had eight boards. Both corner boards were tubular-shaped hollow columns made out of four regular boards, one cubit in diameter. Silver sockets for the corner boards would be of a round shape.[12] The thickness of all boards of the framework was about 1cm.
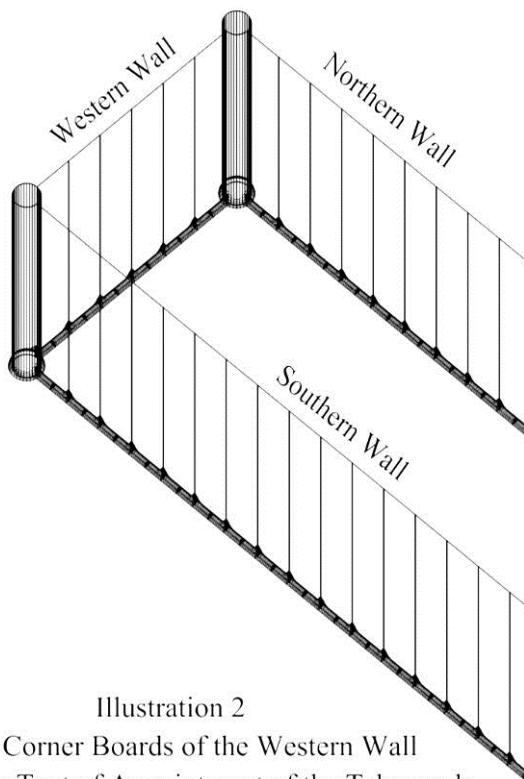

Illustration 2
Two Corner Boards of the Western Wall
of the Tent of Appointment of the Tabernacle

The

advantages of my approach can be seen right away:

1. The thickness of the boards is now clearly defined by one specific value of ~1cm, as opposed to an interval of values (i.e., 0.5 < = > 1 cubit) as in most traditional opinions.

2. The weight of each board would be approximately 14kg,[13] as opposed to 683kg in most traditional opinions. This would make it easy to transport all parts of the framework using the eight bulls provided.

3. Tubular-shaped corner boards would provide very good structural stability, and a certain degree of aesthetic and symbolic beauty, to the framework of the Tabernacle. The technology[14] and skills[15] required to make such round-shaped boards would have been easily available to wandering Israelites, owing to their   simplicity[16] and also because of the Israelites' experience as Egyptian slaves and laborers.[17]

4. Knowing the correct shape of the Tabernacle's corner boards would help to identify the correct shape of the corner elements mentioned in other books of the Tanakh. For example, it may very well mean that in the future Temple of Jerusalem the four corners [*miktzo'ot*] of the outer court mentioned in Ezekiel 46:22 will be of a round shape, as opposed to the square shape usually envisaged in reconstructions based on this prophecy.

5. My solution may also help to determine the source of a relatively strange approach to measuring round objects in Tanakh, as in the description of the Molten Sea of Solomon's Temple in I Kings 7:23-26.

From all the arguments presented here, it is obvious that a proper scientific and architectural approach must be followed when attempting to solve this problem. Even though I am fairly certain that the corner boards of the Tabernacle were of a pillar-like shape, one cubit in diameter and ~1cm thick, a much more thorough collaborative investigation of its design is long overdue. As I see it, without a proper understanding of these two corner pillars that united and strengthened all parts of the framework, it is impossible to truly unravel the hidden mysteries and divine beauty of the Tabernacle.

NOTES

1. Exodus 26:7-11.

2. Exodus 26:16.

3. Exodus 38:27.

4. Exodus 26:18-19.

5. Exodus 26:20-21.

6. Exodus 26:22

7. This calculation does not include the weight of gold overlay or the rings of the boards. It is based on a 45cm cubit, and a very conservative estimate of the density of *shittim* wood at 500 kg/m^3.

8. Tim Harrigan, Richard Roosenberg, Dulcy Perkins, John Sarge, *Estimating Ox-Drawn Implement Draft. Technical Guide* (Kalamazoo MI: Tillers International, 2009).

9. TB *Shabbat* 98b.

10. Ibid.

11. Abraham Ibn Ezra H. Norman Strickman, Arthur M. Silver, *Commentary on the Pentateuch, Volume 2 of Ibn Ezra's Commentary on the Pentateuch* (New York, NY: Menorah Publishing Co., 1988) p. 574.

12. According to Exodus 38:27, silver sockets for boards and pillars of the Tent of Appointment had the same weight – 1 talent of silver. From this we can deduce that the shape and dimensions of the silver sockets were different and defined only by the relevant parts of the framework.

13. Same as the values used in note 7.

14. Richard S. Barnett, *All Kinds of Scented Wood: Wood & Woodworking in the Bible* (Fairfax, VA: Xulon Press, 2002) p. 30.

15. Frederick M. Hocker, *The Philosophy of Shipbuilding: Conceptual Approaches to the Study of Wooden Ships* (College Station, TX: Texas A&M University Press, 2004) p. 14.

16. In order to bend wood one can use a variety of simple techniques. For example, steam bending and planking of wood requires only basic tools and steam. This technology was well known and widely utilized in ancient Egypt to build ships, furniture etc. By the time of the Exodus, Israelites were almost certainly familiar with it as well.

17. According to Exodus 5:14-19, not all of the Israelites were engaged in menial slave labor. Some were appointed to be foremen under the Egyptian taskmasters. Accordingly, there would have been Israelites who had at least some kind of formal education and the skills needed to perform supervisory tasks on various building projects.