

The Monitoring Results Of The Current Technical Condition Of The Architectural Heritage Of Juma Mosque In Khiva

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Abstract: This article illustrates the technical condition of the architectural monument reflected in the results of the monitoring results Juma mosque, where is located in Khiva "Ichan Kala" museum reserve which is in the hereditary cities list of UNESCO.

Index Terms: architectural monument, tower, mosque, roofing, wooden columns, technical condition, clay, termite, reconstruction, monitoring.

1 INTRODUCTION

JUMA mosque with thousands years of history is unique architectural composition and the construction is a unique among the other monuments in "Ichan Kala" museum reserve in Khiva (Figure 1). In the X century arabian traveler al-Muqaddasiy wrote that the mosque was built in the IX-X centuries. The book of Muqaddasiy "Ahsan at taqosim fi ma'rifat al-Aqolim (The best distribution learning to countries)," provides information about Khiva: Khiva is a city located in the desert on the outskirts of the splendid and the river channel. There is a large Juma mosque. According to historical data, this mosque's tower was rebuilt in 1788 by Abdurrahman Mehta. The tower divides two Khan Streets in Ichan-Kala museum reserve, also serves as a landmark for tourists coming from outside. The mosque has four gates and, the main gate is in the northern part.



Fig.1. Juma mosque and tower

2.1 Review Stage

The mosque, which you can read the oldest and most beautiful examples of the art of wood carving has a striking, has a large place for around five thousand prayers. (Figure 3). Several of the columns in the XIII-XV centuries, the great majority of them in the XIX and XX centuries were founded. At present, 12 of these columns, were made in the oldest X-XII centuries, are stored. The columns were decorated with the ancient art of calligraphy in Khorezmian historical data and

narrations. Colorful paints with a pomegranate tree in the middle of the altar of the mosque, and holding the hand of ripe fruit and pomegranate image of Anahita is described as the god of fertility. The religion of Zoroastrianism was the main religion in Old Urgench before Islam, has many sources in order to prove it including the picture proves that it is made of. When the holy religion of Islam came in such kind of idols were lost.

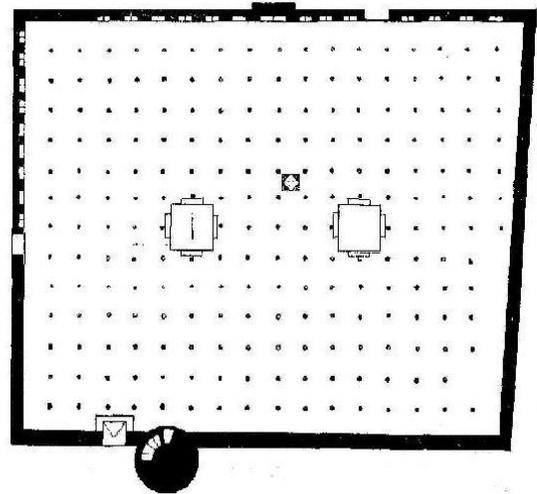


Fig.2. The plan of Juma mosque



Fig.3. Interior of Juma mosque

There is a special pot for water reservation in the middle of the small dome of the mosque. The most surprising thing is that pot had never been over the fire **unless** it had always had hot water during the Khanate of Khiva when the mosque was active. The elderly say that the water is turned on only one candle heat. This pot had been made by calcium-carbonate (CaCO₃). Boiled water had become warm after a specified time, the secret of this miracle at that time only special master architects knew. The wise construction of that mosque increased position of the master architects publicly. At the entering door of the mosque has a unique column which has a discussion. It decorated with the Indian style, the reason why it is an opinion as - "It was presented to Pahlavon Mahmud by Indian King and was made by cotton trees". In fact, its design has no other columns or doors. In particular, the patterns inside the converted image of the seated Buddha and Brahman standing upright is a prove of the above mentioned ideas.

2.3 Sections

Juma Mosque served as a warehouse for storing grain and cotton in the 1940-50 years, as a result, unique wooden columns that time the most affected. 1959-60 years, the Juma mosque during archaeological excavations on the land of a depth of 5 meters of pottery fragments discovered evidence of ancient monuments. 1996-1997 Juma Mosque reconstructed and replaced the majority of columns. Since 1987, the mosque services as Khorezmian Museum of wood carving. The building of the mosque on October 20, 1997 had an international symposium dedicated to the 2500th anniversary of Khiva. The dome of the mosque with total area of 2530 m², the inner area 55,0x45,0 meters and a height of 4.5 meters. The mosque is fully built by baked brick and tile size - 27.5 x 27.5 x 6.5 cm; Used a mixture of brick plaster for building. The mosque is advantage (hypostasis) facility. Its ceiling is covered with wide flat timber, with large square; all accommodated worshipers in the city can get a seat to Friday pray. It has down lights and ventilations from two ropes. The Southern wall has an altar with the pattern of cellular arch. The tower height is 32.5 m, diameter is 6.2 meters. It is located in the northern façade of the mosque, and 7 at the upper part of the green and decorated with tile notes with a flashlight 4, showing a window. They ended with a series of simple stalactites 3 (1, 5).

3 FINAL STAGE

In the 2006-2008 years, we observed technical monitoring of the 54 historical and architectural monuments located in Ichan-Kala open museum reservation. Including the Juma mosque and its minaret we wrote the number of scientific and research works.

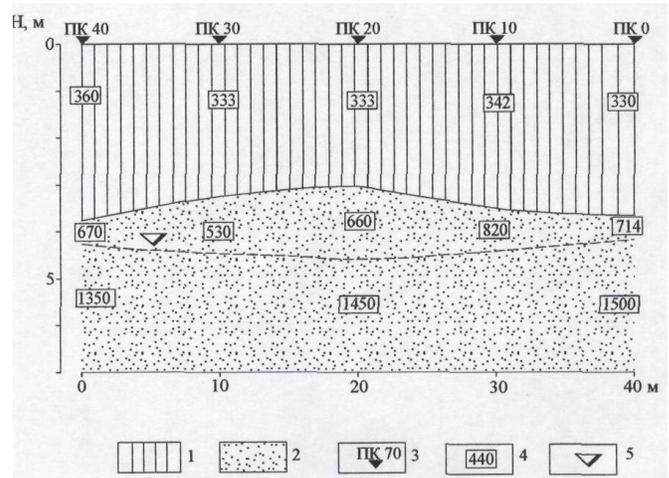


Fig. 4. The seismic section of ground of Juma mosque:
1 – antropogen grunt; **2** – sand; **3** – Seismic monitoring points;
4 – Speed of seismic мулкин; **5** - water level of underground

The incorrect usage of the reservation cotton and grain, during the Juma Mosque served as a warehouse (1940-50) period, influenced the monument. Unique wooden columns that time the most affected. According to the results of the monitoring, wooden columns were damaged for mainly two following characters: 1. Mechanical damage (bent, tilt, cracks, etc.) 2. Biological damage (insects, termites, mold, etc.). The majority of the columns of the mosque were infected by biological effects of the termites (30%) (Figure8). Nowadays, scientists of the Ma'mun Academy prepare special feed anti- termites in a laboratory and use for Juma Mosque.

4 CITATIONS

Additionally, as a result of the seismic electromagnetic researches seismic section graphics were created for the territory of the foundation of mosque tower (Figure 4). According to the results of scientific research, the foundation of the mosque tower influenced of the moisture with around the 4.0 x 5.0 m in size ground, due to soil and underground waters, and the waters coming down from the roof atmosphere, also the tower gone to the east side from its vertical axis. / 3/ Next to the tower, it has water flowing gutters in the 3-5 m distance from foundation, which causes wetting and the east side of the tower in turn affected. Particularly in the current technical condition of the roof of the mosque is not satisfactory, the roof has water dropping. The roof came up to make to be repaired. The longitudinal and transverse wooden beams of a flat roof's top consist of the ramp with 1-2% slopes. In 1947 year, in the reconstruction works of under part of the mosque's roof was not repaired as the original raw (archival documents). In 198, it was opened in order to repair and the roof structure of the mosque was as follows:

- Wood sheeting;
- A layer of reeds;
- Soil rosh (ceramic layer) layer;
- Over the years many times have brought Bituminous straw and mud plaster.

The overall part of the layers of the roof height is 60 cm.

5 EQUATIONS

During that period, the project prepared by the engineer M.I.Burshteyn on the roof of the mosque to reopen closing lightweight construction, proposed the use of raw materials. However, the roof repair work has not been shown as in the project. The responsible people used a cane instead of a layer of 1 floor pergamin, which should be used expanded clay, as well as reinforcing materials were not used, because of shortage for the reconstruction of the roof of the mosque project. By a commission set up in 1983 year to correct deficiencies in the above, straw and clay plaster on 30 mm armotsement layer on the project and the 4-storey ruberoid recommended the necessity of laying carpet, but at the end it is not finished. At the moment, the wood used for roofing beams is varied from the ancient wooden beams structure, in terms of specific weight. Therefore, lifting the wooden columns is in a longitudinal bent. Namely, it gives highly strong deformation influence from above (Figure 6).

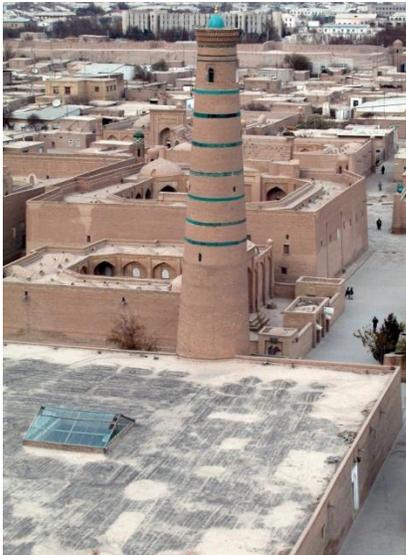


Fig. 5. Full view of the roof of Juma mosque

Constancy load of the wooden poles to the down, as well as incorrectly chosen roof materials for repairing and taking into account of the increasing weight to the roof, due to atmospheric effects of rain, the stake is increasing day by day (Figure 7). Even, one column of the mosque which appears covered with a metal belt in order to stop opening a pole at the longitudinal gaps. This method is quite dangerous, because this metal on the belt might get away from the load after a certain time, under the influence of stress, and with the great power affect around people and other columns.

6.4 Theorems and Proofs

According to the last information of officials of the reservation of Ichan-Kala Museum, the roof of the mosque was reconstructed again in the 2002 -2004 years.



Fig. 6. The column is bent by longitude and dangerous hole has created

The present layer of the roof (from bottom- to up) consists of the following elements and materials:

1. The pair of longitudinal and exposed wooden beams on the patio, which is placed in the timber Tokyo.
2. When thickness of 10.0 cm from the top of the local raw materials are placed in a reed.
3. Cane from the top soils hull clay bedding.
4. Lombok top 3-5 cm thick sand between his laid-smoothing layer is a mixture of cement and reinforcing nets;
5. The men were placed in a simple cardboard-based RPP-350 brand ruberoid;
6. Ruberoid 3-4 cm thick straw-clay.



Fig. 7. Assistant hasps have taken to columns

According to the data analysis of the water dropping from the above of the mosque's roof, the primary reason is explained as follows:

- * Cane, "lomboz"(traditional roof construction) layers with a soft case, which bends under the influence of any external forces, buckling and on the sand-cement layer is deformed (fracture splitting).
- * As a result, a 2-3 layered ordinary ruberoid's elasticity

has lost, in this layer also cracks appeared.

- * In particular, ruberoid, which is on the straw-clay, has been soaked condition in the autumn, winter and spring, and become brittle, due to rain and snow water. Certainly, it has caused to the corrosion of the crevice of ruberoid, as a result it has lost its waterproof property, and these allowed passing water dropping.
- * Sadly, the ramp on the roof is too low, because of the flat roof, precisely, the total area of 1-2% instead. In turn, this caused the gathered atmospheric water on the roof for a long time, and caused the increase the mass of the layers (Figure 5).

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Fig 8. The woods affected by termites

7 END SECTION

CONCLUSION

To conclude with, the roof of Juma mosque is needed immediately repaired, because in the water dropping time the water of atmosphere increases the influences of deflection wooden construction by the termites, as well as, significantly influences longitude bending of columns, in a result, strengthen columns by the height load might bent, even simply cannot withstand the earthquake falling. We hope in the future, officials will fully repair this unique architectural monument, and "Wood Museum", which is unique in Central Asia, will be attracted by the foreign tourists of the seven climates of the world throughout the centuries.

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