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# Modern Technology of Increase carrying Capability of Bricky Buildings

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**ABSTRACT:** The article observes horizontal load of the brick walls of the complex structure works with armor brick inclusions, to identify quantitative data on the increment of their bearing capacity due to the increased reinforcement of masonry at the intersections of the walls and the test results

**KEYWORDS:** load, bricks, walls, technology, building, construction.

## I. INTRODUCTION

Nowadays, buildings are being constructed using different technologies and from different materials. The "law of the conveyor" is becoming a thing of the past the maximum unification of product types, the total monotony of architecture. The construction industry of the city is breaking the deadlock in which it was due to the many-year unilateral approach to the choice of technologies.

With the dynamic development of construction, its mass and innovative nature there are oversights and errors in the manufacture of structures and elements, installation, the wrong choice of methods of work, design, construction and operation of buildings.

In the practice of technical inspection of buildings, the following categories of objects are most often encountered:

- buildings and structures with visible defects and deviations in performance;
- reconstructed buildings, including for capital repairs, add-ons or development of underground space under them;
- buildings and structures of the surrounding construction during construction near them of construction work with an assessment of the actual state and development of recommendations for ensuring sustainability;
- demolished buildings and structures, along with which, along with their technical diagnostics, the hazard class of construction and demolition, as well as the radiation situation of the building, is assessed.

When conducting surveys, special attention is paid to determining the technical condition of structures and their individual elements, to identifying existing strength margins, as well as establishing the possibility of their preservation and further use.

Inspection of structures includes:

- the study of archival materials, design and technical documentation, acquaintance with inventory data and technical passport indicators:
- preliminary survey of buildings and structures; identification of their design scheme, analysis of the layout; establishment of autopsy and sampling sites; description of the state of structures and engineering equipment; description of defects and damages, deviations from the norm of technical operation;
- the implementation of architectural measurements of parts of buildings and the execution of photographs;
- detailed survey of structures, assemblies and connections in nature combining with measurements of their geometric characteristics; identifying the bearing capacity of structures and the state of latent defects, as well as information about the geological and hydrogeological structure of the site.

At the practice of designing, in particular, when adjusting projects for brick houses of the 77 series, there are cases when it is necessary to increase the number of floors against the standard. For this, any additional constructive measures should improve the seismic resistance of the house, providing an additional reserve of seismic resistance compared with the level determined by building codes.

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## II. METHODS OF RESEARCH

The aim of the work is to study when the horizontal load of the brick walls of the complex structure works with armor brick inclusions, to identify quantitative data on the increment of their bearing capacity due to the increased reinforcement of masonry at the intersections of the walls and the test results, to assess the degree of increase in seismic resistance of buildings of the complex structure with armor brick inclusions.

Testing of four fragments of the walls of the complex structure was carried out. The tested fragments are the structural elements of the walls of a brick dwelling house of the 77 series, walls made of ordinary clay brick M 100 on mortar M 50 with reinforced concrete inclusions from concrete class B 10

The actual strength characteristics of the manufactured fragments do not differ from the design. According to tests of concrete cubes concreted simultaneously with the laying of concrete into the body of fragments, the cubic compressive strength of concrete after 28 days of hardening and reduced to a cube with a 15 cm edge varies from 116 to 324 kg / $cm^2$. Brand brick was determined in accordance with CST 8462-75 and CST 530-80 by determining the flexural strength. The average values of the ultimate strength are 67 kg / $cm^2$.

Masonry mortar was applied with a density of 1800 kg / $m^3$, the average compressive strength of the mortar for all fragments was 31 kg / $cm^2$. For all fragments, the average ultimate adhesion strength in the masonry, defined as the arithmetic average, according to all data, taking into account the coefficient 0.9, is 1.05 kg / $cm^2$.

Full-scale fragments of walls were tested for the action of a horizontal statically applied load along the axis of the upper reinforced concrete belt at a height of 3 m from the level of the force field. The loading was carried out with the help of a hydraulic jack and a power counter-force. The load application diagram is shown in Figure 1.

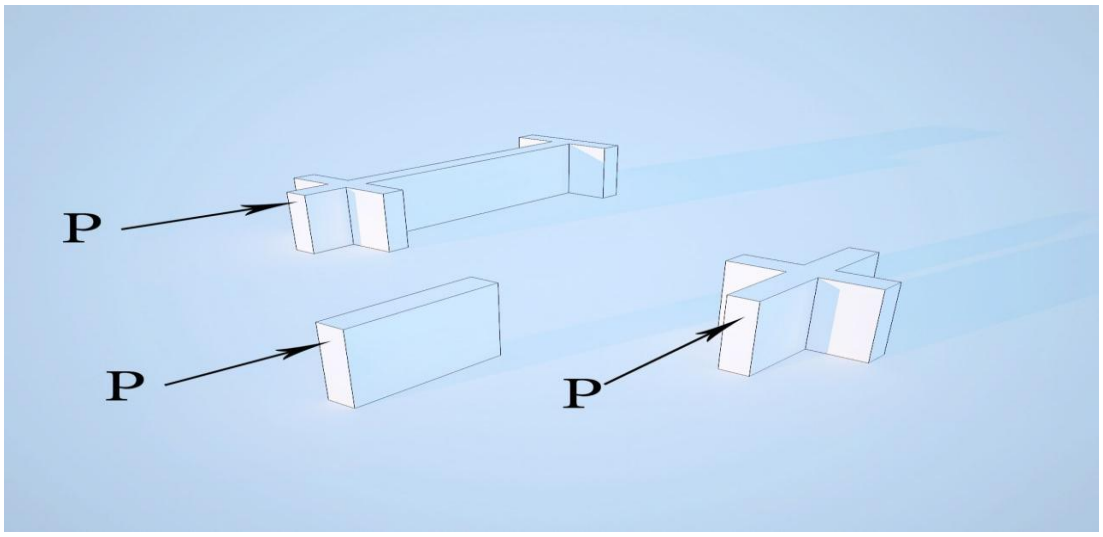


**Fig.1.** Load schemes

The deflections of the fragments were measured by Maximov's defibomers.

Distribution of deformations and stresses in the body of the panels was measured by indicators, hour-type with a division value of 0.001 mm. Obtained during testing of fragments data on the stages of application of loads and damage are shown in Table 1.

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**Test results**

Table 1.

| Fragment | Stages loading | Load t/s | Probes top, mm | Damage characteristics |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| | 1<br>2<br>3<br>4 | 3,5<br>6,6<br>9,6<br>12,4 | 0,6<br>0,8<br>2,3<br>4,7 | From the 1st to the 4th stages of loading visible cracks in the laying was not observed |
| | 5 | 15,2 | 9,6 | Horizontal cracks in the base of the masonry, tensile cracks in the core |
| | 6 | 18,1 | 14,0 | Inclined cracks in the masonry, in the plane of loading, cracks of separation of the vertical core from the masonry |
| | 7 | 19,6 | 23,8 | Cracks in the wall of the loading plane |
| | 8 | 21,0 | 24,1 | The intensity of disclosure and the number of cracks increase |
| | 9 | 21,0 | 34,6 | Streams armature stretched core |
| | 10 | 21,3 | 35,6 | Stretched core armature flows, crack opening = 5mm. |
| | 11 | 21,3 | 36,7 | Core armature rupture on the buttress side |
| | 12<br>13<br>14<br>15 | 15,2<br>11,0<br>12,4<br>9,6 | 71,3<br>75,8<br>79,6<br>91,6 | Upon further loading, a horizontal crack opens and the fragment rotates in a vertical plane |

Estimate the experimental data, the fragments were calculated as cross beams-walls on the effect of horizontal concentrated and vertical weights, distributed over the upper belt in the vertical plane along the axis of the horizontal force. In the calculation, the modulus of elasticity of unreinforced brickwork $E_{р.к.с}$= 17600kg / $cm^2$ of reinforced brick masonry $E_{р.к.с}$=22400 kg/$cm^2$, concrete and reinforced– 230000 kg/$cm^2$.

The fragment representing the intersection of two walls with horizontal reinforcement in the amount of 0.15% and framed with reinforced concrete has a bearing capacity that is 68% higher than the carrying capacity of a similar flat fragment.

## III. CONCLUSION

Therefore, total load bearing capacity of a fragment of a complex structure formed by armor brick inclusions at the intersections of axes and unreinforced masonry in the middle part of the wall is 57% higher, and the load level corresponding to cracking in unreinforced masonry is 32% higher than the carrying capacity of a brick fragment of a complex structure without reinforced inclusions.

Technique of economic efficiency of applying the results of work is to improve seismic resistance, reduce damage during earthquakes, increase the level of maintainability of brick buildings.

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