

## **STUDY OF THE THERMAL BATH WITHIN HISHAM'S PALACE BY UTILIZING A RECONSTRUCTED MODEL AND A SIMULATION OF THE INTERNAL SPACE**

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**Keywords:** Hisham's Palace, Khirbat al Mafjar (Qasr Hisham), Reconstructed Model, Simulation, Islamic Architecture, Mosaic Tile Floor

### **Introduction**

The ruins of Hisham's Palace are located on the northern bank of Wadi Nueima, 2 km north of Jericho in the Jordan Valley. The palace was believed to have been constructed in the 8<sup>th</sup> century as the winter resort of al-Walid II, successor to Caliph Hisham bin Abd al-Malik. The complex consists of the palace, a thermal bath (including the audience hall), a mosque, and a fountain pavilion[6]. Apart from the thermal bath, all the buildings (including the superstructure) were destroyed in an earthquake in 747 A.D[7] While the floor of the thermal bath (with an area of approximately 850 m<sup>2</sup>) is lined with elaborate mosaic tiles (originals from the era), being super structure collapsed poses a threat to the tiles because of lack of adequate protection. Thus, a simulation of the original space was used to produce a reconstructed model, which in turn would be used to design a shed capable of protecting the entire mosaic tile floor.

### **Method**

- 1) The literature reviews (prior research) of the thermal bath within Hisham's Palace was conducted.
- 2) The integrity of existing plan drawings[5] were checked and they were modified as required.
- 3) It was attempted to recreate the model based on the modified plans. Reconsidered areas where construction was not possible due to a contradiction in the drawings were reworked on the plan section. A 1:50 scale model based on the final plan was reconstructed.
- 4) The model was positioned in its actual orientation under the daylight. The interior of model was cross-checked according to the original by using photos and videos[8] of the model.

### **Corrected Points of the Drawings**

- ① The plan drawings were modified to ensure that the base line and center line of the walls are parallel or perpendicular to each other.
- ② Since the dimensions of the existing plans[5] were not defined, they were modified according to the amended base lines and center lines.
- ③ The irregular heights of the pillars were aligned and positioned along the base lines.
- ④ Since the previous studies did not include any elevation drawings, the size, height, and position of the openings were set by using the existing cross-sectional view (and

development view) as a reference[5]. Additionally, as the shapes of the openings in the existing drawings[5] were not applicable for the building structure, the openings were altered to a more feasible shape.

- ⑤ The height of the niches were estimated and set using photos[4] of the current state of the ruins.

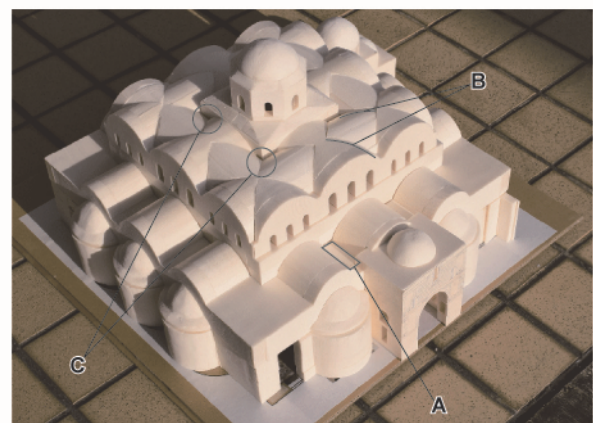
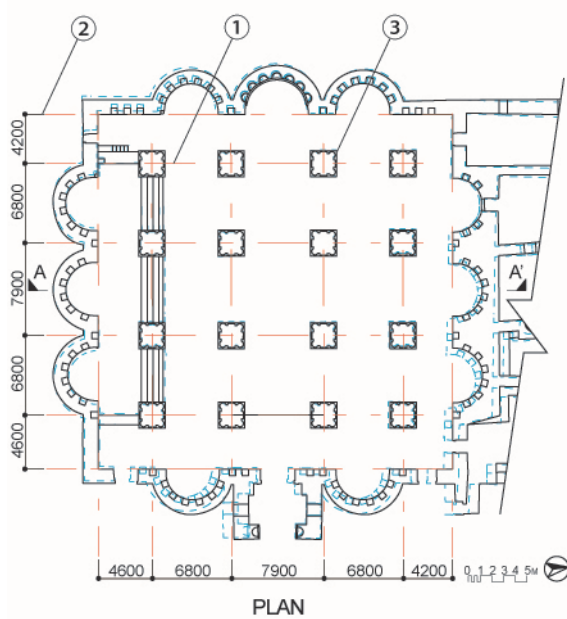
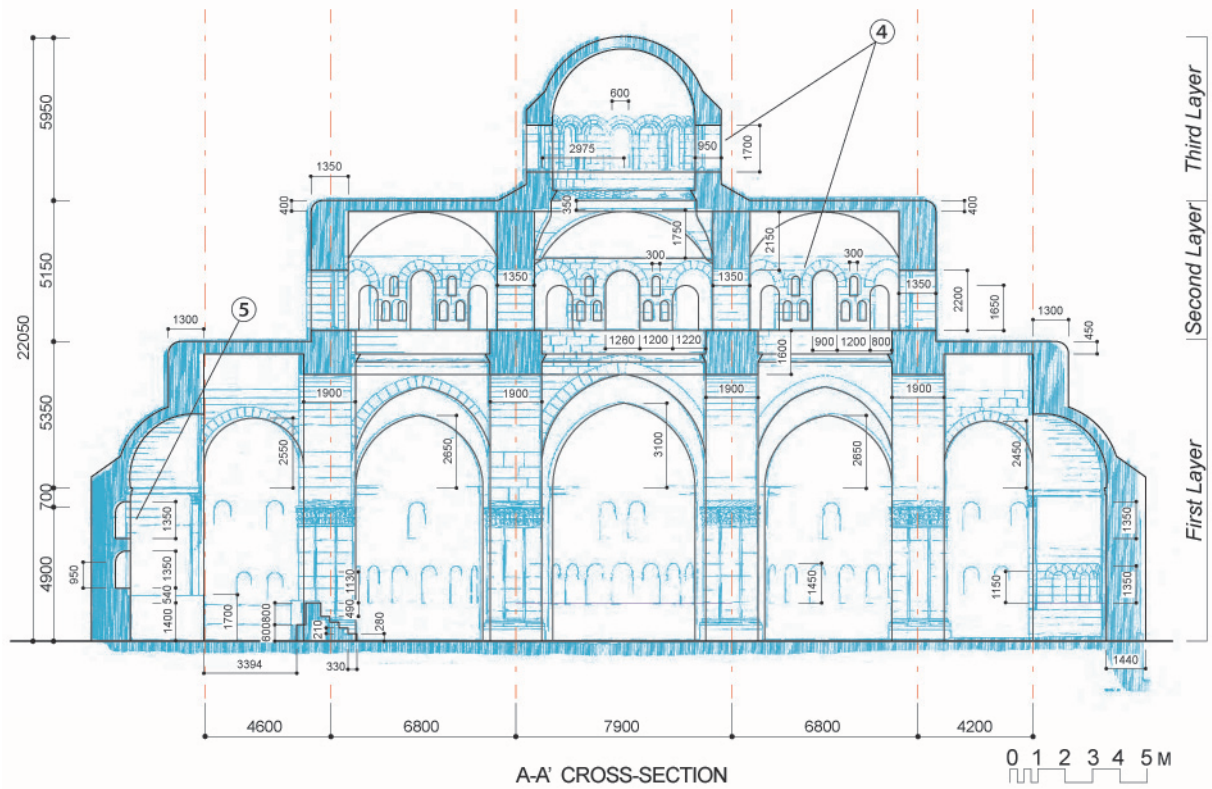


Fig. 1: Drawing Correction

## Corrected Points of the Model

From the modified plans and existing axonometric drawings[3], it was determined that the center vault of the second tier was larger than the lateral vaults. The model was corrected accordingly.

Further, using the existing axonometric drawings[3], it was determined that flashing was required to cover the grooves in the following sections: the junction point between the vaults on the first tier (A), the intersection between the vaults on the second tier, (B), and the junction point between vault edge and the vertical wall (C). The model was corrected to indicate these points (Fig. 1).

## Simulation of Interior

The interior space was cross-checked using photos and videos[8] of the model. The findings were as follows (Fig. 2):

There was a minimum number of gaps, but due to the opening in the drum wall that supported the dome, the interior appeared as a dramatic space lit by dim light.

Additionally, the daylight admitted through the main dome lightened even the thermal bath space. Statues of angels adorned the niche of the drum wall and the pendentive below it. Thus, the light from the openings illuminated the statues and sculptures brightly, and it is believed that during the building's period the angel statues appeared to be floating from the Heavens.

Besides, the light coming through the second tier openings illuminated the mosaic tile floor in a consecutive pattern of the shape of the openings. Additionally, depending on the time of day, the pillar surfaces are brilliantly lighted in a way that emphasizes their three-dimensional structure.



Fig. 2: Model Photo

## Conclusion

This study includes literature reviews of the thermal bath of Hisham's Palace. Through the modification of existing plan drawings[5] and the creation of the reconstructed model, the followings were clarified:

- 1) The existing plans[5] were insufficient to produce the reconstructed model, thus it required additional modifications. The modifications and corrections are listed as follows: The base lines and center lines were modified so that they could be parallel or perpendicular to

each other. The drawings were dimensioned according to the modified base and center lines. The irregular pillars were realigned and repositioned along the base lines. The size, height, and position of the openings were made more feasible from an architectural standpoint. The height of the niche was set based on current photos[4] of the ruins.

- 2) The central vault of the second tier had to be rebuilt as it was larger than the lateral vaults.
- 3) While constructing the model using existing axonometric drawings[3], grooves were formed in the following sections: the junction point between the vaults on the first tier (A), the intersection between the vaults in the second tier (B), and the junction point between vault edge and the vertical wall (C). These grooves required flashing for protection against rain (Fig. 2).

Furthermore, the interior space was verified by using photos and videos[8] of the model. This helped in clarifying the following:

- 1) Although the number of openings is minimal, the opening of the drum wall results with the interior to appear as a dramatic space lit by dim light.
- 2) The drum wall around the dome is an iconic space for the thermal bath and has a recess above the pendentive with a decorative statue of an angel. Due to this, the light from the opening effectively illuminates the statues and sculptures, giving the impression of an angel's descent.
- 3) The light coming through the openings of the second tier illuminates the mosaic tiles on the floor, thus causing different areas of the floor to be illuminated in the shape of the openings. Additionally, the three-dimensional effect of the pillars' surface is highlighted more and brilliantly lighted.

## Funding

The contributors of model creation: Mimiko KIJIMA, Saya NAKANO, Yuriko MURAKAMI, Yasue IMAGAWA, Komika IMAJI, Hiromi SUZUKI

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