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Seismic Insulation Works of Buildings and Structures Using Fluoroplastic

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Abstract:

Ensuring the seismic resistance of buildings and structures is a factor that must be taken into account, especially when constructing in seismically active areas. Nowadays, one of the main approaches to increasing seismic resistance is the use of various seismic insulation systems. It is not always profitable and rational to increase the seismic resistance of building structures or foundations for equipment by simply increasing strength.

Keywords: elastomeric supports; spring supports; seismic isolation; seismically isolated buildings and structures; seismic resistance.

Uzbekistan is located in a seismically active zone. According to official data, on the territory of the republic 359 cities and towns are located in seismically active zones. In these places, earthquakes can be from 7 to 9 points or even higher.

Since the 70-80s of the last century, seismic protection systems - seismic isolation systems (SIS) - have increasingly been used in construction. Seismic insulation systems based on rubber-metal supports (RMS) and elements with increased plastic deformation have become widespread throughout the world.

There are a number of foreign companies that develop and manufacture RMO systems of a diverse range and high quality. The leaders are FIP Industrial, Maurer Sohne, Robinson Seismic, Earthquake Protection Systems, Dynamic Isolation Systems, Scougal Rubber and others. Most of them offer combinations of rubber-metal bearings (RMM) with various types of metal damping elements.

There is a constant search for the most effective damping elements that work in parallel with elastic ones. The principle of their operation is based on plastic deformation of special metal elements.

It is proposed to implement the seismic isolation mechanism as follows.

The lower reinforced concrete slab of the building is concreted on this layer, and the building itself is erected on it.

To ensure that a structure displaced as a result of a seismic shock returns to its initial position of stable equilibrium, the supporting elements should be made in the form of convex and concave pyramidal planes to generate a gravitational restoring force (Fig. 1).

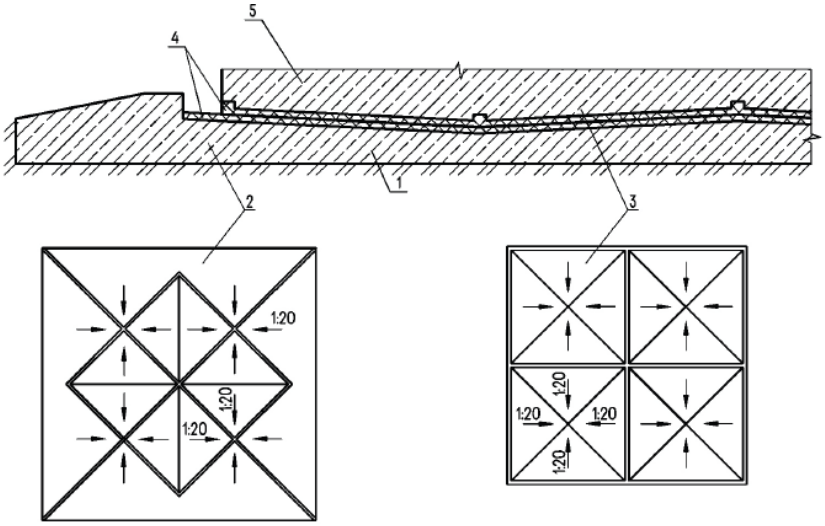
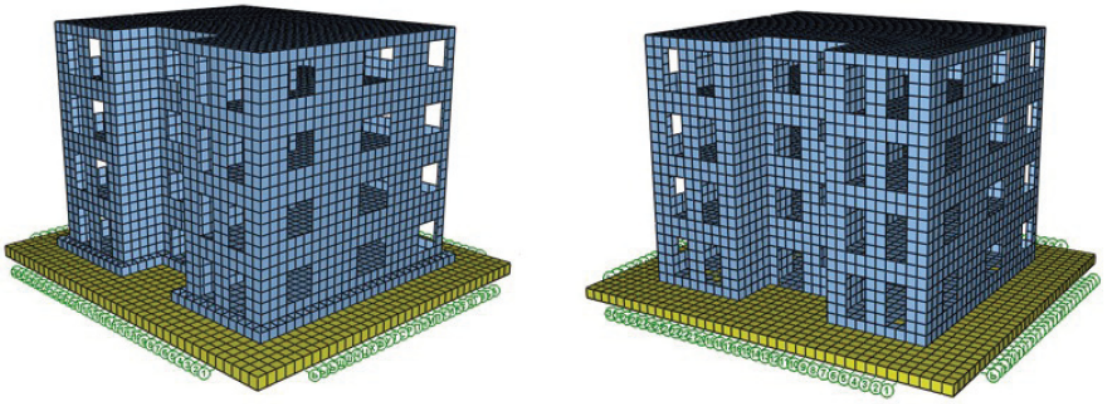


Figure 1. Diagram of the seismic isolation mechanism of the building: 1 - foundation; 2 schematic illustration of foundation slopes; 3 - schematic representation of the slopes of the bottom slab of the building; 4 – fluoroplastic plates; 5 – building.

Based on the selected design diagram of the seismic isolation mechanism, two FEMs of the building were created: one including the seismic isolation mechanism, and a similar one without it, in PC SCAD.



Seismic isolated building **Non-seismically isolated building**

Figure 2. Calculation models

Comparison of the calculation results of a seismically isolated building and a building without SSI confirms the effectiveness of the seismic isolation of the building, because When installing SSI under the foundation of a building, normal stresses in vertical structural elements are reduced by an average of 80%.

To assess the damage to the structure after the destruction of the most loaded pier, a calculation was

made for the progressive collapse of the structure without seismic insulation; the result of the calculation is the strength separation isofields.

The area of destroyed horizontal structures is 603.5 m2, which is 95% of the area of all horizontal structures of the building.

The area of destroyed vertical structures is 51.5 m2, which is 20% of the area of all horizontal structures of the building.

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