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Behavior of RCC Structure with and without Base Isolation for Seismic Excitation

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Abstract – *Generally base isolation is the concept in which the superstructure get separated from the substructure supports by introducing the base isolators in between them, to reduce seismic demand in other words for dissipating energy produced by the earthquake. The main objective of seismic isolation system is to decouple the building structure from the damaging components due to the earthquake motion i.e. to prevent the superstructure of the building from absorbing the earthquake energy. By using base isolation techniques we can reduce the deflection, acceleration, storey drift of the structure.*

Key Words: Base Isolation, Acceleration, Storey Drift, Deflection.

1. INTRODUCTION

Base isolation proceeds with quite a different philosophy in the sense that this concept is fundamentally concerned to reduce the horizontal seismic forces. It is powerful and relatively cheaper method of seismic rehabilitation of buildings .Its main advantages are: a) better protection against earthquake due to the decreasing of shears, b) superstructure will need no reinforcement, c) foundation system will not need any reinforcement to resist the overturning moments, which are much smaller than those of initial design, d) list interrupting the building activities, since the work is carried out in the basement with no loss of income during rehabilitation program, e) list temporary work is required. The term base isolation is the technique in which superstructure get separated from the substructure by introducing the base isolators in between them. The seismic isolation is the concept in which the seismic loads applied on the structures to reduce the energy produced by earthquake. There are various types of base isolators and dampers are used for the base isolation of structure. Damping usually comprise between 5% and 10% critical, but can jump to as high as 20% with the addition of damper. Base isolation technique have created considerable interest among architects and engineer in developed Nations like France, USA, Japan etc. and in India.

1.1 Relevance and Scope

This thesis focuses on the experimental studies conducted on the behavior of realistic models of RCC structure for the seismic loads which applied on them. In this reduction of seismic demand of the structure by using different types of base isolators provided for the realistic models. As each structure has its own natural frequency which is the major factor deciding the behavior of structure for seismic excitation.

1.2 Types of Base Isolators Used:

1. Elastomeric rubber bearing
2. Spring
3. Combination of Elastomeric rubber bearing and spring

2. LITERATURE SURVEY

1. Naveena K, Neeraja Nair, "REVIEW ON BASE ISOLATED STRUCTURES" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 04 Issue: 06 | June -2017.

A author focused on, base isolation, is a design concept that presumes a structure can be substantially decoupled from potentially damaging earthquake ground motions. By decoupling the structure from ground shaking, isolation reduces response in the structure that would otherwise occur in a conventional, fixed-base building. Alternatively, base-isolated buildings may be designed for reduced earthquake response to produce the same degree of seismic protection.

2. Nirav G. Patel "STUDY ON A BASE ISOLATION SYSTEM" IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 1 Issue 8, October 2014.

A author reviewed on, the ability of an adaptive seismic isolation system to protect structures subjected to a variety of earthquake ground motions. Seismic isolation enables reduction in earthquake forces by lengthening period of vibration of the structure. An base isolation system must satisfy four basic criteria of effectiveness, in particular, acceleration response, shear and overturning moments are reduced by a factor of four to eight for buildings mounted on isolators. A particular GAPEC type of isolation system adopted in New Bhuj Hospital that collapsed during Bhuj 2001 earthquake and completed with earthquake engineering New Zealand Technology is studied.

3. OBJECTIVES

1. To provide horizontal flexibility and vertical stiffness to building.
2. To determine deflection of structure.
3.To determine vibrations in structure.
4.To determine storey drift of structure.
5.To reduce seismic demand of structure.

4. MODEL TESTING RESULTS

As test conducted on the realistic models for the deflections in X- directions for the natural frequency of 5.4 Hz and the number of cycles to be 300 on the Servo Shake Table as the amplitude of 3mm provided below results obtained.

Deflection (in mm) For Different Storey For Different Cases In X-Direction As Follows:				
No.of Storey	Without Base Isolator	With Rubber Bearing	With Spring	Combination Of Both Rubber and Spring
1	6.53	19.11	2.29	19.34
2	14.17	4.33	18.74	3.37
3	20.75	9.24	10.5	10.31
4	32.44	14.91	9.23	14.54
5	50.48	23.00	9.59	22.95
6	66.08	35.34	17.29	33.55

Table -1: Deflection in X-Direction

5. CONCLUSIONS

In case of realistic model there is less variation in displacement at ground level and first floor. At the top level for natural frequency excitation in case of fixed, fixed with rubber and spring.

The realistic model prepared fixed with rubber performance very well for natural frequency excitation as compare to other. It is observed that there is huge acceleration developed for natural frequency excitation in case of fixed base and fixed with spring.

For the combination of rubber and spring fixed case realistic results get obtained.

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