

Review on Comparative Analysis of a Building under Seismic Loading with Bare Frame and Base Isolator in different Zones Using Staad Pro

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Abstract— The main objective of the research work is to compare seismic analysis of building under bare frame and base isolation technique i.e. Rubber base isolation and comparing the effect of earthquake forces on both models. An analysis is carried out by the STAAD. Pro Software. It is a well-known fact that in any code based seismic design approach, the performance objective at design bases earthquake level is preventing the inhabitants of the building and accepting a certain level of damage which may be beyond repair. On the other hand the owners of the buildings have an idea that once a building is designed based on a seismic code the building will suffer no damage. By the introduction of “performance based design philosophy” a new approach has been introduced to earthquake engineering society. In the framework of performance based design the so called performance level which is related to the response of the building is defined for different level of seismic input. The performance levels defined in seismic design approach has basically three levels namely; “immediate occupancy”, “life safety” and “collapse prevention”. Based on this new approach it is possible to design a building that meets the performance levels named above. In order to achieve this “target performance” there are certain design alternatives to be applied one of which is “base isolation”. The basic approach in “seismic isolation design” is to provide additional damping and concentrate the nonlinear response on the isolator units and limit the seismic forces on the structural members above isolation level. This approach provides almost elastic response on the structural members and limits the floor accelerations acting on the nonstructural elements on superstructure. In recent years seismic base isolation applications are increasing especially in health complexes like hospitals which are expected to be functional after a major seismic event.

Index Terms— Seismic loading, Earthquake, Base isolation, Collapse prevention, Foundation, Damping, Vibration Control

I. INTRODUCTION

To analyse, the use of base isolation is effective to how much extend, to reduce damage in the structural and non-structural component of the building, to reduce acceleration response to minimize contents related to damage and to prevent plastic deformation of the structure. Base isolation is one of the most important concepts for earthquake engineering which can be defined as separating the structure from its foundation. In other words, base isolation is a technique developed to prevent or minimize damage to buildings during an earthquake. It might be thought that structures are often shielded from the destructive forces of earthquakes by increasing the strength of the structures in order that they are doing not collapse during such events. In other words, more rigid attachment of a building to its foundation will end in less damage in an earthquake. However, if the inspiration is rigidly attached to the building or the other structure, all of the earthquake forces are going to be Transferred directly and without a change in frequency to the remainder of the building. Providing a base isolation device between the building and therefore the ground can minimize the extent of earthquake force transmitted to the buildings.

Base isolation is one among the foremost powerful tools of earthquake engineering concerning the passive structural vibration control technologies. It enables a building or non-building structure to persist a potentially destructive seismic impact by using an

accurate initial design or subsequent modifications. In some cases, application of base isolation can strengthen both a structure's seismic performance and its seismic tolerance appreciably.

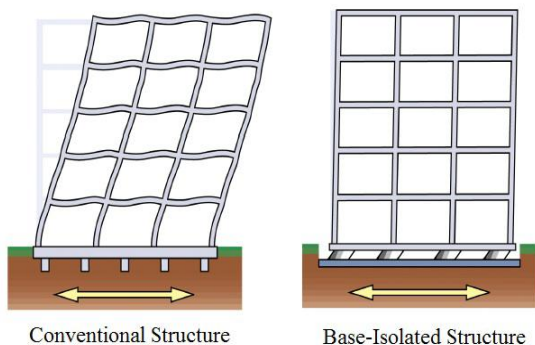


Fig: 1 Base isolation Technique

II. ADVANTAGES

The level of safety against earthquake increases significantly if the structure is built using base isolation. Secondary damage to the structures as a result of falling furniture can be reduced or restricted in other words the level of safety is increased, in base isolation. Moreover it is highly effective in reducing the peak acceleration transmitted to the structure by the action of earthquake forces and hence it enhances the performance of structure under seismic loads.

III. LITERATURE REVIEW

The literature survey regarding the work has been carried out. There were many papers collected on evaluation of application of BASE ISOLATION in residential sector, out of which few are briefed below.

Asst. Prof., Poornima, 2016 This paper gives a review on base isolation technique and briefly on other global retrofitting techniques in the world for making the structures earthquake resistant. The aim of retrofitting technique is to upgrade the lateral strength of the structure and increase the strength and ductility of structure. The base isolation technique is considered as the most suitable method from last fifteen years because it stops the effect of earthquake attack. The flexible base helps to decouple a superstructure from its substructure built on a seismic ground and results in protecting the structure. This paper also finds the effect of other retrofitting

methods like – shear walls, mass dampers, bracings, wing wall buttresses and superiority of base isolation on them.

Prof.R.B.Ghodke, Dr.S.V.Admane, 2015 In their Study of base isolation for five storied moment resisting frame with lead rubber seismic isolation has been studied using SAP2000 software. In this research various parameters were consider related with different base isolation Technique for base shear, acceleration, torsion, storey drift etc. Their research contains performance of moment resisting frame in dynamic analysis studied with base isolation and the results are compared with the results obtained for moment resisting frame without base isolation. The symmetrical frame is used as test model. The analysis of results obtained is related for variation in displacement.

Fabio Mazza and Alfonso Vulcano, 2004 The main objective of their work is to compare different base-isolation techniques, in order to evaluate their effects on the structural response and applicability limits under near-fault earthquakes. In this study, high-damping-laminated-rubber bearings are considered, with supplemental viscous dampers acting either in parallel or in series with steel-PTFE sliding bearings. A numerical investigation is carried out on a base-isolated five-storey reinforced concrete (R.C) framed building designed according to Eurocode 8 (EC8) provisions.

Sarvesh K. Jain and Shashi K. Thakkar, 2004 This study mainly deals with the period of vibration. Seismic isolation enables the reduction in earthquake forces by lengthening the period of vibration of the structure. The conventional period of isolated structures is generally kept as 2 sec. Therefore, the significant benefits obtained from isolation are in structures for which the fundamental period of vibration without base isolation is short, less than 1.0 sec. This paper consists of analytical study of base-isolation for buildings with higher natural period ranging from 1.0 to 3.0 second. Different possibilities are explored to increase the feasibility of base isolation for such type of buildings. Strategies proposed in this study are (i) increasing superstructure stiffness, (ii) increasing superstructure damping and (iii) increasing flexibility of isolation system. It is observed that the effectiveness of base isolation for these buildings may be increased by incorporating such provisions.

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