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Dynamic Study of Base Isolated Building: A Review

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Abstract: ***Explores in past assessed for base isolation techniques investigation using Response Spectrum analysis, it is discovered that the Design in old time don't know and safe because of lake of innovation and lesser programming examination availabilities. Some countries applied base isolation these days and the building response constructed with base isolation performed better at practical ground.***
The response of base isolated building is lesser in terms of amplitude and the cost of the building can also be optimized. Many researchers studied for this subject and they concluded that base isolation must be applied in critical seismic zones and the isolators must be used to save lives and properties.
It is seen that Indian development practices are missing to apply utilization of base detachment in structure plan It is suggested in the end that it must be motivated to study and research base isolation in Indian constrains and conditions, With applying Indian time history data.
Keywords: Base isolation Techniques, LRB, Base Shear, Time history and Etabs etc.

I. INTRODUCTION

Earthquake is one of the major natural hazards to the life on the earth and has affected countless cities and villages of almost every continent.

The damaged caused by earthquakes are mostly to man mad structures. Hundreds of small earthquake occurs around the world every day and every year earthquakes take the lives of thousands of people. Therefore, it is necessary to design structures that are earthquake resistant.

Earthquake engineering has gain lots of attention in recent years since it ensures design of safe structures which can safely withstand earthquakes of reasonable magnitude. Now a day uncountable high rise building has been constructed all over the world and the number is increasing day by day. This is not only due to concerned over high density of population in the cities. Construction of this high rise building the major task is to determine the performance of building under different types of lateral loading i.e. Earthquake and wind force.

Base isolation is a tool in the hands of engineers practicing construction under earthquake boundary conditions. The principle of bake isolation works like, when building is subjected under seismic vibrations and is provided with fixed base the vibration coming from ground are transferred to building and hence building may fails while providing base isolation disconnects the building from ground and reduces earthquake impact and effects.

II. BASE ISOLATION

In the last few years, using base isolation systems as a mean of a seismic design of structures has attracted considerable attention. Different designs for base isolators have special features in common, the most important of which are the horizontal flexibility and the energy dissipation capacity. Base isolation can greatly reduce earthquake intensity and losses, which directly reduces the shaking intensity and damage that permanent equipment and building contents experience during earthquake ground shaking. Base Isolation is one of the passive energy dissipation techniques for earthquake resistant designs of a structure. It is useful to controlling energy, which is passing from foundation or ground to the upper stories. The main use of isolation system is to decrease the displacements, base reactions and member forces in structure. The different studies have been performed on structural isolation system.

Experiments and observations of base-isolated buildings in earthquakes indicate that building acceleration can be reduced to as little as one-quarter of the ground acceleration.

1) Lead-rubber bearings are frequently used for base isolation. A lead rubber bearing is made from layers of rubber sandwiched together with layers of steel. The bearing is very stiff and strong in the vertical direction, but flexible in the horizontal direction.
2) Friction sliding isolation uses bearing pads that have a curved surface and low-friction materials similar to Teflon. During an earthquake the building is free to slide both horizontally and vertically on the curved surfaces and will return to its original position after the ground shaking stops. The forces needed to move the building upwards limit the horizontal or lateral forces that would otherwise cause building deformations.

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III. LITERATURE REVIEW

The researchers are studying and performing research in the field of base isolation to innovate some improved base isolation technique. . To understand the difference between the responses of fixed base and isolated base structure, to determine the effectiveness of different isolator and to study the isolator properties in detail the brief review of some papers is given in this article.

A. H.W shenton et al(1993) The researcher has analyzed the relative results of fixe based and base isolated structures. He used the structural agencies association of California (SEAOC) and he designed a concrete fix base structure and compared with fixed base response. According to SEAOC recommendation the base shear was varying. Three various type of time history and post-earthquake records were used to perform nonlinear dynamic analysis for fixed base and base isolated stuctures.Results were compared and building was checked for various lateral forces.

B. Koji Tsuchimoto et al., (2005) In this research paper the researcher has introduced an experiment, the semi active base isolation system is combined with variable oil dampers with conventional passive base isolation system. And the time history analysis is done and response analysis in the event of an earthquake will be presented, and the effectiveness of the system in reducing acceleration will be indicated. Finally, the monitoring system, which serves as a fail-safe system will be explained.

C. Di Sarno, L. et al., (2007) In this paper the base isolation is provided in an irregular hospital building that is situated in the North-East of Naples,in south of Italy. In this paper we found that the base isolation gives very effective results under seismic performance and also for flexible framed structure both at serviceability and ultimate limit states. In this paper Euro code and Italian seismic code is used.

D. N. Torunbalci and G. Ozpalanlar (2008) Researchers in this research studied analysis methods for most suitable and realistic approaches, where the isolators are provided for the foundations of low-rise and medium-rise buildings. The methods are static equivalent earthquake force analysis, linear response spectrum analysis, linear time history analysis and nonlinear time history analysis. The results are compared for total base shear forces, story shear forces at columns and absolute and relative story drifts. It can be concluded that it is more reasonable to perform first static and then linear response spectrum analysis prior linear time history analysis.

E. Pan Wen and Sun Baifeng (2008) two step design method for base isolation structure was put forward based on Code [Seismic Code, 2001]. In this paper the step-by-step time history analysis was adopted to find out the design of superstructure, foundation and base isolation device. The computation result shows that two step design method is simple and practical, and its concept is clear and easy for further expansion and application. The method provides good design quality and reduce design period.

F. SilviuNastac and Adrian Leopa (2008) Summary for isolation performances improvement of the vibration isolation devices is presented in this paper. Main study is provided with passive isolation, using different structural configurations, based on the compressing and torsion rubber elements. The conclusion of this analysis is that the proposed elastic systems with special configurations, have a decisive contribution to increasing the isolation degree of the base structure - isolator - super structure ensemble, up to the 85 to 95%, these values being provided by actual laws.

G. ShunsukeOtani et al., (2008) Theresearcher analyzed the 10story RCC building under large magnitude earthquakes. If columns are assumed to lose vertical load carrying capacity after the design shear force is developed, the structure collapses in the upper stories after large response deformation is developed in the seismic isolation layer. It is essential even in the design of base isolated buildings to provide ductility on the basis of the weak-beam strong-column concept against unexpected disturbances.

H. B. M. Saiful Islam et al., (2011) Researcher highlights that regarding seismic isolation, there is a lack of proper research.. Lead rubber bearing (LRB), high damping rubber bearing (HDRB), friction pendulum system (FPS) have been critically explored. It was concluded that the obligations for practical isolation system to be incorporated in building structures are flexibility, Damping and resistance to service loads.

I. Y. Li et al (2014) In this paper, Y. Li and J. Li showed about base isolator with variable stiffness and damping, modeling design and experimental testing of the new isolator. Sometimes it happens that the impact of earthquakes is so serious, so that the passive nature of rubber will not generate energy due to seismic. So smart base isolation with adaptive and controllable properties was developed with different stiffness and damping properties of the isolator. In this paper describe that the design and experimental testing, dynamic modeling of smart rubber.

J. ShirulePravin Ashok et al., (2012) the paper deals with the response spectrum to the earthquake resistant structure. Fourteenstored structure analyzed with three conditions which are fixed base, rubber bearing and friction *pendulum* bearing. The results are compared to find best optimal solution with the results such as base and story shear forces, story and relative

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story drifts, isolator's reasonable displacements. The aim of the paper is to compare between the seismic isolation and fixed based building but not to compare isolation alternatives within themselves.

K. Chandak N. R. (2013) When we use Seismic base isolation, it will reduce inertia forces in the structure, and isolators shifts the fundamental period of the structure out of dangerous resonance range. Various studies have been done on Reinforced Concrete building with fixed and isolated base with rubber bearing and friction isolator are carried out using response spectrum method. The researcher in this paper investigates the differences caused by the use of different codes in the dynamic analysis of multistoried RC building along with fixed and isolated base condition. SAP2000 is used. It was found that that the building response with isolated base is very less to that of building with fixed base in all the cases.

L. H. Sugihardjo, et al., (2016) A base isolation system is very effective for reducing seismic impacts by isolating an upper structure from soil vibration due to seismic motion. By using the base isolation system we can extent the natural period of a building. However, the production of isolators is very expensive, particularly when an isolator is employed as a residential house's base isolator. To alleviate the issue, a low-cost rubber base isolation system is proposed nonlinear time history analysis (NLTHA) that is based on seven scaled-earthquake records is implemented in one-and two-story isolated reinforced concrete (RC) residential houses by considering the influence of the isolation ratio. The results indicate that the houses with isolation systems achieved better performance with regard to ductility demand and natural period due to seismic loads. The house with the higher isolation ratio achieved lower ductility demand.

M. Sunny patel, abbasjamani, (2016)In this paper the irregular shaped structures have been analyzed without base isolation, with rubber isolation and friction isolation using E-tab software and results are compared. Whencompared with isolated structure with LRB and FPS story sheardecreases more with reduce in storyheight in FPS isolates structure. The story displacements are high in FPS isolated system compared with LRB isolated structures. For less height stories LRB isolated system is better for good results but for more height building response is good in FPSisolated system.

N. Naveena K and Neeraja Nair (2017) in this paper we studied that the use of base isolation considerably reduces the response of the structure due to earthquake. The base isolation system affect the superstructure having rigid movement shows the relative story displacement & story drift of structural element will decrease and consequently the internal forces of beams and columns will be reduced. Due to decrease in lateral loads to stories, the accelerations of the stories will be reduced. This results in the reduction of inertia forces. Story overturning moment and story shear are also reduced in base isolated building. From the above points, it is concluded that the performance of isolated structure is efficient in the Earthquake prone areas.

O. Owais Kamran Shaikh and Gitadevi B. Bhaskar, (2018) In this paper researchers have done modeling and analysis of fixed base and base isolated building. They used E-TABS software and Lead rubber bearing is used as base isolation system. They did comparison between fixed base and base isolated building on the basis of dynamic properties like maximum shear force ,base shear displacement ,story drift and story acceleration. They got the conclusion is that effectiveness of this base isolation system reduces the response of structure and gives advices for future possible applications.

IV. CONCLUSION

After these study concluded that for medium rise the isolation techniques at the base of building is more efficient to other type of vibrational control devices at the place of fixed base building. It is observed from reviewer and experts that show this new advancement of base isolation techniques which also helps to reduces seismic movement and the results like Drift, Displacement and base shear are better with structure execution of base isolation than fixed base. All base isolation system the Lead Rubber bearing Isolator is effectively used worldwide because of their placing easily and conventionally with any RCC or Steel Building and more economical then other devices. After that the different shaped building are analyzed under time history loading.

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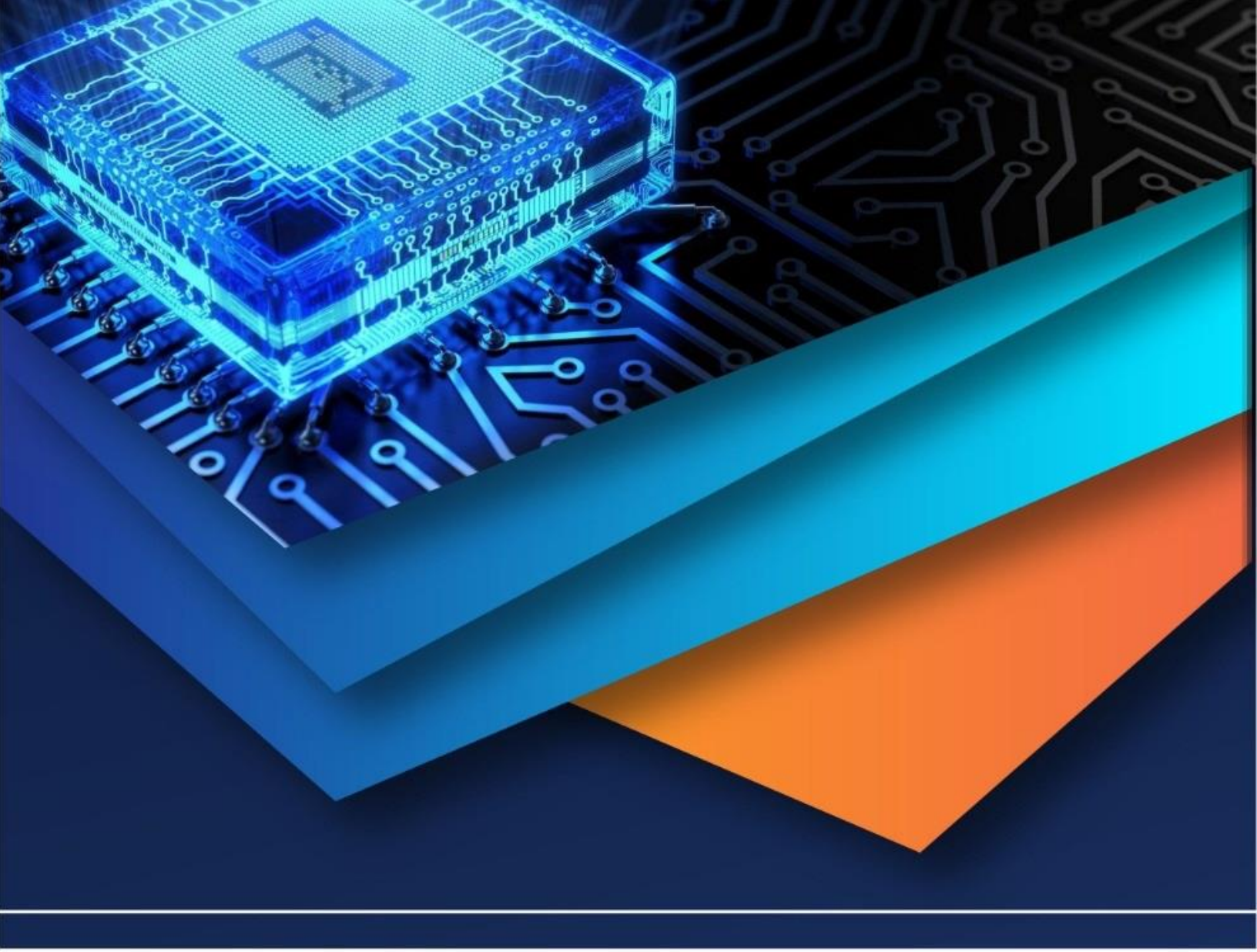
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