

Seismic Performance of Different Base Isolaters Used For Multi-Storey Building

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Abstract:-- Earthquakes are one of nature's greatest hazard, Earthquakes are usually caused when rock underground suddenly breaks along a fault. This sudden release of energy causes the seismic waves that make the ground shake. Throughout historic time they have caused significant loss of life and severe damage to property, especially to man-made structures. Seismic isolation may be used to provide an effective solution for a wide range of seismic design problems. Seismic isolation of structures from ground is a modern technique that has gained popularity and is rapidly evolving. In this paper the effect of base isolation on a structure has been studied by comparing the responses of the base isolated structure and fixed base structure. The paper presents comparative study of performance of base isolaters namely Lead Rubber Bearing (LRB) and Friction Pendulum Bearing (FPB). For this study R.C building is considered and Time History analysis is carried out using ETABS software. Parameters like Building displacement and storey drift are compared for the building with base isolator and building with fixed base. Due to the presence of isolator parameters are significantly reduced in each direction (X and Y direction) as compared to fixed base building.

key words: seismic analysis, Time history analysis, Lead rubber bearing, Friction pendulum bearing.

I. INTRODUCTION

Seismic isolation, also known as base isolation in structures, is an innovative design strategy that provides a practical alternate for the earthquake resistant design of new structures and the seismic rehabilitation of existing buildings, bridges and industrial establishments. The concept of seismic isolation is based on the premise that a structure can be substantially decoupled from damaging horizontal components of earthquake ground motions. Thus, earthquake induced forces may be reduced by factors of five to ten from those that a conventional fixed-base structure would experience.

Seismic protection to buildings and bridges are provided by using two types of base isolation systems namely; Elastomeric isolation systems and Sliding isolation systems. These Laminated layers of rubber bearing bear the load and isolate vibration while the lead plugs absorb energy as a damper. Friction pendulum bearings are composed of dense chrome over steel concave surface connected with an articulated friction slider and free to slide during lateral displacements. Bearings can be designed to carry different magnitudes of displacement simply by adjusting the diameter and curvature of the bearing surface. Friction pendulum bearings work on the principle of simple pendulum. The Friction pendulum bearings increase the structure's natural period by causing the building to slide along the concave inner surface of the bearing similar to a simple pendulum. Bearings can be designed to carry different magnitudes of

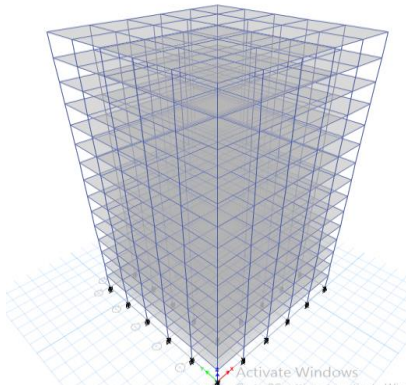
displacement simply by adjusting the diameter and curvature of the bearing surface.

METHODOLOGY

Modeling is carried out using ETABS2015. Structural Properties-

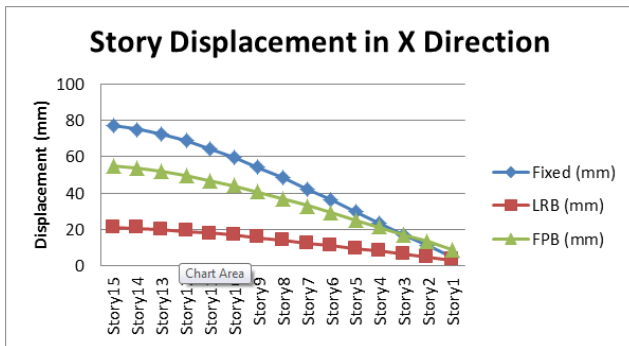
Seismic Zone	Zone 5
No. of storeys	G+15
Height of Building	48 mt
Each floor height	3 mt
Live Load	3 kN/m ²
Wall load	13.8 KN/m ²
Grade of concrete	M25
Grade of Steel	HYSD 415
Size of Beam	450x600 mm
Size of Column	450x600 mm
Thickness of Slab	125 mm

In the present study G+15 storey building is considered and linear time history has been applied. The finite element analysis has been done using ETABS 2015. Comparison of a regular building with a fix base with different base isolaters that is Lead Rubber Bearing (LRB) and Friction Pendulum Bearing (FPB) has been done. Various parameters such as storey displacement and story drift have been calculated and compared.

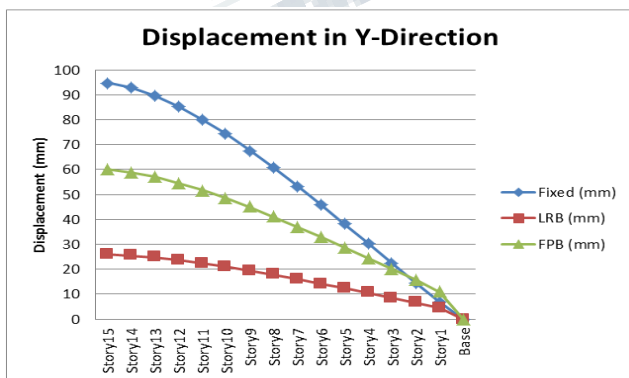


Model of the Regular Building

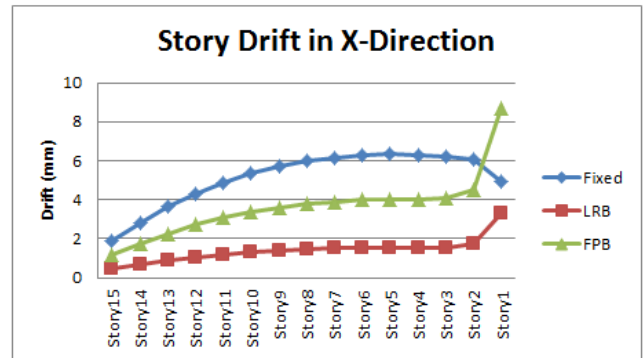
• The study shows that the nature of all the models is different after seismic disturbances. Building having Lead rubber bearing shows the best result and gives a minimum value of story displacement in X direction as compared to other models.



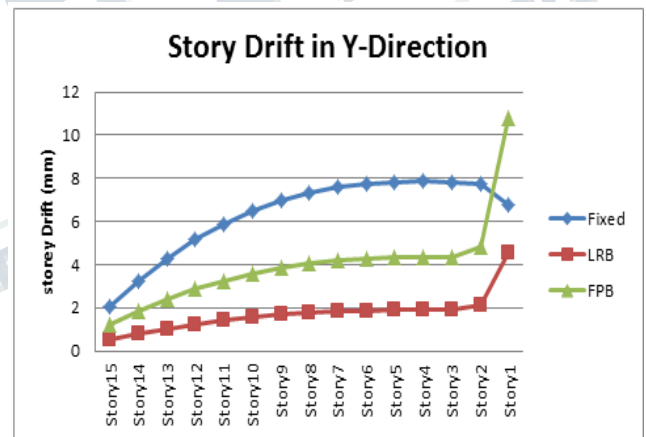
• The study shows that the nature of all the models is different after seismic disturbances. Building having Lead rubber bearing shows the best result and gives a minimum value of story displacement in Y direction as compared to other models.



• The study shows that the nature of all the models is different after seismic disturbances. Building having Lead rubber bearing shows the best result and gives a minimum value of story drift in X direction as compared to other models.



• The study shows that the nature of all the models is different after seismic disturbances. Building having Lead rubber bearing shows the best result and gives a minimum value of story drift in Y direction as compared to other models.



CONCLUSIONS

- It can be concluded that the story displacement both in X and Y directions is the least in Lead rubber bearing, larger in friction pendulum and the most for fixed base.
- It can be concluded that the story drift both in X and Y directions is the least in Lead rubber bearing, larger in friction pendulum and the most for fixed base.
- It is concluded that Lead rubber bearing is the best model as compared to friction pendulum and fixed base.

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