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IMPACTS ON THE ENVIRONMENT AND EARTHQUAKE-RESISTANT BUILDINGS

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----------ABSTRACT----------
One of the most destructive natural catastrophes, earthquakes force the earth's surface to tremble violently. In addition to causing harm to neighboring buildings, it also has an impact on the environment and our way of life. While most natural catastrophes are known ahead of time, earthquakes are an exception in this instance. Because of how quickly this disaster occurred, preparations could not be taken. Compared to other natural catastrophes, this one also causes greater damage. What causes earthquakes? Experts claim that the whole surface is separated into many layers. Once again, every layer is separated into many plates. When these massive tectonic plates meet, the earth's bottom trembles. Rocks climb over one another during earthquakes. And the earth is shaken by the energy that results. In essence, vibration is caused by this energy. A seismometer is a device that measures vibration waves, and earthquakes are measured via a network of similar devices. On paper, a seismograph displays a zigzag chart that illustrates the vibrations of the earth underneath the device. Additionally, we experience earthquakes on Earth's surface. It is necessary to create earthquake-resistant structures before constructing earthquake-resistant buildings. Numerous environmental changes brought on by earthquakes may be divided into primary impacts (such as erosion and surface flaws) and secondary effects (such as displaced rocks, tsunamis, ground fractures, liquids, and landslides). Earthquake environmental effects [EEE] are the term used to describe these impacts.

KEYWORDS: *Earthquake Environmental Effects [EEE], Earthquake Resistance Building, Seismograph, Seismometer, Primary and Secondary Effects of Earthquake.*----------

1. INTRODUCTION

The epicenter was reported below the ground just above the epicenter. The epicenter was reported below the ground. The environment is known as an earthquake environment effect (EEE). We have witnessed several terrible earthquakes that destroyed the whole city and wreaked havoc on a massive scale. The earthquake takes about 10 to 30 seconds. The quake caused loss of life and property, social and economic damage, or degradation of the environment. But strong and devastating earthquakes caused extensive damage to homes and property and caused countless casualties.The Severity of ground shaking at a given location during an earthquake can be minor, moderate, and strong. Relatively speaking, minor shaking occurs frequently, moderate shaking occasionally, and strong shaking rarely. Soil behavior varies at different levels. Moreover, some special phenomena can be seen in the soil field. For example, Sudden and temporary vibrations occur on the surface of the earth. The magnitude of these vibrations caused by the sudden release of energy stored in the earth's crust can range from mild vibration to strong rotation. Earthquakes are a type of wave motion force that occurs in a limited range and spreads in all directions from the source of the event [3,4]. Earthquakes usually last from a few seconds to a minute. The point in the ground where the wave of an earthquake is signaled is called the center and vibrations from this center. However, the process of building earthquake resistance buildings can also have both positive and negative effects on the environment. On the one hand, these structures can reduce the release of hazardous materials and pollutants that can result from building collapses during earthquakes [4]. On the other hand, The construction process itself can have negative environmental impacts, such as the destruction of natural habitats and the use of energy-intensive materials[4].

During this process, the soil behaves like a liquid. If the properties of the soil are not last. Then the structure made on the ground will collapse. So first of all we have to design earthquake resistance scare. The earthquake resistance structure can be built [5]. For example, an average of 5.0 -5.9 magnitude is about 800 earthquakes. Occur in the world while the number is only about 18 for magnitude 7.0 - 7.9. Earthquakes are defined as shallow centers (0 - 60km), medium center (60 - 300km) and deep centers (300km) based on the depth of the epicenter. The most

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common measure of the magnitude of an earthquake is the 'Richter Value'. The seismograph uses the difference between the maximum surface wave amplitude and the time it takes to reach the primary (P) and secondary (S) waves to determine the intensity on the 'Richter scale'. The magnitude of the earthquake is 1 - 10 on this scale. The higher the Richter scale, the greater the loss. First, it is felt on the surface of the earth along the point just above the center which is called the epicenter. The first tremor was felt in this epicenter. A magnitude 7.8 earthquake shook the region of 'Tangshan' in China in 1976. It killed 242,000 people. And there was also a 9.0 magnitude earthquake in Indonesia in 2001. It killed 226,898 people.

2. EARTHQUAKE ENVIRONMENT EFFECTS (EEES)

The effects of an earthquake on the nearby and adjacent environment it is called earthquake environmental effect [EEE]. Two things are involved with earthquakes. One is the center and the other is the epicenter. Earthquake environmental effects [EEE] can be categorized into two types primary and secondary. Cause of earthquake scientists have been experimenting for many years to identify the causes of earthquakes. Among the causes are landslides, groundwater vapor, avalanches, heat radiation, loss of groundwater pressure, volcanic eruptions, glacier effects, cracks, and fissures, sea level changes, river diversion, folding, landslides and glaciers. [EEEs] are increasingly being used as equipment for measuring the intensity of an earthquake[. But in relatively developed counties the effects of earthquakes are not seen. The reason is their improved quality construction methods and plans.

3. METHOD OF EARTHQUAKE RESISTANCE BUILDING

Since the earthquake force is a function of mass, the building shall be as light as possible. A heavier structure means a large inertia force and the collapse of these structures result in heavier damage and loss of lives . Before constructing the building, the soil has to be examined well. There are two types of soil > clay and sand. If there is more sand in the soil, the water at the bottom rises during the earthquake. This process is called liquefaction. If the properties of the soil are not intact, the ghost will not survive. Then the structure made on the ground will collapse so first of all you have to design earthquake - resistance scare. Then an earthquake - resistance structure can be built .

To specify the earthquake resistance features in masonry and

3.1 REGULARITY

The building should have a simple rectangular plan. It is seen that simple shapes behave better during earthquakes than complex shapes like L, T, E, H, U ,C ,etc. It is seen that during earthquakes the buildings with re-entrant corners have suffered great damage. Torsional effects of ground motion are pronounced in long narrow rectangular blocks. Therefore, it is desirable to restrict the length of a block to three times its width (L>3b). Separation of a large building into several blocks may be required to obtain symmetry and regularity of each block.

3.2 SIZE OF BUILDING

Building of great length or planned area may not respond to earthquakes in the way calculated . Buildings that are too long in plan, may be subjected to different earthquake movements simultaneously at the two ends, leading to disastrous results. As an alternative such a building can be broken into several separate square buildings shown below (Fig 1).

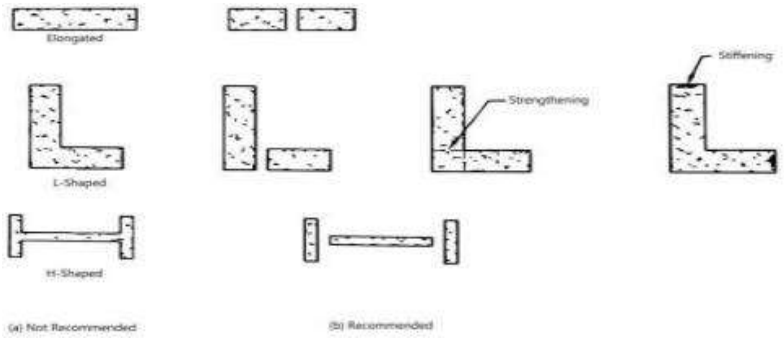


Fig. 1 Broken Layout Square Buildings

In tall buildings with large height - to - base size ratio (slenderness ration > 4). The horizontal movement of the floors during ground shaking is large.

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Earthquake resistance building will not happen without proper structural design.The columns of the building should be placed parallel to each other .The pressure carrying capacity of concrete can't be reduced below 3000 PSI under any circumstances. High power rods should be used. So that it can be carrying power close to 60 thousand PSI. The plan and elevation of the building are balanced on both sides. The expansion gap should be kept as per the building code.The amount of seismic strength should be increased by placing the concrete walls in the right place.

3.3 CONTINUITY

The seismic forces developed at different floor levels of a building need to be lowered to the ground by the shortest path; any deviation or pause in this load transfer path leads to poor building performance .The risk could be greatly reduced if a proper foundation was laid through proper piling. constructing a building by following the code and building construction rules properly.

Buildings with columns that hang or float on beams at an intermediate story and do not go all the way to the foundation have discontinuities in the load transfer path in Fig. 2. Building on the sloping ground has unequal height columns along the slope, which causes ill effects like twisting and damage in shorter columns. Five different cases of (G+3) building on varying slope angles are designed 0, 15, 30, 45 and 60. Successive floors of such building step back towards the hill slope ,and sometimes the building also setbacks. The stepping back of the building towards the hill slope results in unequal column height in the same story, which causes severe stiffness irregularities in along-and-cross-slope directions.

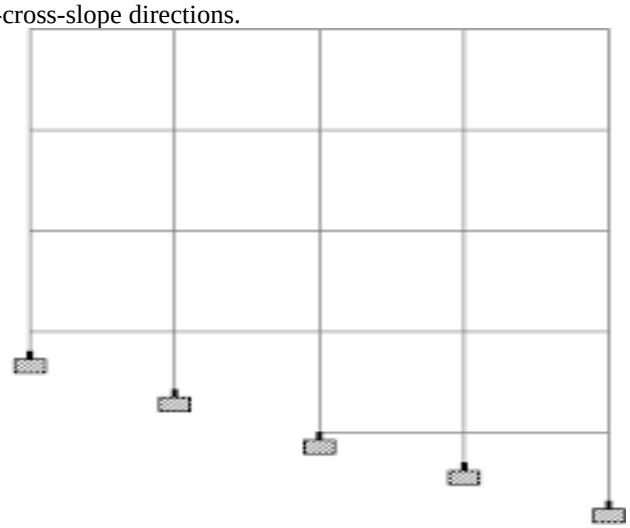


Fig. 2: Elevation of A Sloping Ground (15 Degrees)

Consider the layout of the structural framing system (weight- bearing infrastructure system) with special attention to the addition of lateral resistance and the design of the general design and consider the intersections with heavy weight with the provision of reinforcement as required. The structure should not be fragile and should not be accidentally destroyed. Rather they should be strong and should have sufficient capacity for deformation and deflection. Resistant parts like walls must be given evenly throughout the building from one side to the other and from top to bottom. Nowadays, rapid construction is taking in hilly areas due to the scarcity of plain ground. As a result, the hilly areas have a marked effect on the buildings in terms of style, material, and method of construction leading to the popularity of structures in hilly regions. Due to the sloping profile, the various levels of such structures step back towards the hill slope and may have setback also at the same time.

4. ANALYSIS & RESULT

In IS method of analysis is followed by using code - IS1893 (Part 1): 2002.
The seismic analysis of buildings connected with and without friction dampers is done by equivalent static analysis, Response spectrum analysis.

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TABLE 1: COMBINATIONS OF LOAD AS PER IS 1893-2002 & IS 875(Part-3)-1987.

Combination of loads	Loads Factor
Equivalent Static Method (ESM)	1.2 (DL+LL+EQX)
	1.2 (DL+LL+EQY)
	1.5 (DL+EQX)
	1.5 (DL+EQY)
Response Spectrum Method (RSM)	1.2 (DL+LL+RSX)
	1.2 (DL+LL+RSY)
	1.5 (DL+RSX)
	1.5 (DL+RSY)

4.1 CHARACTERISTICS OF FRICTION DAMPER

If there is no seismic activity, there is no activity of the damper, Which can support its designed static load indefinitely, So there is no problem with wear or fatigue. FDs are designed to protect structures from earthquakes by absorbing energy from seismic forces [49]. They act as fuses, limiting the force that can be imposed on the members they protect. Dampers have a rectangular hysteresis loop, providing maximum energy dissipation for a given force and travel, independent of velocity and frequency. They are manufactured to slip at a specified force and are adjusted by the tension in bolts holding the sliding elements together. The coefficient of friction is about 0.2, but it is not of great importance as the slip force is controlled by bolt tension [50]. Energy dissipation during sliding increases the temperature of the damper but does not affect its performance. The extent of travel in the event of an earthquake will act as a damage indicator, showing whether the main structural frame remained elastic.

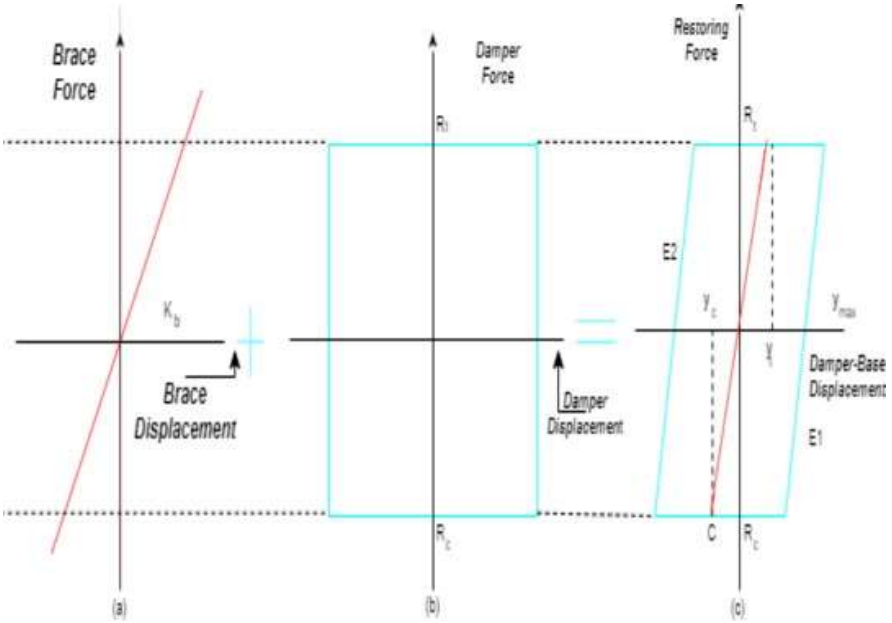


Fig 3: **(a) Elastic Behavior of brace, (b) hysteretic loop of FDs, (c) resultant elastoplastic behavior of offriction damper in the brace.**

5. CONCLUSION

Earthquakes are natural disasters. Resulting in destruction and loss of life. The effects of the earthquake on the nearby and adjacent environment it is called earthquake environmental effect [EEE]. Earthquake environmental effects [EEE] can be categorized into two types primary and secondary. We do not have the experience, training and mentality to face natural disasters like earthquake. Earthquakes are not a mainstream phenomenon. The floods and tsunamis caused by the earthquake and many casualties. Earthquakes sometimes cause parts of the earth's surface to move downward. Again some parts go up. Earthquakes in the form of natural disasters make people helpless. The Richter scale is an instrument that determines the stability of an earthquake. If the magnitude of this scale is more than 5, there is a risk of a catastrophic disaster. The cruelty of the earthquake shook everyone on Earth. Huge buildings are being built without any code. To build an earthquake resistant building an earthquake resistant structure has to be built before that. The earthquake resistance of a building can be improved by five simple principles of design and good building construction practices. These principles are

lightness, symmetry, regularity, continuity ,and size of a building.

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