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Seismic Behaviour of Multey Storey Building with Different Base Isolaters

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Abstract: **— This paper presents information on the design procedure of seismic base isolation systems. Analysis of the seismic responses of isolated structures, which is oriented to give a clear understanding of the effect of base isolation on the nature of the structure and discussion of various isolator types are involved in this work. The concept of Base isolation is to insert a flexible layer between foundation and superstructure thus decoupling the building from damaging action of ground motion. The paper presents comparative study of performance of base isolators 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 Story stiffness and Time period are compared for the building with base isolator and building with fixed base. Due to the presence of isolator parameters are changed in each direction (X and Y direction) as compared to fixed base building.**

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

INTRODUCTION

In the past decades, earthquake resistant design of building structures has been based on a ductility design concept. The performances of the intended ductile structures during major earthquakes have proved to be unsatisfactory and below expectation. To enhance structural safety and integrity against severe earthquakes, more effective and reliable techniques for seismic isolation design of structures based on structural control concepts are desired. Among the structural control schemes developed, seismic base isolation is one of the most promising alternatives. It can be adopted for new structures as well as the retrofit of existing buildings and bridges.

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 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.

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 isolators 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.

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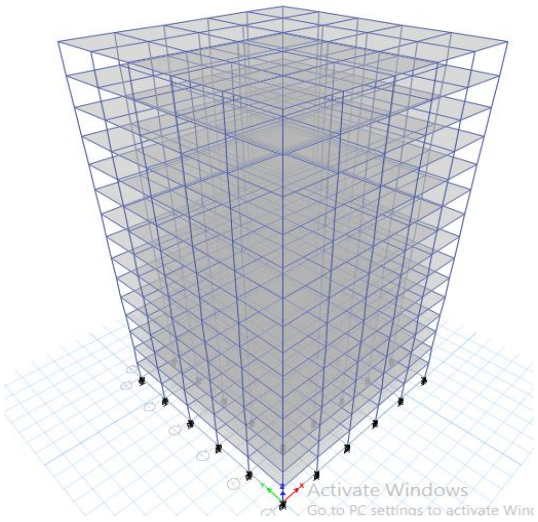
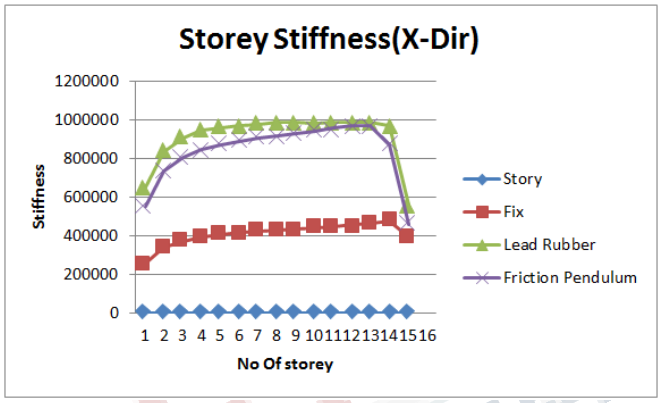
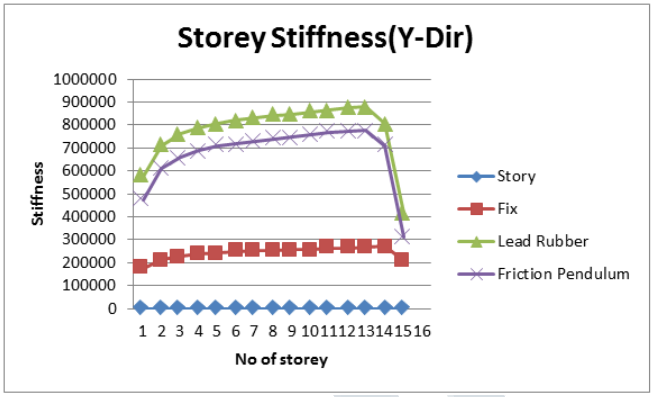


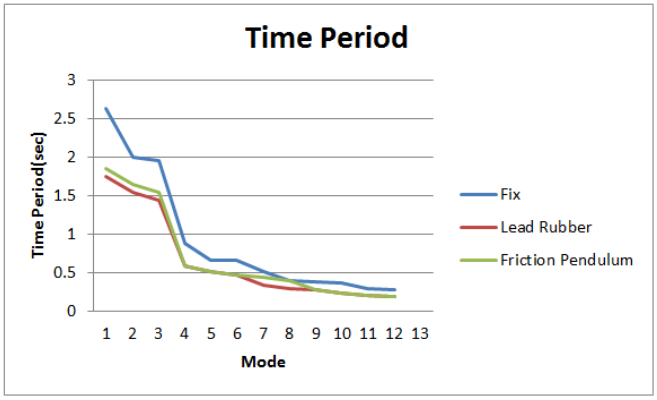
Model of the Regular Building



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 maximum value of story stiffness 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 maximum value of story stiffness 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 Time period as compared to other models.

CONCLUSIONS

- It can be concluded that the story stiffness both in X and Y directions is the maximum for Lead rubber bearing, lesser in friction pendulum and minimum for fixed base.

- It can be concluded that the natural time periodis the least in Lead rubber bearing, larger in friction pendulum and the most for fixed base.

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- It is concluded that Lead rubber bearing is the best model as compared to friction pendulum and fixed base.

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