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A Study on Earthquake Resistant Construction Technique, Through the Dampers

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ABSTRACT: Earthquakes are very serious problems since they affect human life in various ways. The Earthquakes are mainly prevented by two methods namely Base Isolation Methods and Seismic Dampers. The present work deals with Increase natural period of structure by “Base Isolation Technique & Increase damping of the system by Energy Dissipation Device.

KEYWORDS: Types of damper, Damper Techniques, Earthquake Resistance etc.

I. INTRODUCTION

Earthquake cause severe damage to infrastructures. Structures are designed to resist dynamic forces through a combination of strength, deformability and energy absorption. These structures may deform well beyond the elastic limit in case of a severe earthquake. The structures designed with these methods are sometimes vulnerable to strong earthquake motions. In order to avoid such critical damages, structural engineers are working on different types of structural systems that can be withstanding strong motions.

Earthquakes are sudden movements over the surface of Earth. It may due to sudden shift of rock over the Fracture of Earth. When such quakes happen, enormous amounts of energy is released, which is far greater than big nuclear bomb.

II. RELATED WORK

Earthquake resistance by dampers

Dampers are the energy dissipating devices which are used to resist lateral forces acting on the structure. Dampers are used to reduce the buckling of columns and deflection of beams and to increase the stiffness of the structure. Damper is used to reduce the vibration and deformation of RC framed structure during earthquake.

Objectives

- The main objective behind this study is to understand the basic concept of earthquake.
- To understand the earthquake resistant Design criteria.
- Comparative study of various type of dampers and their parameters like storey shear, storey drift, and absolute displacement.

Earthquakes Are Measured

- The EQ's are measured by process called Seismology.
- During an EQ, waves travel in surface of Earth, which carry the load of EQ to surface and then from surface to Structure to damage it. The waves which travel in surface of Earth and transfer to load of EQ are called Earthquake waves or Seismic Waves. Study of such waves is called Seismology. Based on Seismology, Seismometer is designed which gives the effect of EQ in graph manner.

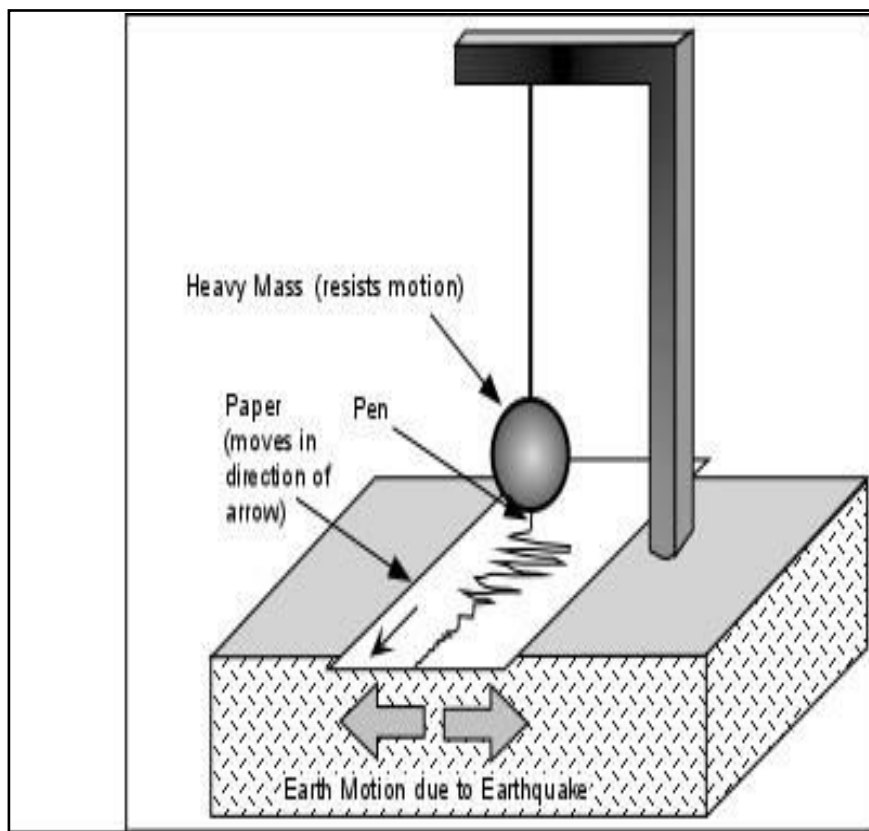


Fig. Seismometer

III. METHODOLOGY

Energy dissipation devices

Commonly used Seismic Dampers

1. Viscous Dampers
2. Friction Dampers
3. Yielding Dampers
4. Viscoelastic Dampers
5. Tuned mass damper(TMD)

IS CODES FOR EARTHQUAKE RESISTANT STRUCTURES

1. IS 1893:1984 : Criteria for Earthquake Resistant Design of Structures
2. IS 1893(Part 1):2002: Criteria for Earthquake Resistant Design of Structures: Part 1 General provisions and Buildings.
3. IS 1893(Part 4):2005: Criteria for Earthquake Resistant Design of Structures: Part 4 Industrial Structures Including Stack Like Structures.
4. IS 4326:1993: Earthquake Resistant Design and
5. Construction of Buildings - Code of Practice.
6. IS 13828:1993: Improving Earthquake Resistance of Low Strength Masonry Buildings – Guidelines.
7. IS 13920:1993: Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice.
8. IS 13935:2009: Seismic Evaluation, Repair and Strengthening of Masonry Buildings – Guidelines.
9. IS 6922:1973: Criteria for Safety and Design of Structures Subject to Underground Blasts.
10. IS 4991:1968: Criteria for Blast Resistant Design of Structures for Explosions Above Ground.

11. IS 4967:1968: Recommendations for Seismic

IV. DISCUSSIONS

Typical fluid viscous damper

The construction of a fluid damper consists of a stainless steel piston with bronze orifice head. It is filled with silicone oil. The piston head utilizes specially shaped passages which alter the flow of the damper fluid and thus alter the resistance characteristics of the damper. Fluid dampers may be designed to behave as a pure energy dissipater or a spring or as a combination of the two.

Fluid viscous damper

A fluid viscous damper resembles the common shock absorber such as those found in automobiles. The piston transmits energy entering the system to the fluid in the damper, causing it to move within the damper. The movement of the fluid within the damper fluid absorbs this kinetic energy by converting it into heat. In automobiles, this means that a shock received at the wheel is damped before it reaches the passengers compartment. In buildings this can mean that the building columns protected by dampers will undergo considerably less horizontal movement and damage during an earthquake.



Fig. Fluid viscous damper.

Tuned Mass Dampers

A tuned mass damper is a device mounted in structures to prevent discomfort, damage, or outright structural failure caused by vibration. They are used in high rise buildings to prevent failure of buildings during earthquakes. They are also known as an active mass damper (AMD) or harmonic absorber.

Tuned Mass damper A large mass or a large space is needed for their installation. The effectiveness of a tuned mass dampers considered constrained by the maximum weight that can be practically placed on top of the structure, plastic deformation of the spring, exceeding the limit of deformation.

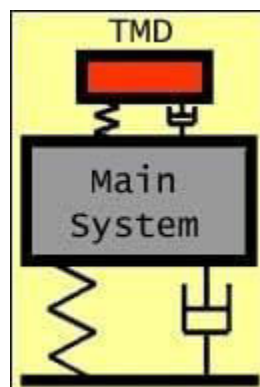


Fig. TMD

Tuned mass dampers (applications)

- Tall and slender free-standing
- Stairs, spectator stands, pedestrian bridges

- Steel structures like factory floors excited in one of their natural frequencies by machines, such as screens, centrifuges, fans etc.,

Fluid viscous damper

Generally silicone fluid is used in fluid viscous dampers as damping fluid. Silicone fluid can be obtained with a wide range of viscosities and do not change their viscosity with respect to the temperature as much as petroleum based oils. Standard viscosity silicone fluids range in viscosity from 50cst to 1000cst

V. CONCLUSION

Seismic Performance of building can be improved by providing energy dissipating device (damper), which absorb input energy during earthquake. Frame is safer when damper is provided up to Floor from base as compare with other arrangement. With deployment of damper in the structures, base shear effectively reduce. By the installation of dampers in the building the building acquires the resistance to the structure. The displacement of the building decreases with the installation of Dampers.

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