

ISSUES OF THE SEISMIC CONSTRUCTION OF THE KHIVA MINARETES

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Abstract - This article touches upon the issue of seismic stability of historical-architectural minaret.

Index Terms - ancient heritages, walls, archeology, structure, historical monuments, research, samples, effects of earthquakes.

INTRODUCTION

Without exaggeration that ancient Khorezm has played an important role in human history with its highly developed architecture and construction monuments. A comprehensive study of the unique and rare heritage of past craftsmen, that is, the construction and architecture of earthquake engineering is a time frame. The creative product of construction and architecture is the buildings and structures, especially the restoration of various mined towers.

The Ichan-Kala Museum of the ancient Khiva, known as the "Open-air Museum of the City" by UNESCO, has a number of towers, madrassahs and mosques, which have been resisting the various negative effects of nature for centuries. In the past, the question was raised by the question of how master-architects used earthquake-powered methods in the construction of architectural monuments and what construction materials they used to repair them.

It is known that Khorezm region mainly consists of soil and sandy mud, which forms the basis of buildings and structures. Architectural builders have been able to achieve the maximum drainage and drainage of the grass by filling the kettle several times with water in order to strengthen the foundation before building its base. In some cases, depending on the need, the area is then milled with a special clay layer after leveling. Firstly, the groundwater was protected against the aggressive impact of the groundwater, and, secondly, due to the high plasticity of this clay layer, the seismic effect was eliminated, that is, the power of the earthquake. [4]

The towers of Khiva are distinguished from other towers with their characteristic features: the cool glass holes are located in the body of the tower, visible from the slopes in the roof, providing the appearance of

these towers even more elegant. The towers are therefore not the same. The architects, builders and

designers have worked very hard on the balance, appearance, style and design of the towers.

According to historical data, the Kalta Minor minaret (Figure 1), which began to be restored by Muhammad Aminkhon madrassa in 1851, and which for some reasons stopped its construction, was intended to be the only tallest tower in Khiva Khanate but probably in the Muslim world. [2]

Measurements on the tower were performed by V.L. Voronina in the late 30s of the last century. The tower was later studied by V. Bulatova and I.I. Notkin in the complex of architectural monuments. [1]

It is difficult to say enough about the dimensions of the tower in terms of constructive structure of the tower. The height of the Kaltaminor building is 28.0 meters, the base value of the diameter is $D = 14.2$ meters and the density above is $d = 10.6$ meters. When the tower was completed, the height of the tower was 75.0 meters, and the diameter of the building was $d = 2.2$ meters.



Figure 1. Kalta Minor **Figure 2. Islam Khoja minaret**

According to experts, the initial form of the Central Asian towers is derived from the observation

peaks in the castle architecture. However, their cube and circular base, the lower part, is like the shape of Indian synagogues described by Beruni, a conical body that ends with dome. This does not mean that the building is intended for any purpose but merely expresses ideological and symbolic meanings. [3]

A number of engineering issues have been solved to build a magnificent Kalta Minor in a complex construction environment. As you know, the height of the building increases with its specific weight, and its body has a great deal of stress. From the engineering point of view, the tower is a very complex structure, and it is difficult to predict its state of affairs during the earthquake.

Kalta Minor diameter of the lower part of the building with the increase in the height of intensive reduction of the amount of construction by builders who can prevent the leakage of the growing tension in its body tense. From this point of view, the builders' reducing the cross-section of the tower along the height was a wise solution than the seismic activity.

The existence of a single up the stairs in the body cavities, brick towers in a certain degree of tension caused by the uneven distribution of the steps to be taken into consideration, it is built from a certain height above ground level.

Kalta Minor structures built steps from a distance of 5.0 meters above ground level. The space on the tower staircase is 2.1 x 1.5 meters in its entrance, and the height of the hinges has diminished.

The necessity of the Kalta Minor exploitation process was that there was a need for staircases and lanterns in the building. The staircases are made by dragging the bottom to the minimum distance to the outer wall around the core. Similar solutions can also be seen in the construction of the Tower of Islam Khoja in the Ichan-Qala Museum Reserve in Khiva (Fig.2).

The Islam Khoja tower was restored in 1908-1910 years with the special layers of marble blocks with a height of 1.0 meters and a height of 19 cm. The marble layer serves not only to lower the humidity from the top to the wall, but also used as an anti-seismic device. As you know, the increase in altitude increases the insertion mass of the tower, which in turn causes the seismic forces to affect the structure during the earthquake. It is important to note that this effect has been reduced by the fact that the builders have reduced the diameter of the tower to a greater extent, so that the value of the tension in the bricks does not increase sharply, ex., at the surface $D = 9.5$ m, at the top of the width is equal to $d = 3.0$ m.

The tower of Islam Khodja, the Kalta Minor, is distinguished not only by its magnificence, but also by its unique designs. Belts on the tower are very beautifully decorated, with unique architectural achievements of the Khorezmian architects.

The Kalta Minor monument stretching to the skirts is coated with gilded veil-colored coatings, and blue, white, and white dyes combine with the sky (Figure 1).

Although the Little Minor is not completed, its current composition, with its content and shape, is a unique architectural and construction artifact of its time and adds extraordinary beauty to the Ichan-Kala Museum Reserve.

These minarets, which have a unique place in the civilization of the people and are the result of art and work of Khorezm architects, are now increasing the number of beaches that flow from the seven climates of the world and praise the genius architects.

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