Calculation Of A Multi-Storey Building Unfinished Construction Established In A Seismic Area 8 Points.

Alimov Xikmat Tairovich, Doctoral student of the Tashkent institute of Architecture and civil engineering, Tashkent, Uzbekistan

Tulyaganov Ilkhomjon Bakhromovich, Design engineer at JV "UzLITI Engineering" LLC

Usmanxodjaeva Lola Asadovna, Senior lecturer of the Tashkent institute of Architecture and civil engineering, Tashkent, Uzbekistan

Ergashov Jasurbek Dilmurodovich, Senior lecturer of the Tashkent institute of Architecture and civil engineering, Tashkent, Uzbekistan

ABSTRACT

The work contains the results of a survey of a multi-storey administrative building of unfinished construction with subsequent reconstruction. The data obtained in the calculation of the building using the LIRA 9.6 software package have been verified.

INTRODUCTION.

Due to the lack of relevant technical regulations in the field of earthquake-resistant construction, the main regulatory document for design is KMK 2.01.03-96 "Construction in seismic regions" [1]. Methods and approaches to the calculation of buildings and structures for seismic effects are described in the literature [2, 3, 4]. At present, in accordance with [1], the linear-spectral theory of seismic resistance is used for structural calculations. As the name implies, it uses an initial seismic action set as a spectrum (acceleration versus frequency).

The increase in the number of storeys of buildings due to the aggravating shortage of land in urban areas and its rise in price, the change in seismic zoning maps of the territory of Uzbekistan towards an increase in the predicted intensity of seismic impacts and the number of seismically hazardous regions have transferred calculations of buildings and structures for seismic impacts into the category of frequently used ones. A large number of studies on the rationality of the use of various structural systems of multi-storey civil buildings are aimed, as a rule, at assessing one or several structural parameters (number of floors, area, shape, etc.) and substantiating the optimal limits of their use, without considering the issues of their seismic resistance. in this connection, the assessment of the seismic resistance of various structural systems of multi-storey buildings is becoming increasingly important. Nevertheless, the question of choosing the optimality criterion and the research methodology itself remains open.

METHODS AND MATERIALS

The object of the research is the combined structural systems of multi-storey high-rise buildings.

Climatic characteristics of the object: Construction area - Tashkent city, seismicity - 8 points; the estimated seismicity of the site is estimated at 9 points, the capital of construction is class II, the class of durability is class II, the degree of fire resistance is class II, the base soils are taken non-planting with a design resistance R = 20 kPa, the soil category for seismic properties is II, groundwater is non-aggressive to concrete

normal permeability on Portland cement, the standard depth of soil freezing is 0.68 m, the depth of seasonal freezing of soils is 0.7 m, groundwater within the site has been opened at a depth of 2.8 m from the earth's surface.

General parameters of structural systems: In the plan, the building is rectangular with dimensions in the axes - 15 × 36 m. The foundation is monolithic reinforced concrete,

dimensions are 90 × 70 cm., Concrete for foundations is class B25. column grid - 3 × 6 and 6 × 6 m; section of columns - 40 × 40 cm; cross-section of the crossbar - 40 × 30 cm; floor slab thickness - 22 cm; wall panel thickness - 25 cm; floor height - 3 m; number of floors –8; material of supporting structures - concrete B 40, reinforcement A class III.

Photo 1 - Building façade.
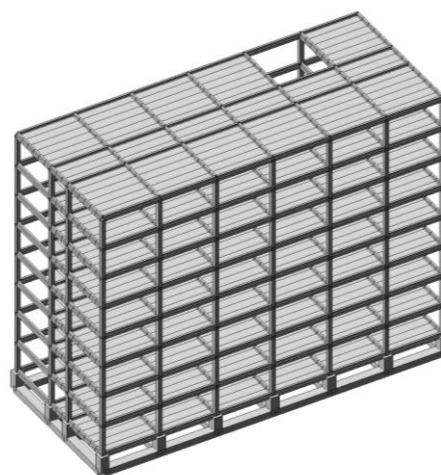
Photo 2 - General view. 3D model.
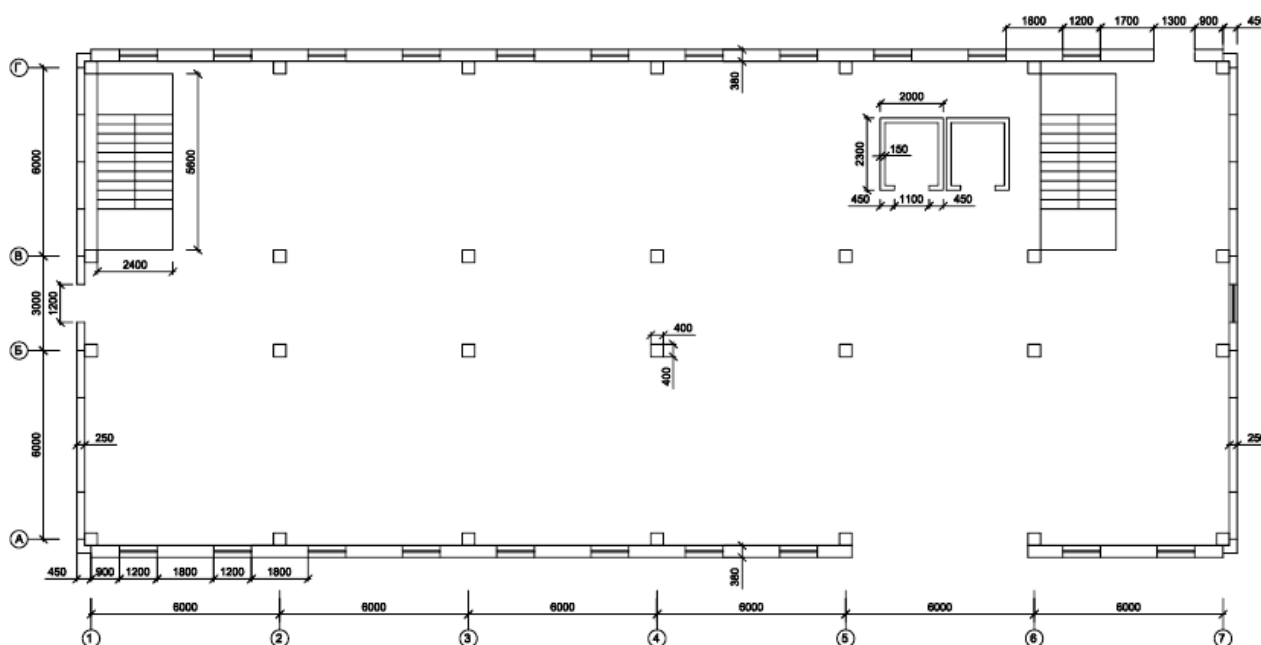
Photo 3 - First floor plan.
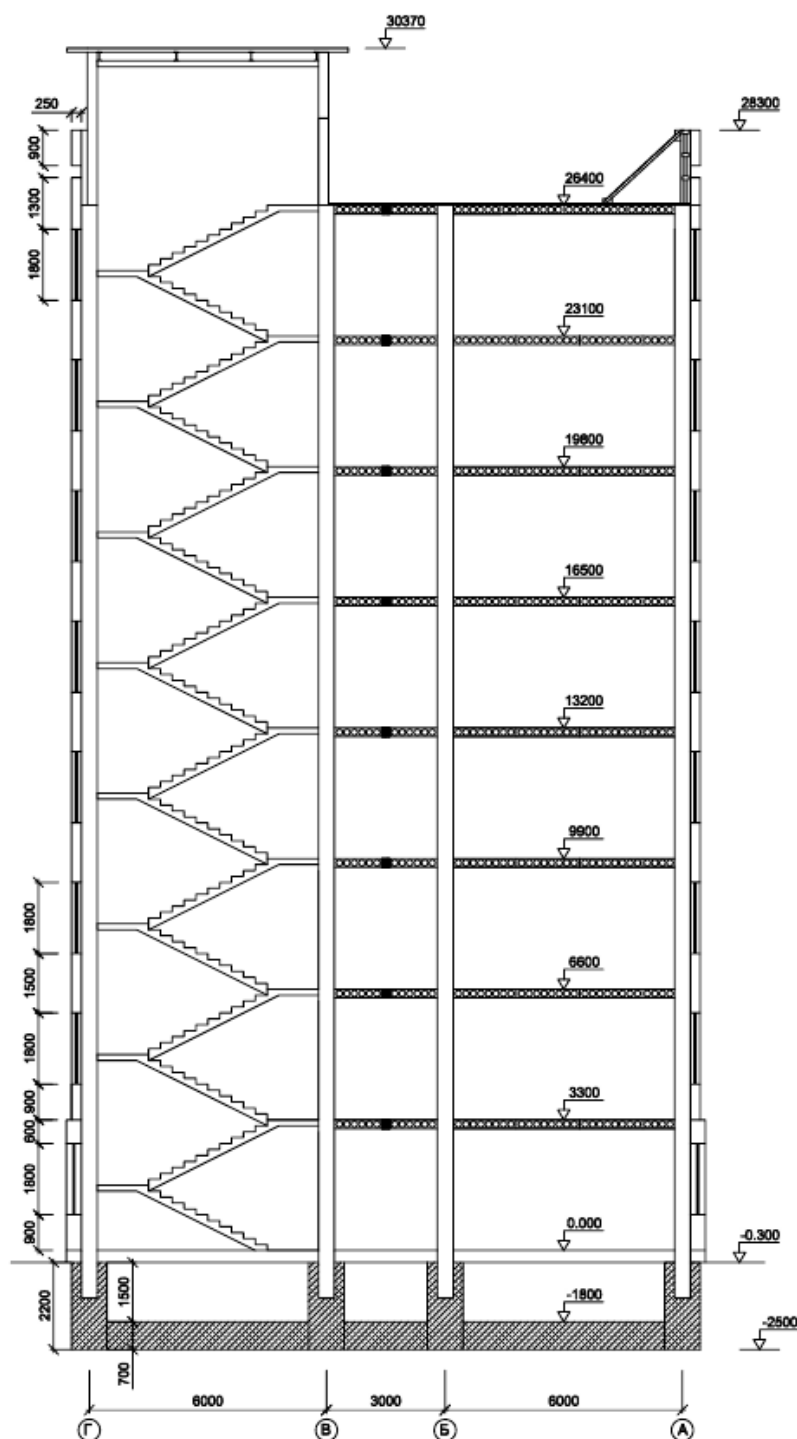
Photo 1 - Section of the building.

Calculation method. To accomplish this task, the SP LIRA 9.6 software package was used.

The calculation was carried out in accordance with KMK 2.01.03-96 for a design earthquake with an intensity of 8 points on the scale of PK LIRA 9.6. The number of vibration modes for all considered structural systems was automatically determined. Eigenvalues, periods and modal masses were determined for each of the vibration modes. The sum of the effective modal masses taken into account in the calculation was at least 90% of the total mass of the system excited in the direction of the seismic action for horizontal actions and at least 75% for vertical actions. To automatically determine the required number of natural vibration modes, the Lanczos method is used together with the multifrontal method. The

maximum displacements, stresses, accelerations were calculated.

Research area limitations. All calculations were performed for the II category of soil. Since the main objectives of the study were to evaluate the operation of their own elements of structural systems of multi-storey civil buildings and analyze their stress-strain state, this study did not take into account the effect of the interaction of the building with the foundation soil.

Load 1. Actual weight γ = 1.1 Load 2. Constant load. slab weight 300x1.1 = 330 top layer (5cm) 125x1.2 = 150 brick. Partition. 100x1.2 = 120 $\sum$ = 600kg / m2

Load 3. Weight of the wall (panel) 400kg / m2, Load 4. Long load 200x1.2 = 240 kg / m2, Load 5. Load from people 200x1.2 = 240kg / m2, Load 6. Snow load 50x1.4 = 70kg / m2, Load 7. Seismic X.

Load 9. Seismic along the Y-axis

Design load combinations

When forming the DCF table, after choosing from the list of required norms, the values of the parameters and coefficients of the DCF are set for all loadings of this problem.
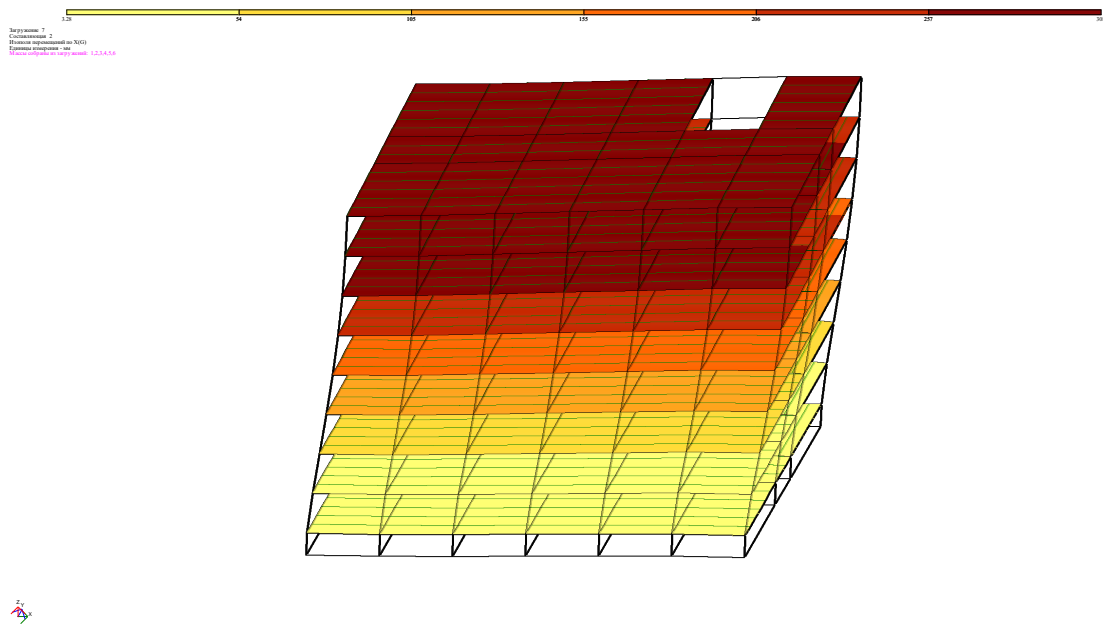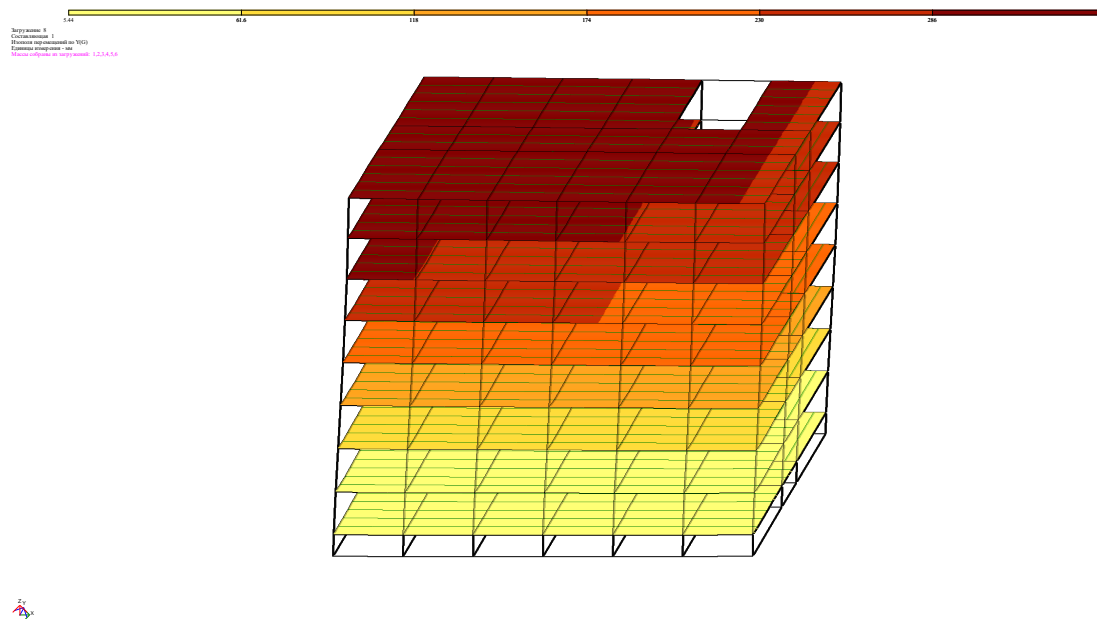
RESULTS

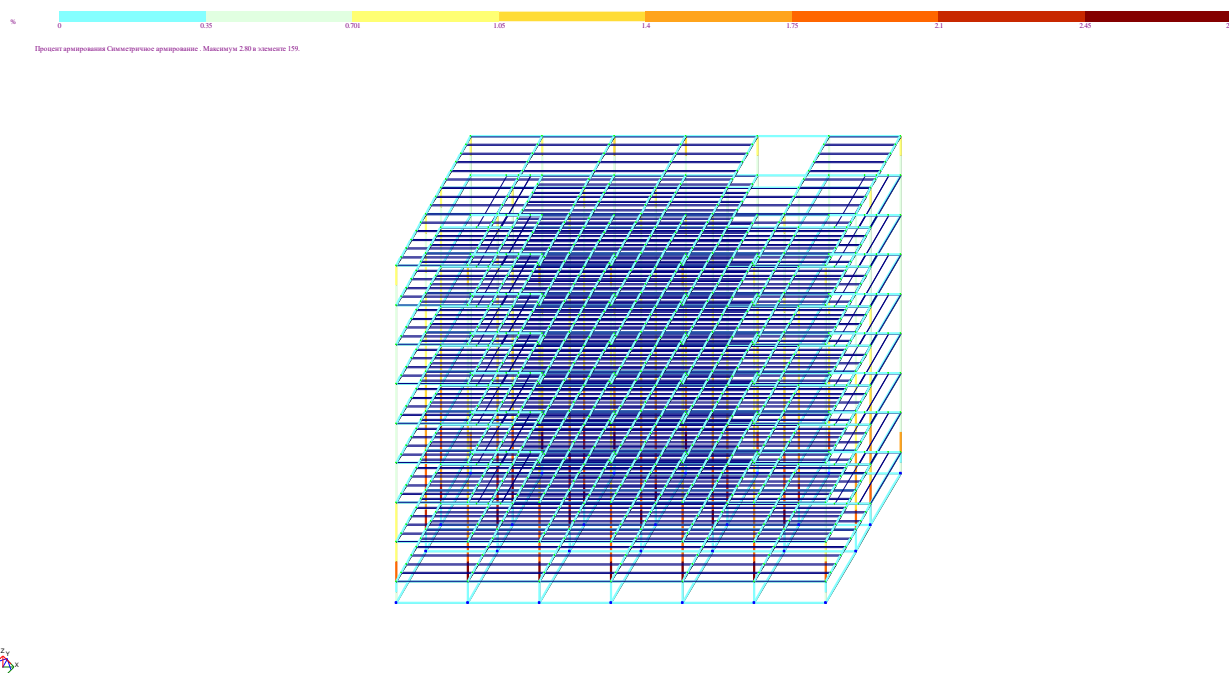Displacements from seismic in X direction
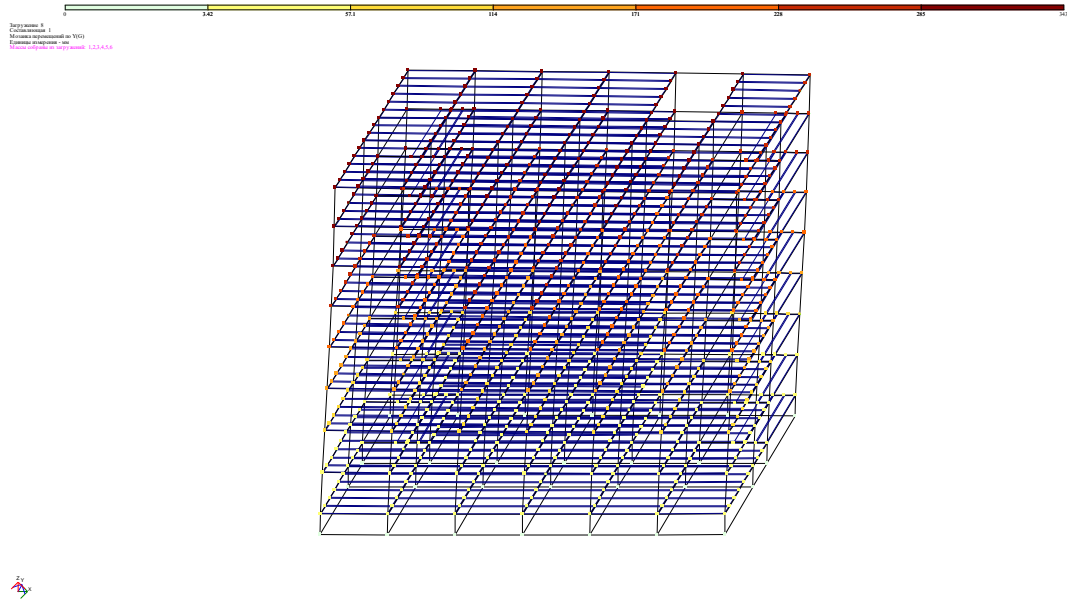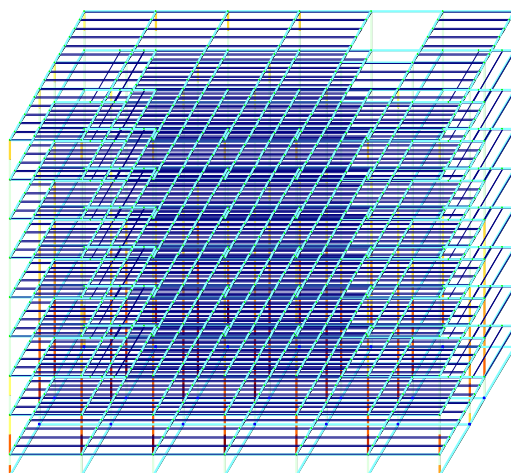
Displacements from seismic in the Y direction

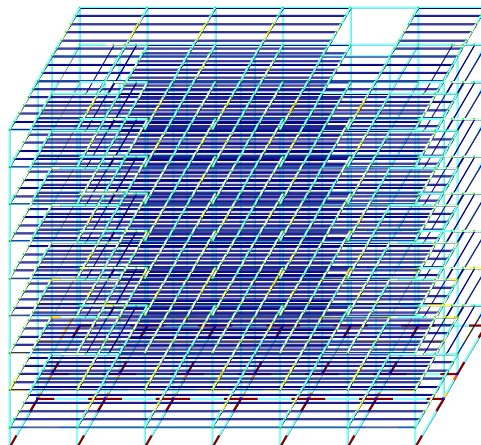Mosaic of displacement from seismic in the X direction

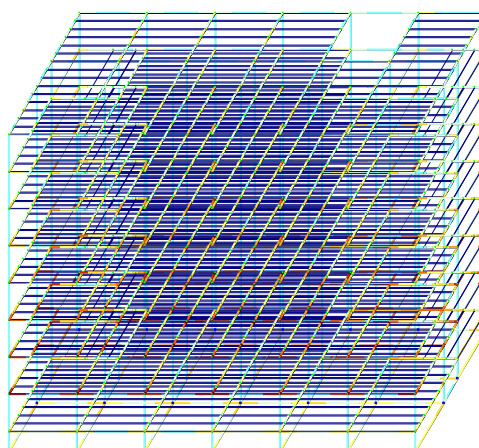Mosaic of displacement from seismic in the Y direction

Percentage of building reinforcement
(symmetrical reinforcement)

Column reinforcement
Corner fittings

Reinforcement horizontal structures

Percentage of building reinforcement
(asymmetrical reinforcement)

The calculation results show that the reinforced concrete-frame system of the frame walls of the bearing walls develops large accelerations. Accelerations are 43% lower on average than systems with a large number of load-bearing walls.

CONCLUSION

Based on the results of the study, an analysis of the structural systems of multi-storey office buildings was carried out. The calculation was carried out in accordance with KMK 2.01.03-96 for a design earthquake with an intensity of 8 points on the scale of PK LIRA 9.6.

A longer period of oscillation reduces the dynamic effect of the impact on the building. According to the results of the calculation of accelerations, it can be seen that in systems with a small number of load-bearing walls, the lowest accelerations develop.

For frame-wall systems, the maximum accelerations are on average 43% lower than in the other three systems with a large number of load-bearing walls.

Based on the results of the research, the following conclusions were made:

1. There is a significant discrepancy in the bending moments in the bearing zone (up to 43%) near column 7 / B. Large values of these efforts arise with subsidence foundations.

2. In vertical bearing elements (columns), the values of the longitudinal forces have a smaller discrepancy (no more than 17%).

3. In the foundation slab, an increase in bending moments is observed during subsidence soil of the base (up to 38%).

4. Based on the results of the research carried out, the reinforcement of load-bearing structural elements of multi-storey buildings will be the most rational.

REFERENCES

[1] KMK 2.01.03-96 "Construction in seismic regions". Goskomarkhitektstroy RUz - Tashkent, 1996-65s.

[2] Kurzanov A.M. Current state of rationing of calculation of structures for seismic load // Industrial and civil construction. 2009. No. 11. S. 52-53.

[3] Birbraer A.N. Calculation of structures for seismic stability. SPb., 1998.

[4] Polyakov S.V. Seismic resistant structures of buildings: textbook. aid for universities. M., 1983.