



ENSURING THE EARTHQUAKE RESISTANCE OF BUILDINGS AND CONSTRUCTIONS

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Abstract: The article shows that when designing earthquake-resistant buildings today, it is necessary to strive to achieve a symmetrical plan view and a uniform distribution of masses and volumes. It is necessary to arrange walls and frames symmetrically relative to the longitudinal and transverse axes of the building. In this way, torsional vibrations can be prevented or their development can be limited.

One of the ways to increase the efficiency of construction is to increase its readiness as much as possible based on the compaction of structural drawings and typification of constructions, and the second is the need to ensure that these buildings are earthquake-resistant, high-quality, comfortable and functionally convenient.

Key words: Buildings, civil buildings, structures, engineering structures, construction ditch.

Earthquakes are natural disasters that cause great suffering to the population of the globe every year, as a result of which buildings are destroyed, fires break out, and people die. According to UNESCO, during the earthquakes that occurred between 1925 and 1950, more than 350 thousand people died worldwide, and about 10 billion dollars in material damage was caused. More than 300 thousand earthquakes occur on the globe every year, most of which occur in weak or uninhabited areas. Sometimes the epicenter of an earthquake is located in densely populated cities and regions.

Earthquakes rarely occur in the same place, after tens and even hundreds of years, and each earthquake has its own characteristics, so measures to make buildings earthquake-resistant can sometimes be beneficial, and sometimes, on the contrary, can be harmful. Nevertheless, a number of rules, determined on the basis of an analysis of the consequences of earthquakes, can be considered universal and useful.

An earthquake is an elastic shaking of the earth's surface as a result of tectonic processes caused by volcanic eruptions or the sliding of rocks against each other in the deep layers of the earth. The strength of an earthquake is measured in points. In most countries, a 12-point scale for the strength of an earthquake is adopted. When the strength of an earthquake is up to 6 points, there is no damage to buildings and structures. In such cases, individual cracks form in building structures or wall surfaces, and mainly the facade of the building may be damaged.

When an earthquake occurs, depending on its strength and score, there will be some damage and negative consequences to buildings and the environment:

1. When there is an earthquake, there are some weak tremors and there is no change in the buildings and the environment.
2. A minor earthquake is a weak tremor, and damage to buildings is not felt.
3. In a small earthquake, a person inside the building can feel the shaking, and in high-rise buildings, a fear-inducing vibration can be created. No significant damage to buildings.



4. In the Balik earthquake, it is expected that high-rise buildings, especially on the upper floors, will have noticeable vibrations, and the chandeliers in the rooms will vibrate, but the buildings may not be damaged.

5. Floors, intermediate walls crushed sound, glass vibration sounds, wall finish dust may appear in the ball. Movements of open frames and doors, slight damage to the building, waves in water basins are observed.

6. In a Balik earthquake, most buildings experience significant shaking and minor damage as a result, often the chimney on the roof of the building can be damaged. Significant cracks may appear in places where the ground surface is excessively wet.

7. During a Ballik earthquake, significant damage and destruction may occur in most buildings, and people may feel severe fear. Earthquake-resistant buildings will not experience significant damage, but will mainly feel the shaking force. Significant cracks will appear in porous soils, and large cracks in moist soils. Flooding is expected in water bodies.

8. In a Balik earthquake, almost all buildings suffer significant, sometimes irreparable damage and some parts can be used. In this case, in the walls, chimneys, in the rooms, the dishes in the server, in the multi-story buildings, sounds of vibration of the structure appear. Statues in the city may fall, engineering equipment may be significantly damaged, and sewerage and water supply may be disrupted. It is expected that significant cracks will appear on the surface of the earth, and in some places, cracks will appear.

9. In addition to all the above-mentioned events, various damages to all buildings have been recorded several times during the Ballik earthquake, especially those that did not take measures against earthquakes, which were completely destroyed, collapsed, and were damaged, causing great losses. Sometimes the stairs, overhangs, and walls of buildings were observed to collapse. Outside, railways may twist, ponds may sink, and large cracks may appear on roads. Structures such as towers have been toppled, and engineering structures have been made unreliable. Cracks of 10 cm and larger have appeared on the ground surface.

Construction is strictly prohibited in areas where earthquakes of magnitude 10-12 are possible, as during an earthquake, there may be significant damage and extremely dangerous conditions, with the ground leveling or cracking, causing major losses.

In general, earthquakes cause the rocks in the earth's crust to break and produce large residual deformations. The limited area in the earth's crust where the movement begins is called the "hypocenter" or focus of the earthquake. The distance from the epicenter to any point on the earth's surface is called the epicentral distance. The vertical components in the epicentral zones are greater than the horizontal components and decrease with distance from the epicenter. In this case, the horizontal component becomes the main one, which is dangerous for buildings and structures. Therefore, all types of buildings and structures in earthquake-prone areas are designed, built and used based on special requirements, rules and conditions.

Earthquake resistance of buildings. Features of dimensional planning and constructive solutions.

The resistance of buildings and structures to earthquakes is called seismic resistance. In order to ensure sufficient seismic resistance of buildings in earthquake-prone areas, it is necessary to take into account that, in addition to gravity forces, horizontal forces also act on these structures during an earthquake. These forces are of a repeating nature and can act in different directions.



In order to simplify the calculations, building codes recommend taking into account only horizontal seismic forces directed along the axes of symmetry corresponding to the largest and smallest dimensions of the building.

When constructing residential buildings in earthquake-prone areas, it is necessary to leave a large free space between buildings and green areas. This measure is mainly a fire prevention measure and is taken as

15-20% larger than the width of the street and the distance between buildings. When developing a building and structure design, the following basic rules must be followed.

Volumetric planning and constructive solutions must satisfy the conditions of symmetry and equal distribution of mass and volume.

If the purpose and architectural requirements of the building require the construction of an asymmetric and complex shape, then the building plan is divided into sections with anti-seismic joints. These joints are also used to divide building plans whose dimensions are larger than those specified in the standard into sections. In buildings with load-bearing walls, anti-seismic joints are formed by installing double walls, and in buildings with beams, by installing side frames (double beams). The joints must ensure free horizontal movement of the wide element. Joints in the foundations may not be left, if they do not have a settlement joint at the same time. The foundations of the building or its individual parts should be located on the same level. The foundations of load-bearing stone walls should be strip concrete. If pile foundations are used, then the "pile-column" type of pile foundation is preferable. In the case of reinforced concrete structures, the column foundations are made of cast or precast reinforced concrete, and they are connected by a foundation beam.

The stability and spatial integrity of buildings with load-bearing stone walls are ensured by anti-seismic belts located along the entire length of the internal and external walls of the building and in the plane of the floor slabs of each floor. Such belts can be made of cast or prefabricated reinforced concrete or metal: the reinforcement of cast belts is continuous. In prefabricated belts, the details of the horizontal frame are welded or the exposed reinforcement is interconnected and concrete is poured over them.

The width of anti-seismic arches is usually the same as the wall thickness. When the wall thickness is more than 500 mm, the thickness should be taken not less than 120 mm. The height of the arch is often 150 mm and more.

In each section of brick-walled buildings, the constructive solution and materials of the elements should be the same, while the walls between the windows and the door and window openings should be the same size. The joints of the walls are reinforced with reinforcement.

In areas with earthquakes of 7, 8 and 9 points, the height of load-bearing brick walls should not exceed 6, 5 and 4 m, respectively. In areas prone to earthquakes, the ratio of the height of each floor to the thickness of the wall should not exceed 1:12. At the same time, the staircase, curtain wall and other structural elements should be firmly installed.

References

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