Metodology for checking the seismic strength of buildings based on existing norms

Zebuniso Abobakirova*, *Shodiljon* Umarov, *Shokhrukh* Davlyatov, *Saxiba* Mirzababayeva, *Hasanboy* Nasriddinov, and *Akbarjon* Mahmudov

Fergana Polytechnic Institute, 86 Fergana str., Fergana 150107, Uzbekistan

Abstract. The article also provides basic information on methods and tools currently used when adding additional floors to buildings in use, assessing the seismic strength of buildings recommended for reconstruction work, determining the reserves for increasing their earthquake intensity. The main part of the article details the methods of accounting for seismic loads in increasing the number of floors of buildings for organizations studying the technical conditions of buildings and structures operating in the Republic of Uzbekistan.

1 Introduction

It becomes a policy in the state administration to repair, rebuild, increase the number of floors of buildings, organize reconstruction so that existing residential buildings, production enterprises, socio-domestic and cultural buildings meet the requirements of the present time. This problem entails solving such issues as changing the shape, dimensions of buildings, replacing or strengthening structures, increasing the number of floors if possible. Excellent repair and reconstruction of buildings and structures in the cities of our country is carried out intensively. The perfect renovation and reconstruction of existing buildings, reconstruction of industrial enterprises in relation to new construction in modern construction, is carried out several times cheaper. In the Fergana region, there are many buildings and structures for reconstruction in the three major cities of Fergana, Kokand and Margilan. The following periods can be divided according to the time of construction of existing buildings in the city of Fergana alone. Capital construction plays an incomparable role in the socio-economic development of any country. In our country, great attention is paid to the development of this sector of the economy on a state scale. During the years of independence, many buildings and structures were erected in our country.

Special attention is paid to the issues of reconstruction of existing production enterprises in the Republic of Uzbekistan, their re-technical equipment, reconstruction and improvement of factories and their territories on the basis of modern requirements, the creation of good conditions for workers and employees working in them, large amounts of funds are allocated for these works from the state budget and non-budgetary sources.

Decrees of the president of the Republic of Uzbekistan, laws aimed at further development of the construction sector adopted in the House of Commons and Senate,

* Corresponding author: z.abobakirova@ferpi.uz

decisions of the Cabinet of Ministers, orders and orders of the ministries of the network, specific measures aimed at solving these issues have been developed and are being put into practice.

2 Materials and methods

PR-4794 resolution in the "Correctness of measures to radically improve the system of ensuring the seismic safety of the population and territory of the Republic of Uzbekistan"of the Prezdent of the Republic of Uzbekistan dated July 30, 2020, № 405 of the Cabinet of Ministers of the Republic of Uzbekistan dated June 30, 2021 "Assessment of the seismic strength of buildings and structures and implementation of the system.

In recent years, scientists of Uzbekistan in the field of Seismology have focused their main fundamental ideas and practical scientific research on the development and implementation of specific targeted measures to protect populations and territories from seismic danger [1-10].

Today, ensuring the seismic safety of the population and territory of the Republic and reducing casualties by pre-preparing for earthquakes in seismically active zones with a high probability of an earthquake largely determines the strategic development of the Republic.

The research carried out in the field of seismology is aimed at determining the nature of the earthquake, in which it is necessary to determine the laws of manifestation of earthquake clusters, to study the distribution of seismic waves by the mechanisms and parameters of the epicenter and their characteristics in the geological environment, to determine the location of the foci of the formation of earthquakes, it is focused on assessing regional changes in seismic risk and seismic fluctuations depending on the conditions of the grunt at the surface of the Earth and fading along the distance, and the seismic risk of the regions at different levels.

PR-144 of the president of the Republic of Uzbekistan dated May 30, 2022 "The concept of improving the system for ensuring the seismic safety of the population and territory of the Republic of Uzbekistan until 2025"consists in determining and implementing scientific and practical, software and organizational work until 2025, identifying the population residing in the seismic active zones of the Republic, The implementation of the concept, sustainable socio-economic development of Uzbekistan in the future and the possibility of rational distribution of available resources in emergency events are envisaged.

Development of a method for accounting for seismic loads in increasing the number of floors of buildings in all regions of Uzbekistan. Preparation of recommendations to ensure the existing consistency resources and seismic priority and safety.

3 Results and discussion

The day-to-day increase in the population of the Republic of Uzbekistan necessitates the growth of industrialization and the development of technological capabilities of the urban construction sector. Today, housing a family is an issue considered at the level of Public Policy. As a solution to this issue, the construction of the simplest form of low-rise housing of the standard series was carried out. Today, these areas have a convenient and reliable transport connection, developed engineering and social infrastructure.

Along with the development of the construction of new housing estates in the cities of our republic, the need for areas where construction is carried out has intensified. The expansion of the city limits will certainly lead to additional sar costs, these are: the purchase of land around the city, the conduct of engineering surveys of these areas, the transfer of engineering and electricity, the creation of a monand infrastructure to the image of a full city, etc. The above factors lead to an increase in the cost of a new object.

Studies show that reasonable use of existing buildings and structures in the urban area is necessary. In addition, it is important to look at the increase in the service life of these buildings by increasing the number of raw floors in expired buildings, as a single process that ensures their convenience and increased energy efficiency.

The main constructive-technological method of reconstruction of buildings is to increase the number of additional floors in buildings, change volumetric-plan solutions.

The decision on the reconstruction of buildings is made by studying all the technical and economic indicators and requirements for the building.

Based on real indicators, we can say that such processes as the reconstruction and overhaul of buildings are the target and rational usli of Urban Development. And the achievement of the specified goals can be achieved by increasing the number of additional floors in the premises where the service is passing. Because it does not require additional funds for construction and installation work, laying new engineering networks, transportation and cultural household improvement work. Increasing the number of additional floors in existing service-life buildings makes it possible to use the existing reserves of the load-bearing capacity of building structures and load-bearing, including foundations and foundations of the reconstructed building.

The construction practice of the European and CIS Estates shows that in the last 30-40 years, reconstruction work has been carried out by adding a double floor in a huge number of expired buildings.

Various construction organizations, research and project institutes offer organizational and technological solutions for adding additional floors, expanding buildings, expanding erkers and loggias, Diamond and strengthening structures, creating energy savings in buildings, replacing engineering networks, repairing roofs, etc. However, not all recommendations of foreign construction engineers can be applied to the territory of the Respublka of Uzbekistan [5-23].

The complex of these styles combines all the recommendations and accounting work presented in the accounting of seismic loads in increasing the number of floors of buildings. The purpose of this is to improve the quality of design, to reduce the seismic strength of buildings, errors, time consumption when designing. It is located in the seismic area of the Republic of Uzbekistan, and under the influence of seismic activity, major economic damage can be inflicted on buildings and our Republic. Especially in the Tashkent region, in the Fergana valley, areas are characterized where earthquakes are most common compared to other regions of the Republic. Settlements are densely populated in these areas, and many manufacturing enterprises are also located in these areas. The work to increase the number of floors through the construction of multi-storey residential buildings for the population, the reconstruction of old buildings is also intensively carried out precisely in seismic areas.

As can be seen from this information, when adding additional floors to buildings of existing use, assessing the seismic strength of the buildings recommended for reconstruction work, increasing their earthquake stability, determining reserves is one of the current issues.

A superstructure is the addition of one or more additional floors to buildings. It is cost-effective, while increasing the useful area in buildings:

- eliminates the reserve for additional land area;
- reduces financial costs;
- does not require solutions to problems associated with a number of activities in the construction process:
- building foundations, building external walls,
- the superstructure does not require landscaping work in khududud, where the building is being built;
- constructions of different types and tasks are used in capital construction (taking into account the requirements of Urban Planning Standards):

- mansardas of multi-apartment houses are actively used in cities where buildings are densely populated: similarly, the upper third floor of the taunhaus, duplex, quadrokhaus, Lanehouse
- an additional floor of an administrative or office building increases the useful area of the building;
- the addition of superstructure floors in industrial buildings makes it possible to increase production capacity.

When reconstructing buildings by adding an additional floor, there is a change in the object's negative-plan solutions:

- height;
- number of floors;
- area;
- size.

Buildings that are serving their service life can be carried out with or without strengthening the structures in the existing building (without loading the existing foundation, with the possibility of applying a separate foundation for the superstructure).

There are the following types of primers:

- construction of additional floors over existing structures of buildings;
- building mansards;
- dressing of small rooms and recreations on a functional exploitable roof;

Options for constructive solutions of overlays:

- new additional floor walls existing floors repeat the walls;
- non-dying of internal load-bearing walls with columns on the superstructure;
- envisioning a system with a separate frame for superstructure;
- performing overlays on separate supports;
- installation of progon or farms with high load-bearing capacity between the curtains;
- combine all the solutions listed above.

Overlays, that is, increasing individual parts or all parts of the building, are performed following the norms of urban planning and taking into account the volatile exploitative state.

Based on constructive signs, the overlays can be divided into three types: simple, constructive scheme modified and unloaded.

A simple superstructure (Figure 1, a) is a height – wise continuation of the building, with the building's internal structure, load-bearing walls with preserved dimensions, and other foundations. On most traditional two-story buildings, one-or two-story overhangs are built in a solution that visually reduces the technical condition of the foundations and foundations, as well as the walls. In buildings where overlays are built for periods of 10 years and earlier, the height of the building can be additionally increased to 1-2 floors. Such superstructures are performed in the process of exploitation when the base is compacted, the satisfactory halate of the foundations and the satisfactory of the walls and supports [5-7].

Superstructures (Figure 1, b), in which the structural schemes of the building change, are carried out by transmitting an additional load, that is, the additional floor weight under construction, reducing the main load-bearing elements of the existing building, to a poorly loaded or unloaded structure. It is recommended when it is not possible to achieve such a required size of the superstructure in a simple way, it is confirmed by checking the technical condition of the building. 1-Figure b shows the plan of the partitions of the building on which the superstructure will be built. Impact loads are assumed by longitudinal load-bearing walls. In the superstructures, additional floor closures load falls on the transverse walls. Thus, the superstructure mass is equidistant throughout the building: all walls are grown, but the load on the superstructure cover falls on poorly loaded transverse walls.

The structural scheme allows you to increase the interchangeable superstructure floors to 3-4 floors.

The load-bearing core of the superstructure floors has two constructive options. Superstructure floors can form a platform that can have any constructive solutions (Figure 1, s).

In addition, on each floor, load-bearing elements are applied, which are mounted on columns in the form of a beam, a farm, a rama (Figure 1, g).

Thus, an additional super structure of an object is understood as a kind of Kaysi of reconstruction. In its implementation, functional modeficalization of the capital construction department occurs:

1. the number of floors increases in existing or autonomous structures due to the construction of one or more additional floors;
2. basic classifications and all parameters change;
3. the amount of load on the foundation increases.

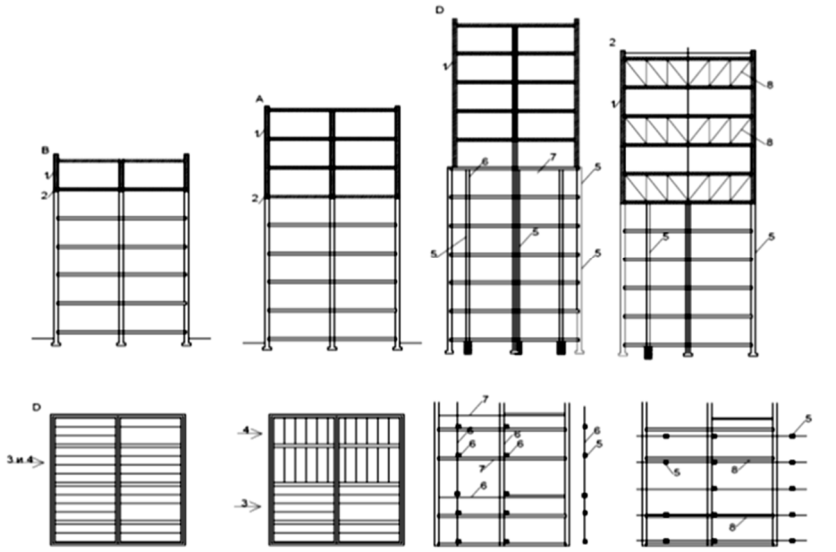

Fig. 1. Additional floor (superstructure) types and their constructive schemes: a-simple superstructure; b - the same, structural scheme modified; v – the same, as the base platform; g - the same, floors with intermediate beams (farms, frames); d – structural schemes of ridges and plans; 1 - superstructure Floor; 2 - wall bikrlik arches; 3 – the existing building's orientation Scheme; 4 – superstructure floor orientation scheme; 5 - superstructure columns; 6 - Foundation platform head beams; 7 – in the latter are cross – sectional beams; wall-balconies of the floors of the 8th superstructure.

When reconstructing with an additional floor - superstructure, it is required to check the technical condition of the object structures, and in this it will be necessary to clarify the quays:

- strength of the grunt under the influence of additional load;
- tolerance of existing load-bearing structures and foundations to increased loads;
- the need to strengthen foundations;
- the real state of constructive elements of structures and engineering communications:
- facade;
- attic and roof structures;
- pipe laying areas, building ventilation system elements, etc;

- the potential risk that an additional floor will be located next to the planned reconstruction object;
- cocktail complexes, public buildings and business centers, but with the exception of:
  - settlements near streets and roads in Qin
  - in and near areas of historical importance
  - the completion of the new construction in the government-regulated municipalities;
  - railway stations, transport facilities and transport stops – except as follows;
  - next to the road network;
  - in the territory of residential complexes;
  - in places where construction work is regulated;
  - buildings and structures of industrial enterprises located near residential buildings and recreation areas and in the eyes of many;
  - socially significant objects used on the basis of funds allocated from the maximum budget;
  - other objects.

When studying the method of accounting for seismic loads in increasing the number of floors of buildings, methods for reconstructing low-rise, that is, 4-5-storey buildings in the Fergana region were analyzed. The terms of service for the excellent repair and reconstruction of these buildings by the standards have expired, but most such buildings have sufficient reserves and respond to the impact of loads. They were subjected to spiritual decay. All these indicators indicate that the reconstruction of buildings is possible[2-15].

When increasing the number of floors of buildings, that is, reconstruction, it will be necessary to choose the most optimal solution to the following issues:

- achieve maximum increase in useful area with minimum expansion of construction area;
- modernization of engineering networks;
- improving the architectural fear of facades;
- ensure seismobardality.

Solving seismic safety problems is one of the most important tasks of socio-economic development of seismically active areas. Every seismic activity is characterized by its socio-economic and environmental consequences on its natural parameters. The level of disasters depends on many factors: the parameters of the earthquake that took place, the seismic level of the building, the extensibility of secondary side effects, the readiness of state authorities for immediate rescue and recovery work, etc. Thus, in any conditions, especially when reconstructing buildings by increasing the number of floors over the service life, it is necessary to achieve that the seismic strength of the building is within the established standards.

In the reconstruction of existing buildings in the Fergana region, the provision of seismobardoshlity established in the norms was studied. In increasing the number of floors of existing buildings by reconstruction, it is promising to build overlays, especially taking into account seismic loads and seismicity of the area. Therefore, in increasing the number of floors of buildings serving their service life, the seismobardality of the “building-superstructure” system was investigated. In the course of research, the joint seismobardality of existing buildings with superstructure was assessed [1-4].

4 Fundamentals of ensuring seismic priority and safety of buildings-structures

On May 30, 2022, the decree of the president on "measures to further improve the system of ensuring the seismic safety of the Republic of Uzbekistan" was adopted.

Currently, the issues of ensuring the seismic safety of buildings and structures are leading in the construction of world practice. In this regard, some progress has been made in developed countries of the world, with particular attention being paid to the development of constructive solutions and antiseismic measures and the improvement of computational methods to ensure strength and earthquake stability in the design of buildings and structures.

It is known that Uzbekistan is among the active seismic regions. Therefore, the issues of the construction of buildings and structures and their earthquake stability are always relevant. In the above decree of the head of our state, these issues are taken into account. They are responsible and a number of important tasks are set for specialists to be solved and completed. [9-13].

In particular, due to the increase in automated complex-prognostic stations, it became a vital necessity to expand the possibility of full monitoring of the territory of the Republic, to ensure constant communication of the national network of seismic observations with stations included in the global system of international seismic observations, to develop science and education in the field, and to regulate the activities of [5-9].

The decree also sets out personal responsibility and responsibility for the first heads of state bodies to ensure the timely and effective implementation of the measures established by the deeply thought-out concept and the "road map". In addition, the Space Research and Technology Agency under the Cabinet of Ministers, the Academy of Sciences, emergency situations, higher and secondary special, Innovative Development, Construction, Housing and communal services, water management, Transport ministries and related industry agencies are tasked with eliminating existing problems in the field.

At the same time, since September 1, 2022, the introduction of the procedure for obtaining conclusions on earthquake relations to objects belonging to Category IV (objects with the highest risk factor), the risk factor under which a new construction is planned in the seismic active zones of our republic, And since October 1, it is another aspect of recognition that the procedure for introducing proposals for the gradual introduction of new housing in the territory of the Republic into the local state authorities in the place of seismically weak and accident-prone housing, which, according to the results of which the period of operation has been completed, has been established and the practice of

Starting in 2023, a series of construction planned or selected buildings and structures with a height of 9 floors or higher in the seismic active zones of the Republic, testing and inspection using vibrodynamic equipment or modern digitized instrumental equipment was established in order to increase the earthquake intensity, ensure quality and eliminate defects in advance [4-23].

5 Conclusions

In conclusion, it can be said that the effective implementation of the execution of this decree plays an important role in ensuring the seismic safety of buildings and structures on the territory of our country. Many risks that can occur are taken. The level of training of the population and management bodies in the Prevention of casualties increases, in this direction the development of science and education, the system of training of high-potential personnel reaches a new level.

Therefore, in order to take into account seismic loads in increasing the number of floors of buildings serving the service life of buildings, it is necessary to develop volumetric - plan

and constructive solutions that will fully respond to its long - term use as early as the design stage: solid, crispy and resistant materials must be selected; they must be protected from atmosphere, humidity-temperature, technological.

The increase in earthquake stability of buildings and structures with an increasing number of floors can be achieved at the expense of optimizing their constructive scheme, enlarging Assembly elements, reducing nodes and attachment seams.

To ensure the suitability of buildings for a full accounting period of service, it is required to periodically undergo technical inspections and inspections, timely elimination of emerging defects, current and overhaul, quality maintenance. Timely complete elimination of defects identified as a result of technical inspection, restoration of working capacity of load-bearing structures, ensuring reliability, maintaining operational indicators of building-structures at the level of regulatory requirements, serving as a guarantee of their safe use for a long time.

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