THE WIDE USAGE OF VISCOUS SEISMIC PROTECTION IN IMPROVING THE RESISTANCE OF BUILDINGS FOR EARTHQUAKE

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Annotatsiya: Ushbu maqolada hozirgi kundagi dolzarb muammolardan biri bo'lgan seysmik faol hududlardagi binolarning zilzilabardoshliligini oshirishda qo'llaniladigan zilzilaviy himoya vositalari, ularning turlari va qo'llanilishi haqida so'z boradi. Bundan tashqari, ko'p qavatli binolarda qavatlararo zilzilaviy himoya vositalaridan foydalanish orqali ularning zilzilabardoshliligini takomillashtirish haqida so'z yuritilgan.

Kalit so'zlar: zilzilaviy himoya vositalari, seysmik demfer, viscus demfer, metal chevron tirgak, dioganal tirgak, ustun tizimi, vaqtinchalik ta'sir, poydevor himoya tizimi.

Аннотатция: В данной статье рассматриваются средства сейсмозащиты, их виды и области применения, которые используются для повышения сейсмостойкости зданий в сейсмоактивных районах, что является одной из актуальных проблем. Кроме того, говорят о повышении сейсмостойкости многоэтажных зданий за счет применения межэтажных устройств сейсмозащиты.

Ключевые слова: устройства защиты от землетрясений, сейсмический демпфер, демпфер вязкости, металлический шевронный раскос, диагональный раскос, колонная система, временный эффект, система защиты фундамента.

Abstract: In this article deals with earthquake protection tools, their types and applications, which are used to increase the earthquake resistance of buildings in seismically active areas, which is one of the current problems. In addition, there is talk about improving the earthquake resistance of multi-story buildings by using inter-floor seismic protection devices.

Key words: earthquake protection means, seismic damper, fluid viscous damper, steel chevron brace, diagonal bracing, outrigger system, transient shock, base-isolation system.

Nowadays, in the construction practice of the developed countries of the world, the issues of ensuring the seismic stability of multi-story buildings by using devices that extinguish the energy of earthquake force occupy a leading place. Some progress has been made in this regard, and one of the important tasks is the development of structural solutions and anti-earthquake measures to ensure stability and earthquake resistance in the construction and reconstruction of multi-story buildings, as well as the improvement of theoretical calculation methods. At the same time, the disastrous consequences of a series of earthquakes in different countries, in which many destructions of buildings built in different periods reveal a number of problems that require urgent solutions. Taking into account the scale of damages and victims, in seismically active areas, including Uzbekistan, it is of particular importance to ensure the seismic safety of buildings and structures, as well as their anti-seismic strengthening, the use of earthquake protection means and economically appropriate spending of material and labor resources.

In world's experience, great importance is attached to the creation of devices designed to increase the seismic strength of existing and newly constructed buildings, to reduce the impact of seismic forces on buildings and possible damage caused by them. In this regard, including the use of seismic force damping devices in buildings, improving the methods of calculating the impact of earthquakes on buildings, and installing inter-floor seismic protection devices (dampers) in existing buildings, calculating the effect of seismic forces, calculating with the help of a computer program, earthquake energy that reduces the energy of earthquake force appearing in buildings. It is one of the important tasks to carry out targeted scientific research in directions such as the development of a design method using protective means (damper).

Damping is one of many different methods that have been proposed for allowing a structure to achieve optimal performance when it is subjected to seismic, windstorm or other types of transient shock and vibration disturbances. Conventional approach would dictate that the structure must passively attenuate or dissipate the effects of transient inputs through a combination of strength, flexibility, deformability and energy absorption. The level of damping in a conventional structure is very low, and hence the amount of energy dissipated during transient disturbances is also very low. During strong motions, such as earthquakes, conventional structures usually deform well beyond their elastic limits, and remain intact only due to their ability to inelastically deform. Therefore, most of the energy dissipated is absorbed by the structure itself through localized damage.

The concept of added-on dampers within a structure assumes that some of the energy input to the structure from a transient will be absorbed, not by the structure itself, but rather by supplemental damping elements. An idealized supplemental damper would be of a form such that the force being produced by the damper is of such a magnitude and occurs at such a time that the damper forces do not increase overall stress in the structure. Properly implemented, an ideal damper should be able to simultaneously reduce both stress and deflection in the structure.

Many methods exist to implement distributed damping in a structure, the typical underlying concept is to connect the moving masses (floor levels) with dampers so that as they move or deflect relative to one-another in a shearing-type motion, the dampers capture this motion and resist in both tension and compression directions with an opposing force. This concept works well in typical moment frame, shear wall or braced frame office or residential type buildings, and can be applied to short, medium and tall structures. It is noted that all of these systems are passive, meaning that no external power is needed to make the dampers function. The dampers simply react at any time they are deflected.

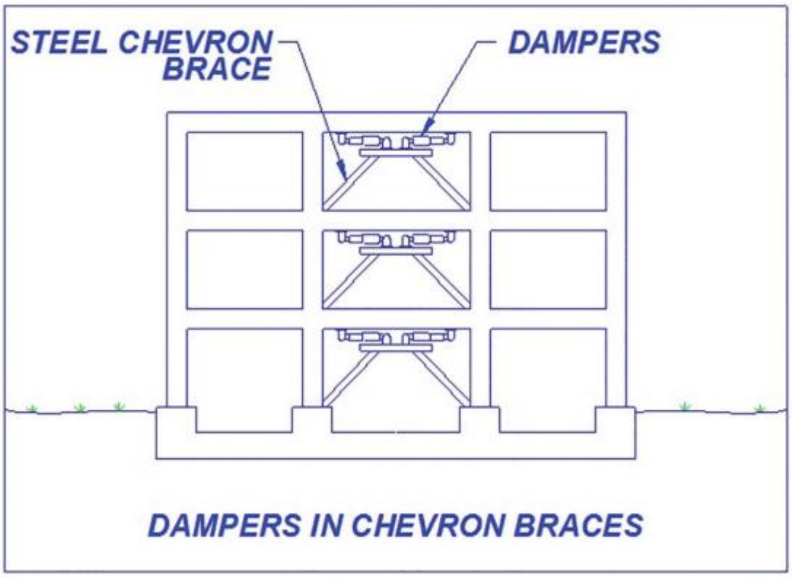


Figure 1. *Dampers in Chevron Braced Frames.*

Chevron frames are depicted in Figure 1 In this configuration, the dampers are placed horizontally, and connected to a frame (chevron) that is intended to be near rigid with the floor it is connected to. The advantage with this direct damping orientation is that the horizontal flexibility of the structure injects this full movement directly into the horizontal orientation of the damper. However, a small amount of motion can be lost due to the constraints of the attainable stiffness of an economical chevron frame.

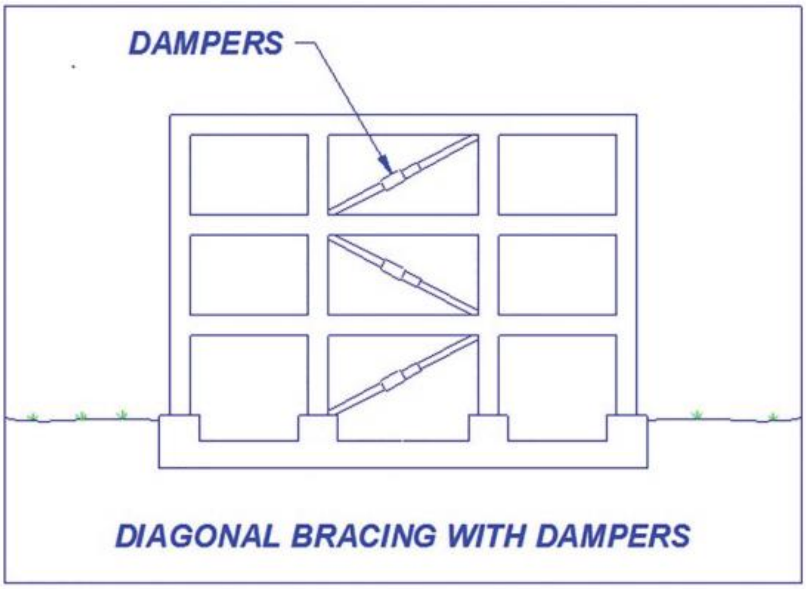
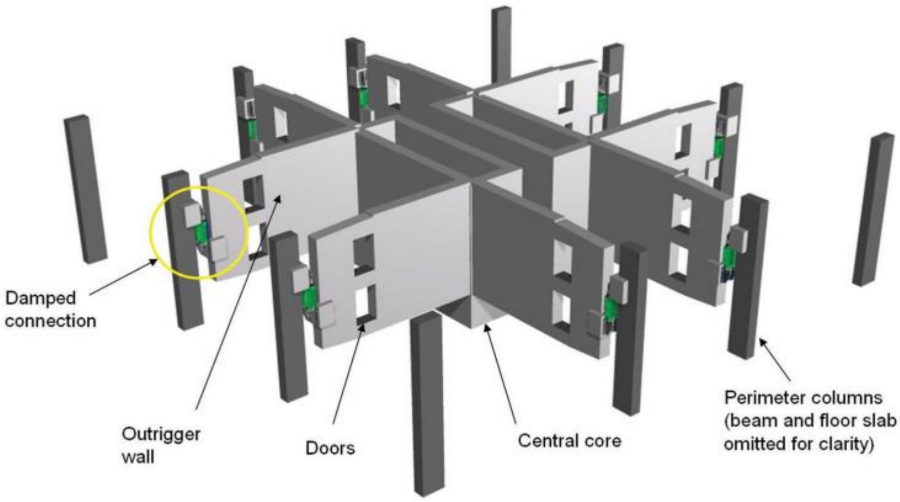


Figure 2. *Dampers in Diagonal Braced Frames.*

Dampers in Diagonal bracing schemes are depicted in Figure 2 In this orientation, the horizontal movement of the structure only allows an angular component of the full deflection to go into the damper, but thence takes this motion directly to the next floor level, straight through a strong tension/compression member. Often this diagonal bracing scheme is considered the most basic, or simplistic method to apply distributed damping in a structure.

Additionally, an outrigger solution to apply damping to taller, more slender building systems can be used where it is determined that the gross motion of the structure does not fall into the traditional shearing-type movement pattern, but exhibits more of an overall tension/compression on the opposing outer columns of the building. Often outrigger damping can be accomplished by creating a rigid level near the top of a building that moves with the core and connecting dampers between the rigid level and the outer columns of the building. This useful system is shown in Figures 3 and 4.

Figure 3. *Dampers in Outrigger Systems (a).*



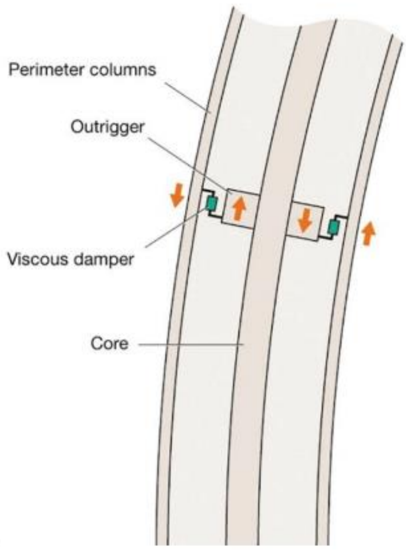


Figure 4. *Dampers in Outrigger Systems (b).*

Dampers can also be distributed in base isolation systems, as depicted in Figure 5, where the damper is used to augment the vertically supporting isolators, and most often provide viscous (velocity dependent) damping to significantly improve the performance and usefulness of the isolators.

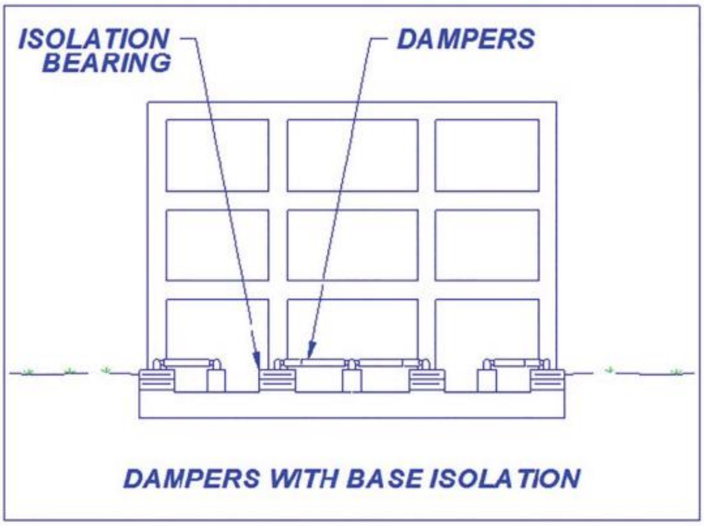


Figure 5. *Dampers in Base-Isolation Systems.*

Currently, most of the scientific research carried out in our country is focused only on the study of the connection between the foundation of the building and the ground, and they are mainly devoted to the improvement of the model of the ground soil, issues of interaction with the foundation under the influence of external forces, issues of the building-foundation-ground system and their solutions. But in the world experience, we can see that the practice of using inter-floor seismic protection devices is also widely used in multi-story buildings. But taking into account the fact that the researches conducted in our country are very few, the need to study this type of earthquake protection means in the field of defense has been recognized by the scientists of the field.

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