TO STUDY THE EXPERIENCE OF USING MODERN INNOVATIVE SEISMIC PROTECTION SYSTEMS IN THE DESIGN OF SKYSCRAPERS

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Abstract: *According to the local police of the state of Japan, about 130 thousand buildings and structures were destroyed and damaged as a result of the worst earthquakes in the history of the country and the subsequent tsunami. However, the largest of them, the skyscrapers, survived, and they were able to show that they were earthquake-resistant to natural disasters.*
Key words: *destructive effects, special technological solutions, external loads.*

In March 2011, more than two hundred thousand people watched a video of the Tokyo skyscrapers being photographed during an earthquake on YouTube.

- Earthquakes in Japan often occur during breakfast, lunch and dinner. Local scientists pay special attention to protection from this disaster, - said Mergen Abakanov, Deputy Director General of the Research Institute of Earthquake Engineering and Architecture of Kazakhstan. - They calculate the foundations for seismic resistance, use critical-mesh systems, effectively use a virgin diaphragm and various seismic protection devices.

Ensuring resilience to the destructive effects of earthquakes in the construction of skyscrapers is a unique set of engineering measures. The purpose of these measures is to reduce the impact that can occur on the upper part of the building by damaging the value of the seismic force acting between the building and the ground.

Earthquake-resistant buildings must meet several of the most important requirements: the symmetry of structural schemes, a uniform distribution of masses, and the correct use of building materials. The main element that allows to increase the stability of modern skyscrapers is a metal frame, which is branched using a central support (column) made of steel.

Steel frames made on the basis of special technological solutions can not only adequately withstand seismic forces, but also ensure reliable operation of structures under the influence of future earthquakes. These seismic forces can be divided into two groups: the first will be placed at the bottom of the skyscrapers, and the second will be distributed over the entire height of the building.

By constructive ideas belonging to the first group, it can be understood that an additional object appears between the building itself and the floor, which allows to extinguish the horizontal vibrations in the soil layer. The types of these additional objects can be many: it can be a lead-rubber base, a spring vibration damping device (damper) or a sliding base.

Several nine-story panel buildings in Almaty, which are seismically uncomfortable, stand on a gabled structure: during the earthquake, the ground beneath the apartment building appears to have shaken slightly, while the house itself remains in place. In Japan, on the other hand, lead-rubber supports are often used - cylindrical rubber devices with a high flexibility of the lead core with a diameter of about one and a half meters. During an earthquake, the lower part of the base moves along with the ground, while the upper part remains in place, allowing the building to maintain its direction in space for some time [4,5].

The second group is the idea of reducing the impact of seismic loading along the height of a building. In particular, the use of a virgin diaphragm in high-rise buildings is mandatory here. They cause a redistribution of energy between vertical load-bearing structures and inertial dampers acting as a pendulum (when the building is tilted to one side and the pendulum tries to return the building to its previous position). Such dampers were installed in the Taipei 101 skyscraper, which in 2002, while still under construction, experienced a magnitude 6.8 earthquake. Inside the tower, on the 88-92 floors, there is a sphere weighing 660 tons. It consists of 41 steel plates, which are held by eight steel ropes and eight springs. possible.

In order to select the exact type of seismic wave absorber, it is necessary to know the seismological data of each construction site, as well as their specific geological characteristics to record their velocity, acceleration and displacement.

An earthquake in 1995 in Kobe, Japan, destroyed about 200,000 buildings and killed 6,434 people. The results of the earthquake study showed that many skyscrapers in the city did not meet the earthquake resistance requirements adopted in 1981 at all.

At that time, the builders had built old-style weak wooden roofs and multi-ton roofs on the towers, which further intensified the effects of strong winds and typhoons. However, under the influence of the earthquake, unstable curtains collapsed and heavy slabs on the roof overwhelmed the structures from top to bottom. Recent events show that Japanese builders have learned from their mistakes in the past and changed their approach to building skyscrapers.

The design of seismic structures is a very complex issue. This is because seismic forces are formed not only under the influence of external loads, but also in the process of vibration of structures. This situation has identified two ways to increase the seismic strength of structures, namely traditional and special methods.

Traditional methods are mainly concerned with reducing the mass of structures, increasing their strength and virginity properties, as well as choosing rational constructive types and planning solutions. Special methods of seismic protection are very important for high-rise buildings, which are associated with the targeted modification of the dynamic schemes of operation of structures [1].

Thanks to a specially adopted government program of the Japanese state to support scientific research on the development of innovative technologies of seismic protection of buildings and the development of seismic protection design standards and ranked first in the world in the number of buildings (more than 3,000 buildings and structures). One of the technical solutions adopted is to increase the virginity and priority of these structures. For example, in the Harumi Island Triton Square office complex in Japan, vibration control devices are located around the perimeter of the main building, which protects load-bearing columns and beams from strong earthquakes (Figure 1). As a result, three adjacent buildings are interconnected by a damping system. This helps to reduce the vibration caused by wind pressure and provide a comfortable environment inside the rooms.

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Figure 1. Harumi Island Triton Square office complex, Japan, 2001.

Figure 2. Nikken Tokyo Building, Japan, 2003.

A vibration control system was also used in the Nikken Tokyo Building in Japan (construction completed in March 2003) (Figure 2) [3].

The above brief comments provide examples of building design using innovative systems of seismic protection of buildings in Japan, as well as some modern methods of seismic protection of buildings. In particular, it was noted that one of the most effective ways to ensure the reliability of high-rise buildings and structures is the effective use of seismic protection and damping devices.

The use of innovative seismic protection systems allows to reduce the seismic forces acting on buildings by 2-3 times. Naturally, the use of vibration control systems in buildings increases costs, but seismic resistance indicators (including the reliability of load-bearing structures and equipment) increase.

Thus, a significant increase in the following indicators can be achieved through the implementation of proper design work on the effective use of seismic protection and seismic extinguishing means:

- reliability of buildings increases;
- safety and reliability of equipment is ensured;
- economic performance of buildings will increase;
- there is no need to carry out rehabilitation work after strong earthquakes;
- Convenient and comfortable conditions will be created for the population.

REFERENCES:

1.Зеленицкий И. Япония научилась на собственных ошибках и строит сейсмоустойчивые небоскребы.// "Коммерсант. Наука" №1 от 01.04.2011, стр. 17.
2.Architector [Электронный ресурс]: Harumi Island Triton Square, Япония,2001.
3.Architektonika [Электронный ресурс]: Nikken Tokyo Building, Япония,2003.
4. Б.С.Рахмонов. Иншоотлар динамикаси ва зилзилабардошлиги асослари.Ўқув қўлланма.Урганч.2012 й. 275 бет .
5.Б.А.Ҳобилов, У.Фахриддинов**.** Бино ва иншоотлар зилзилабардошлиги. Дarslik 1 ва 2-қисм.Тошкент,2014. 272 бет.

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