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FLEXIBLE FLOOR BUILDINGS AND SEISMICITY

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Abstract
The article talks about the development of methods for increasing the seismic resistance of existing buildings by using elements of parametric design, design solutions for active seismic protection devices using local raw materials, generative design, kinetic architecture, microfabrication, parametric solutions. The article uses scientific research by a number of scientists [1-30].

Keywords: Seismic protection systems, seismic adaptation, adaptive systems, generative design, kinetic architecture, parametric modeling, IT in construction production, digitalization of construction production, ecology, construction practice, economics, service life accounting, duration, quality.

Introduction

Extensive measures are being taken in our republic to ensure the seismic safety of buildings and structures in emergency situations. According to the Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 "On the new development strategy of Uzbekistan for 2022-2026" on increasing the seismic resistance of buildings and structures, seismic waves and paraseismic impacts. to determine the stress-strain state, vibration and displacement of a building and its environment under the influence of forces using digital calculation methods, One of the important tasks is the development and development of methods aimed at ensuring the stability of indicators that increase the static strength of structures, taking into account the peculiarities of the interaction of buildings and structures with an elastic environment.

The Republic of Uzbekistan is located in an earthquake-prone zone, and most territories are subject to seismic impacts of varying strength, duration and manifestation.

In modern design solutions, it is impossible to ensure earthquake resistance only by increasing the cross-section, strength and weight of the structure. The structure may be very robust, but the economic efficiency may be unsatisfactory, and the inertial seismic force may increase. This requires new effective methods of seismic protection. These methods include changing the mass and stiffness of the system or changing the armature to account for movements and velocities.

In carrying out this task, special attention is paid to the development of methods to increase the seismic resistance of existing buildings by using parametric design elements in the development of structural solutions for active seismic protection elements. Today, the construction of high-rise buildings in seismically active regions of the world and the Republic of Uzbekistan continues at a rapid pace, while the issue of ensuring the seismic resistance of existing buildings and structures remains relevant.

From the point of view of seismic resistance, the reliability of existing buildings and structures is ensured not only by the strength of the structural material, but also by their shape and size. There are various calculation models and calculation methods aimed at ensuring the seismic resistance of buildings and structures, their seismic safety, and, despite scientific research aimed at improving them, studies conducted using parametric design elements in solving this issue and the results obtained have a small percentage.

In the process of studying the research problem, research works in the field of seismic resistance in Russia, Turkey, Japan and Mexico were studied. In particular, I.L. Korchinsky, A.I. Studied the research works of Saitlin and academician E. Khachiyan on constructive solutions of the "flexible floor" as an element of seismic protection of buildings.

Therefore, the choice of accurate models reflecting the spatial operation of a building under seismic influence and the development of a method for their dynamic calculation remains an urgent task and is the next step in the development of structural theory in structural mechanics.

Method

Currently, in the technically developed countries of the world, more and more attention is being paid to improving the seismic resistance of buildings, developing its methods and improving it. Experimental research in this direction has been conducted in the last decade in scientific laboratories and centers in Japan, the USA, New Zealand, CIS countries and India. It should be noted that dozens of different technical solutions have been proposed in the field of seismic protection of buildings and structures. Most of these proposals have been implemented. Today, scientific research in this direction is also underway in Uzbekistan.

Earthquakes kill people and cause huge damage to the most important spheres of human activity and property worth billions of soums. The issue of protecting buildings and structures from seismic impacts has been facing people since the first earthquakes in the history of mankind and has not lost its relevance to this day. Today, with the development of science and technology, research in this area is especially relevant. Recent devastating earthquakes underline this fact.

Although seismologists and engineers strive to limit or prevent the effects of earthquakes through knowledge gained through years of observation and research, scientific research in this area has achieved effective results, however, it cannot be considered that the goal has been achieved.

Special seismic protection, which includes parametric design elements, is implemented by changing flexibility (compliance). In this case, antiseismic elements are introduced to reduce the seismic impact on construction sites under scientific research. They serve to isolate the protected part of the building from seismic effects. Therefore, the second name of special seismic protection is seismic isolation. Compared with traditional methods, the use of methods to increase the seismic resistance of existing buildings through the use of parametric design elements reduces the seismic impact and increases the necessary seismic resistance of the construction system. At the same time, it should be noted that often a combination of various structural elements is used in architectural and structural solutions of a building, for example, a combination of load-bearing elements of a building frame and a wall. system. This approach allows not only to create an interesting composition of the building, but also to solve many problems related to providing comfortable living conditions in it.

Among the main disadvantages of the existing seismic protection, its relatively low level of efficiency and reliability should be noted. The fact is that in many countries of the world there are measures for seismic protection of construction sites, and despite the fact that they are considered mandatory, after strong earthquakes, destruction, casualties and loss of life are always recorded. Today, the contradiction in society is clearly visible. The needs of society are growing, naturally, and the requirements for seismic protection are increasing accordingly. Unfortunately, the quality of seismic protection remains at the same level.

The reason for the discrepancy is simple – the unpredictability of seismic impacts, the diversity of the construction system from an architectural and structural point of view, and the high degree of its diversity and uncertainty. As a result, any constructive decision we make will have the status of an assessment or forecast, the accuracy of which will be determined only in the event of a catastrophic earthquake.

Therefore, the unequivocal conclusion is to reduce the existing uncertainty and imbalance to the level of constructive measures taken by society. It should be noted that the concept of an acceptable level is to reduce the number of victims and the level of material (economic) losses of society.

It is used in modern solutions of buildings and structures with a reinforced concrete structure "flexible ground floor" both without filling and with partially filled walls. Unfortunately, strengthening the flexible overlap system leads to a change in its dynamic parameters, which directly affects the seismic insulation characteristics of the seismic protection.

A striking example of this approach is the use of "flexible overlap" through the columns of the building frame of a single structural system, including large-panel buildings, buildings with a monolithic wall system, stone and other buildings. An example of such solutions is the high-rise building of the ASIA-UZ hypermarket (the old TSUM building), located in the center of the city of Ferghana, shown in Figure 1, which includes elements of a "flexible floor".

Figure 1. A building with elements of a "flexible floor" in the city of Ferghana

In construction practice, the flexible ground floor seismic protection can be widely used due to its structural simplicity, cheapness, efficiency and reliability. Considering that the city of Ferghana is located in an 8-point seismic zone, and these buildings are located in an 8-point seismic zone. they are susceptible to seismic effects. If their behavior differs significantly from that of conventional buildings, then a "flexible floor" can perform different functions. Thus, in buildings with a single structural system, the I.L. method is useful. Korchinsky, in which, as an

example, the construction of a large panel building based on the frame of the lower floor is shown (Fig. 2), which performs the functions of a flexible floor.

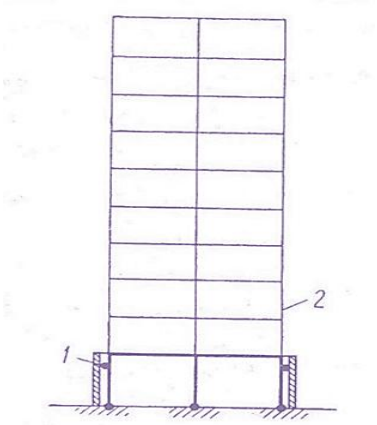

Figure 2. Diagram of a large panel house with a "flexible floor" at the bottom

1- the "flexible floor" part of the building; 2- the rigid part of the building

Conclusion

The scientific novelty of the study lies in the fact that methods for increasing the seismic resistance of buildings and structures have been developed based on the principles of parametric modeling and determining the dimensions of an active seismic protection device, their indicators and materials, as well as the formalization of drawings of its parts based on strength calculations. It is planned to develop methods to increase the seismic resistance of existing buildings through the use of parametric design elements, constructive solutions for active seismic protection devices using local raw materials. On this front, to achieve the application of generative design, kinetic architecture, microfabrication, parametric design in the automatic monitoring of buildings and structures.

At the same time, in order to apply the results of this project in buildings and structures located on the territory of the Republic of Uzbekistan, recommendations will be given to relevant organizations and work will be carried out in cooperation.

In conclusion, calculation methods and calculation programs for increasing the seismic resistance of existing buildings through the use of parametric design elements have been developed.

1. The use of a "flexible floor" in buildings with a single structural system can be used not only to solve architectural and planning problems, but also to perform the function of seismic protection of the building. At the same time, the "flexible floor" can be located at different heights.

2. The introduction of a "flexible floor" into the building's seismic protection system leads to a change in its frequency characteristics: by increasing the flexibility of the elements, the seismic load on the building is reduced.

References

[1]. Goncharova, N., Abobakirova, Z., Davlyatov, S., Umarov, S., & Mirzababayeva, S. (2023, September). Capillary permeability of concrete in aggressive dry hot climate. In E3S Web of Conferences (Vol. 452, p. 06021).

[2]. Mirzababaeva, S. (2023). THE ESSENCE OF THE COEFFICIENT OF VARIATION IN THE PROBABILITY APPROACH IN CHECKING THE STRENGTH OF CONCRETE AND REINFORCED CONCRETE STRUCTURES. *Spectrum Journal of Innovation, Reforms and Development*, *21*, 260-266.

[3]. Operation of reinforced concrete beams along an inclined section under conditions of one-sided heating, Umarov, S., Mirzababayeva, S., Abobakirova, Z., Goncharova, N., Davlyatov, S. *E3S Web of Conferences*, 2024, 508, 05001.

[4]. Y Karimov, I Musaev, S Mirzababayeva, Z Abobakirova, S Umarov, Land use and land cover change dynamics of Uzbekistan: a review, E3S Web of Conferences 421, 03007

[5]. Tolqin, A., & Mirzaakbarovna, M. S. (2023). ON THE REDUCTION OF MATERIAL CONSUMPTION AS A RESULT OF THE USE OF HIGH STRENGTH CONCRETE IN CENTRAL COMPRESSION REINFORCED CONCRETE COLUMNS. *Spectrum Journal of Innovation, Reforms and Development*, *22*, 170-174.

[6]. Tolqin, A., & Mirzaakbarovna, M. S. (2023). STRENGTHENING OF FOUNDATIONS AND FOUNDATIONS. *Spectrum Journal of Innovation, Reforms and Development*, *22*, 162-169.

[7]. Mirzababayeva, S., Abobakirova, Z., Umarov, S. Crack resistance of bent concrete structures with fiberglass reinforcement, E3S Web of Conferences, 2023, 452, 06023.

[8]. Mirzababayeva, S. M. (2022). Binolarning yuk ko ‘taruvchi konstruktsiyalarini ekspluatatsiyaviy ishonchliligi. *International conference on learning and teaching*, *1*(6), 110-115.

[9]. Numerical simulation of laminar symmetric flow of viscous fluids. Madraximov, M., Abdulkhaev, Z., Ibrokhimov, A., Mirababaeva, S. *AIP Conference Proceedings*, 2024, 3119(1), 040003.

[10]. Comparison of current and expired norms for the development of methods for checking and monitoring the seismic resistance of buildings.Shodiljon Umarov, Khusnitdin Akramov, Zebuniso Abobakirova and Saxiba Mirzababayeva, E3S Web Conf., 474 (2024) 01020, DOI: https://doi.org/10.1051/e3sconf/202447401020.

[11]. Abdulkhaev, Z., Madraximov, M., Abdujalilova, S., Mirzababayeva, S., Otakulov, B., Sattorov, A., & Umirzakov, Z. (2023, September). Flow trajectory analysis and velocity coefficients for fluid dynamics in tubes and holes. In E3S Web of Conferences (Vol. 452, p. 02010).

[12].]. Metodology for checking the seismic strength of buildings based on existing norms Abobakirova, Z., Umarov, S., Davlyatov, S., ... Nasriddinov, H., Mahmudov, A. *BIO Web of Conferences*, 2024, 105, 05014.

[13]. Improving the thermal properties of lightweight concrete exterior walls.
Goncharova, N., Ababakirova, Z., Davlyatov, S., Umarov, S., Mirzababayeva, S. *E3S Web of Conferences*, 2024, 508, 05002.

[14]. SHISHA KOMPOZIT ARMATURALAR BILAN ARMATURALANGAN BETON TO‘SINLARNI MUSTAHKAMLIGI VA BIKRLIGINI TADQIQ ETISH. J.D. AXMEDOV S.A. UMAROVZ.A. ABOBAKIROVA, S.M. MIRZABAYEVA, 2024/10, ARXITEKTURA. QURILISH. DIZAYN, № 3, 559-564, “The Scientific-Practice Journal of Architecture, Construction and Design”.
[15]. FOYDALANISHDA BO‘LGAN BINOLARNING SEYSMIK MUSTAHKAMLIGINI TA’MINLASH BO‘YICHA TAVSIYALAR, Sh.A. Umarov S.M. Mirzababayeva, Z.A. Abobakirova, 2024/10, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2024,Том 28, Номер спец.выпуск № 20, 115-122
[16]. Мирзабабаева, С. М. (2023). ТЕМИРБЕТОН КОНСТРУКЦИЯЛАРДА ҲИМОЯ ҚАТЛАМИНИНГ БУЗИЛИШИ, УЛАРНИ БАРТАРАФ ЭТИШ: ТЕМИРБЕТОН КОНСТРУКЦИЯЛАРДА ҲИМОЯ ҚАТЛАМИНИНГ БУЗИЛИШИ, УЛАРНИ БАРТАРАФ ЭТИШ.
[17]. BINO-INSHOOTLARNI TEXNIK TEKSHIRISHDA QO‘LLANILUVCHI USULLAR. Мирзабабаева Сахиба Мирзаакбаровна, 2023/12, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023,), Том 27, Номер 20, 62-66
[18]. ASOSLAR VA POYDEVORLARNI KUCHAYTIRISH. Мирзабабаева Сахиба Мирзаакбаровна, 2023/12, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023,) Том 27, Номер 20, 49-54
[19]. ASOSLAR VA POYDEVORLARNI KUCHAYTIRISH. Мирзабабаева Сахиба Мирзаакбаровна, 2023/12, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023,), Том 27, Номер 20, 49-54
[20]. G‘ISHT DEVORLI BINOLARDA HOSIL BO‘LUVCHI NUQSON VA SHIKASTLANISHLAR VA ULARNI BARTARAF ETISH, MC Мирзаакбаровна, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023, Т.27
[21] INTEGRTSIYA - MALAKALI KADRLAR TAYYORLASH NEGIZIDIR, MC Мирзаакбаровна, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023,) 27 …
[22]. BETON VA TEMIRBETON KONSTRUKTSIYALAR MUSTAHKAMLIGINI TEKSHIRISHDA EHTIMOLIY YONDOSHUVDA VARIATSIYA (O‘ZGARUVCHANLIK) KOEFFITSIENTINING MOHIYATI, MC Мирзаакбаровна, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2022,) 27
[23]. Rekonstruktsiya qilinuvchi bino-inshootlarning ekspluatatsiya ishonchliligi tadqiq etish. MC Мирзаакбаровна , Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023) 15 …
[24]. KOMPOZIT ARMATURALI BETON TO‘SINLARNING TUZILMASI. Sh.A. Umarov, Z.A. Abobakirova, S.M. Mirzababaeva, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023) 14 …
[25]. BINOLARNING SEYSMIK MUSTAHKAMLIGINI TEKSHIRISH VA MONITORING QILISH METODIKASINI ISHLAB CHIQISHDA QURILISH ME’YORLARINING QIYOSIY TAHLILI SAU S.M. Mirzababaeva, Z.A. Abobakirova, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2023,) 14

[26]. SEYSMIK MUSTAHKAMLIKNI TEKSHIRISH VA MONITORING QILISHDA BINOLARNING SHIKASTLANGAN DEVORLARINI KUCHAYTIRISHNING SAMARALI USULLARINI ISHLAB CHIQISH SAU S.M. Mirzababayeva, Z.A. Abobakirova, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ) 27 (№10
[27]. BINOLARNING SEYSMIK MUSTAHKAMLIGINI TEKSHIRISH VA MONITORING QILISH USLUBLARI. SMM Z.A. Abobakirova, Sh.A. Umarov, Scientific-technical journal 27 (№10)), 41-47
[28]. ИССЛЕДОВАНИЕ ДЕФОРМАЦИЙ АРМАТУРЫ И БЕТОНА ИЗГИБАЕМЫХ БАЛОК СО СТЕКЛОПЛАСТИКОВОЙ АРМАТУРОЙ. ШУС Мирзабабаева, Scientific-technical journal (STJ FerPI, ФарПИ ИТЖ, НТЖ ФерПИ, 2022,) 2
[29]. ZAMONAVIY TEXNOLOGIYALARDAN FOYDALANGAN HOLDA FASADLARNI TADQIQ QILISH USULLARI. MC Мирзаакбаровна, STJ FerPI 14 (14), 67-71
[30]. Махкамов, Й. М., & Мирзабабаева, С. М. К РАСЧЕТУ ИЗГИБАЕМЫХ ЭЛЕМЕНТОВ, РАБОТАЮЩИХ В УСЛОВИЯХ ВОЗДЕЙСТВИЯ ПОВЫШЕННЫХ И ВЫСОКИХ ТЕМПЕРАТУР НА ПОПЕРЕЧНУЮ СИЛУ ПО НОВОЙ МЕТОДИКЕ. ЖУРНАЛИ, 109.