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Review on Seismic Response of Asymmetric Reinforced Concrete Structure with Lead Rubber Bearing

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Abstract: *The need for design of structures to resist earthquake is to protect the human lives, infrastructures from the damaging effects of earthquake and reduce the hazards after seismic event. Normally seismic design of structures is based on the method of increasing the resistance capacity of structures against earthquake by using shear walls, braced frames and moment resistance. Base isolation is the recent development for seismic resistant designs. In the present study static and dynamic analysis will be carried out on 5 and 10 storey Frame with Fixed Base and Frame with LRB Base. The aim of the study is to review out the comparative analysis in terms of displacements, height, drift, and shear on the basis of previous review.*

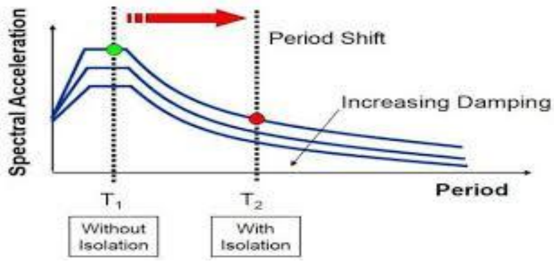
KEYWORD:- Seismic Zones, Base Isolation, Lead Rubber Bearing, Static and Dynamic Analysis, Etabs Software.

I-Introduction

Base Isolation

In seismic zones and high risk areas for constructing bridges, flyovers and buildings Base isolation is being commonly used in the past few years. There are many projects made and many are under construction in which base isolation is applied.

At the time of earthquake the movement of the ground occurs laterally and disrupt the structure. So there is a need to bifurcate the structure from the ground by inserting flexible isolation system between the structure and the foundation and therefore the after effects and shocks of the earthquake will be minimised by doing this. Thus the stability of the structure remains for longer period because of low seismic energy is transmitted in the structure. The prime factors which are being used in maintaining the flexibility of structure are Rubber bearing and Lead Rubber. These helps in increasing the usual period of the structure as a whole and base displacement is greater than the prearranged limit. The time period shift is shown in the Fig

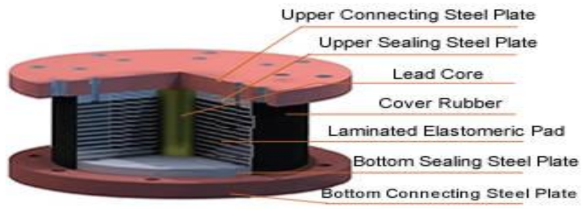


Effect of base isolation on spectral acceleration

Lead Rubber Bearing (LRB)

New Zealand was the first country to use Lead Rubber Bearing in year 1975 afterwards it was used in New Zealand, Japan and United States at a large scale. To support the structure and provide ground flexibility to the structure one or more lead plugs are installed in the bearing.

With the lead core with diameter ranging from 15% to 33% of bonded diameter and low damping elastomers the LRB is constructed as shown in fig.



Lead Rubber Bearing (LRB)

II-Literature Review

Back Ground

An earthquake is the result of a sudden release of stored energy in the Earth's crust that creates seismic waves. The inertia forces can cause shearing of the structure which can concentrate stresses on the weak walls or joints in the structure resulting in failure or perhaps total collapse. To resist earthquake is to protect the human lives, infrastructures, economy and important buildings such as hospitals, military bases, etc. from the damaging effects of earthquake and reduce the hazards after seismic event. . If the structure is located in or near seismic zones then possibility of earthquake disaster is very high and it is unanticipated. Normally seismic design of structures is based on the method of increasing the resistance capacity of structures against earthquake by using shear walls, braced frames and moment resistance. Base isolation is the recent development for seismic resistant designs. At the time of earthquake the movement of the ground occurs laterally and disrupt the structure. So there is a need to bifurcate the structure from the ground by inserting flexible isolation system between the structure and the foundation and therefore the after effects and shocks of the earthquake will be minimised by doing this. Thus the stability of the structure remains for longer period because of low seismic energy is transmitted to the structure. The various researchers have been carried out the study of structures to reduce the hazards after seismic activity with performance investigations. Some of them are as:

2.2 Previous Researches

Avinash A.R, Rahul N.K, Kiran Kamath studied the the impact of height changing of a base isolated structure on torsional response has been explore. For the analysis of structure are base isolated by lead rubber bearing (LRB). The elevation of the structure is changed trumphant and subjected to two direction seismic excitation. The maximum diminishion in torsional movement by LRB isolator is 92.315% for twelve story building for Chi-Chi earthquake. It is 91.625% for twelve story building in Kobe and 73.091% for eleven story building in El-Centro seismic.

Sonali Anilduke1, Amay Khedikar2. Studied that All over chronical time seismic are one of the natural threat that obtain due to instant vicious vibration of earth's surface which causes destroyed to field, mainly to man-made building . Base isolation is one of the most equipment of seismic engineering pertaining to the passive structural movement restrict technologies. . This paper recent three dimensional nonlinear time history analysis is presentation on r/c structure the use of computer program SAP 2000 v12.0.0. The dynamic study of the building has been used and the presentation of the structure with and without isolator is analysis.

Shirol and Kori(2017), contemplate a G6 storey dummy with and without masonary infill. Lead rubber bearing and abrasion type isolators were used. The infill was modelled as single bevelled swagger. The static and response spectrum analysis are implement using ETABS-2016. From the analysis it was culminate that equipping of isolators escalate the natural time period which abolish the prospect of sonority. The base shear and the storey drifts got diminished noteworthy while the deracination escalate which is due to the pliability transmitted to the buildings. The deliberation of infill operation escalate the base shear while the deracination and inter storey drifts showed diminished bias. The base shear diminished by 50% for bare fixture dummy and 70% for models with masonry infill in static method. The base shear diminished by 46 % and 42% in bare fixture and by 71% and 65% for infill buildings for rubber isolator and abrasion isolator discretely by response spectrum method. The escalate in deracination at foundation is 19.38 mm and 14.48mm for LRB and FPS isolator for response.

Rastandi J. I. et al (2018), Initiate the disparity of length of wings in L-shaped structure. Lead rubber bearing (LRB) with damping ratio 27% was preowned for base isolation. Six dummy were provinced as office sticture in 6-story high; three fixed foundation dummy are designed with twofold procedure and another three isolated dummy were delineation using linear dissemination horizontal forces pursuant to ASCE 7-16 code. 3D nonlinear time history analysis for isolated dummy is execute and will presume seven couples of ground movement, which are contest to MCER ambition variety of Jakarta in soft soil circumstances. Finally it was initiate that the non-linear dynamic major reaction of isolated buildings may impart superior and flowless outcome. In inclusion, evaluate cost for design phase of pre-framework can be done by the computaion of rebar ratio and comparable thickness of concrete, known from the outcomes of this analysis. The base shear deliberate from the NLTHA is harmonious lofty than RSA on fastened foundation. The distinction of both utility is 34.23%% for L1 dummy; 33.31% for L2 dummy; and 36.75% for L3 dummy. The isolated buildings offer the miniature drift story rate of not more than 0.2% for each story, elude any destruction to non-structural component interior the structure. It can be culminates that foundation isolation can guide to the retrenchment attempt i.e. rebar by 7-15% and concrete by 3%.

III-Conclusion

The following conclusion can be made after the present study on the basis of various papers:

The review of literature reveals that some works have been done for the analysis and design of multi-storey buildings using base isolation under seismic loading. Yet the work to improve the performance of these buildings is to be investigated with asymmetric buildings. There is a need to find out a better system of base isolation, which is appropriate in various parameters.

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