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**RESULTS OF INVESTIGATION OF TECHNICAL CONDITION,
EARTHQUAKE RESISTANCE AND DESIGN SOLUTIONS FOR
RESTORATION, RECONSTRUCTION OF THE MADRASAI WORLD
BUILDING IN THE CITY OF KAKAND**

Annotation: the article discusses the results of a full-scale technical survey and the proposed methods of restoration and reconstruction measures to ensure the durability of the “Madrasai Mir” building in the city of Kokand.

Keywords: construction, building, seismic resistance, spatial rigidity, settlement, reconstruction, design solution.

Introduction

The Madrasai Mir Memorial was built in 1799 under the historical name "Norbutabek madrasasi" and is a historical and architectural monument of the Republic of Uzbekistan. Restoration and reconstruction of the facility requires a special approach, while an important role is played by the study and understanding of engineering solutions of the national architecture of the Kakand Khanate in the XVIII century [1].

Materials and methods:

This includes empirical methods such as modeling, fact-finding, experiment, description and observation, as well as theoretical methods such as logical and historical methods, abstraction, deduction, induction, synthesis and analysis, as well as methods of heuristic strategies. The research materials are:

scientific facts, the results of previous observations, surveys, experiments and tests; means of idealization and rationalization of the scientific approach.

A field survey is a set of measures that allow for a general objective assessment of the technical condition of structures, buildings and structures. As a result of the survey, a conclusion is given on the suitability of structures and operation or on the need for repairs, measures are being developed to strengthen the structure.

Surveys of buildings and structures are carried out in two stages. At the first stage, a preliminary inspection of the facility is carried out, design and technological documentation is studied, then a detailed inspection is carried out, real operating conditions are identified, cracks, defects and structural damage are recorded [3].

At the second stage, detailed surveys of the technical condition of structures are carried out in order to obtain additional information about the actual boundary conditions, about the features of deformation of the structure, about stresses in it.

Reconstruction and capital repairs of existing buildings and structures involves, first of all, conducting a survey of their technical condition, determining their suitability for further operation. According to the provisions of the current regulations, the results and conclusions of the technical survey serve as the basis for the development of projects.

Results and discussion:

Space-planning features of the building. The building consists of four portal compartments, which frame the courtyards of the mosque on four sides. Overall dimensions of the main – Northern portals: length 49.4 m, width 24.5 m; Southern portals: length 50.7 m, width 8.9 m; Eastern portals: length 49.4 m, width 9.0 m; Western portals: length 49.4 m, width 9.0 m. The building is one-storey, has three domes, two are in the main portal, One is located in the southern portal of the building, and unfinished minarets are located at the four

corners of the building. The hujras, located at the intersection of mutually perpendicular parts of the memorial complex, are divided diagonally into two triangular rooms using separate adjacent walls, that is, a kind of sedimentary and seismic seam is arranged. Do you wonder if there were standards for antiseismic construction 220 years ago?! Or the Madrasai Mir Memorial is another vivid example of intuitive, historical memory, a couple, heuristic wisdom of folk architecture [4].

The main portal in the madrasah is traditional, with a pointed niche divided into two tiers. In the first tier, in the recess, there is an entrance pointed arch with a wooden door, above which, in the corners of a rectangular niche, a mosaic has a floral ornament. In the second tier there is a balcony gallery. Arched niches with imitation grilles are made in the upper part of the portal. Arched and rectangular niches alternate in the sides of the portal. At the corners of the portal there are traditional guldasts with decorative lanterns and corrugated domes. The trunk of the guldasta is made of brick masonry in a "herringbone pattern", diagonally. In the corners of the madrasah, the domes of the reading room (darshana) rise, standing on a low platform of a quadrangle turning into an octagon. The drum is divided into lancet window openings with a panjara.

The foundation of the building. Based on the excavated pit and the lithological section of the soil of the base of the building located closer, the capacities and other mechanical parameters of the soil layers were determined. 1-formation – a bulk layer with a thickness of 0.4 m, consists of sandy loam, sand, gravel containing construction debris; 2-formation – a bearing layer of the base, where the foundation bodies are deposited, sandy loam from brown to dark gray light, water-saturated, from plastic to current consistency, with interlayers of 282 loam, with inclusion carbonate nodules up to 20%, with an average capacity of 4 meters; 3-formation – gravel-galichnik deposits with sandstone

filler, water-saturated, consist of sedimentary and igneous rocks. The groundwater level is 3.6 m.

The foundations of the building. The foundations under the walls are ribbon, built on two layers, the bottom layer is on a ground–clay solution of rubble not hewn stones, the thickness of the layer is 300 mm, the overhang (console) from the wall on the upper part is 320 mm; the top layer is a five-row brickwork on ganch mortar, the thickness of the brick is 60-65 mm, the thickness of the solution is 25-30 mm, the total height of the masonry is 400 mm, the overhang (console) from the wall on the top is 650 mm. The general shape of the foundation on the cross section is wedge–shaped, in the form of a truncated triangular pyramid, the smaller base is directed downward. It should be noted that the vertical cross-section of the foundations has the most stable shape, it never overturns during earthquakes. Seismic vibrations contribute to the additional immersion of the foundation body into the ground, the soles never come off the ground, the foundation and foundations adapt to each other, the compatibility of taking special loads does not increase.

It seems that the time has come to reconsider the foundations of foundation construction in terms of ensuring the seismic stability of buildings and structures in special engineering and geological conditions of construction sites. The calculated bearing capacity of the base soil (sandy loam) according to КМК - 2.02.01-98 and the results of engineering and geological surveys $R_0 = 630$ kPa. When calculating the deformations of the base using the calculation schemes specified in clause 2.40КМК -2.02.01-98, the average pressure under the sole of the foundation p should not exceed the calculated resistance of the base soil.. In parts of the building, the pressure values under the soles of the foundations of the building range from 3-20 kPa to 550 kPa. However, there are local damages in some sections of the strip foundations. But in general, the continuity and consistency of neighboring parts in a suitable state are preserved.

Field studies [3] and experience in the operation of historical buildings have also established that lime and clay solutions are characterized by flexibility, which is often accompanied by displacement, without subjecting stress to individual boulders and bricks, which make up the foundation structure [5].

The walls of the building. The walls are built of burnt "Muslim brick", square in shape with sides of 240-260 mm. on ganch mortar, the brick thickness is 55-72 mm, the mortar is 20-30 mm. The volume weight (average density) of the brick is 1.45 g / cm^3 , the compressive strength is 8.6 MPa, this corresponds to the strength of a modern brick of the M75 brand, the compressive strength of the ganch mortar is 3.0-6.5 MPa, corresponds to the strength of the M50 grade mortar. To determine the mechanical strength of bricks and ganch mortar, cubes were cut from natural samples, for a solution with 283 faces of 10 mm, for bricks with faces equal to the thickness of ground natural bricks. Compression tests were carried out using a P50 press. The thickness of the main load-bearing walls is on average 1100 mm (four bricks). The height of the framing exterior walls of the sides is 4900 mm, the height of the walls of the exterior facade is 6200 mm.

Conclusion:

1. A field survey is a set of measures that allow for a general objective assessment of the technical condition of structures, buildings and structures. As a result of the survey, a conclusion is given on the suitability of structures and operation or on the need for repairs, measures are being developed to strengthen the structure.

2. Surveys of buildings and structures are carried out in two stages. At the first stage, a preliminary inspection of the facility is carried out, design and technological documentation is studied, then a detailed inspection is carried out, real operating conditions are identified, cracks, defects and structural damage are recorded [3].

3. At the second stage, detailed surveys of the technical condition of structures are carried out in order to obtain additional information about the actual boundary conditions, about the features of deformation of the structure, about stresses in it.

4. Reconstruction and capital repairs of existing buildings and structures involves, first of all, conducting a survey of their technical condition, determining their suitability for further operation. According to the provisions of the current regulations, the results and conclusions of the technical survey serve as the basis for the development of projects.

5. The general shape of the foundation of the Madrasai Mir building in the cross section is wedge-shaped, in the form of a truncated triangular pyramid, the smaller base is directed downward.

6. It seems that the time has come to reconsider the foundations of foundation building, taking into account historical innovations, folk creative heritage in architecture [4]. .

7. Research and experience in the operation of historical buildings have also established that lime and clay mortars are characterized by flexibility, which is often accompanied by displacement, without straining individual boulders and bricks that make up the foundation structure [2].

8. The hujras, located at the intersection of mutually perpendicular parts of the memorial complex building, are divided diagonally into two triangular rooms using separate adjacent walls, that is, a kind of sedimentary and seismic seam is arranged.

9. Does he not realize that there were standards for antiseismic construction 220 years ago?! Or the Madrasai Mir Memorial is another vivid example of intuitive, historical memory, a couple, heuristic wisdom of folk architecture! [4].

10. Restoration and reconstruction, according to the recommendations, will serve to ensure the normal operation and durability of the building for the

next centuries. At the same time, to provide for joint regular supervision of research and design institutions [6].

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