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# Seismic Excitation using Lead Rubber Bearing in Low Rise to High Rise Building

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***Abstract:*** ***The main aim of this project is to carry out modelling and analysis of fixed base and base isolated building by using E-tab 2016 software and study the effect of earthquake on this model.***
***The model which have been adopted for study are symmetric five storey (G+5), ten storeys (G+10)***
***Fifteen storeys (G+15), twenty storeys(G+20) separately for fixed base and base isolation.***
***Keywords:*** ***To carry out comparison between fixed base and base isolated building on the basis of their dynamic properties like maximum shear force, maximum bending moment, base shear, story drift and story's acceleration.***

## I. INTRODUCTION

Conventional seismic design attempts to make buildings that do not collapse under strong earthquake shaking, but may sustain damage to non-structural elements and to some structural members in the building. Non-structural components may consist of furniture, equipment, partitions, curtain wall systems, piping, electrical equipment and many other items. There are mainly three main categories: architectural components, mechanical and electrical equipment's and building contents. This may render the building non-functional after the earthquake, which may be problematic in some structures, like hospitals, which need to remain functional during the earthquake. Non-structural components are sensitive to large floor accelerations, velocities, and displacements. When a building is subjected to an earthquake ground motion, the building induces motion, resulting in floor accelerations higher than the ground acceleration. Hence, it is present need and also a duty of civil engineers to innovate earthquake resisting design approach to reduce such type of structural damages. Special techniques are required to design buildings such that they remain practically undamaged even in a severe earthquake. There are two basic technologies used to protect buildings from damaging earthquake effects. These are base isolation devices and seismic dampers. The idea behind base isolations to detach (isolate) the building from the ground in such a way that earthquake motions are not transmitted up through the building, or at least greatly reduced. Seismic dampers are special devices introduced in the building to absorb the energy provided by the ground motion to the building (much like the way shock absorbers in motor vehicles absorb the impacts due to undulations of the road).

### *A. Advantageous of E-tab*

*1)* Easy and quick model creation for any type of structure.
*2)* Creation of 3D model with utilization of plan and view.
*3)* Automatic consideration of self-weight of material.
*4)* Automatic creation of seismic load and wind load.
*5)* Load combination as per your defined building code is also automated.
*6)* Easy report and documentation.

### *B. Loads And Load Combination*

*1)* *Loads Considered:* Dead load: the load due to its self-weight.
*2)* *Live Load:* for residential building live load is taken as KN/m2
*3)* *Seismic Load:* the load due to acceleration response of the ground to the super structure

## II. CALCULATION OF LOADS

According to IS code: For dead load calculations,
Unit weight of brickwall = 20 kN/m3,
Unit weight of RCC= 25 kN/m3,
Floor finish =1kN/m2 on each floor 3 and (1.5kN/m2) on roof.
Seismic load calculation: As per IS-1893 (PART1)

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## III. DETAILS OF THE STRUCTURE

Multi-storey plane frame with fixed base and base isolation is considered for the present study

*1)* Utility of building: Residential building
*2)* No of stories: G+5, G+10, G+15, G+20
*3)* Floor to floor height: 3.0M
*4)* Shape of the building: SQUARE
*5)* Type of construction: R.C.C framed structure
*6)* Seismic zone IV is considered
*7)* Grade of concrete considered is M30 and grade of steel considered is Fe 415

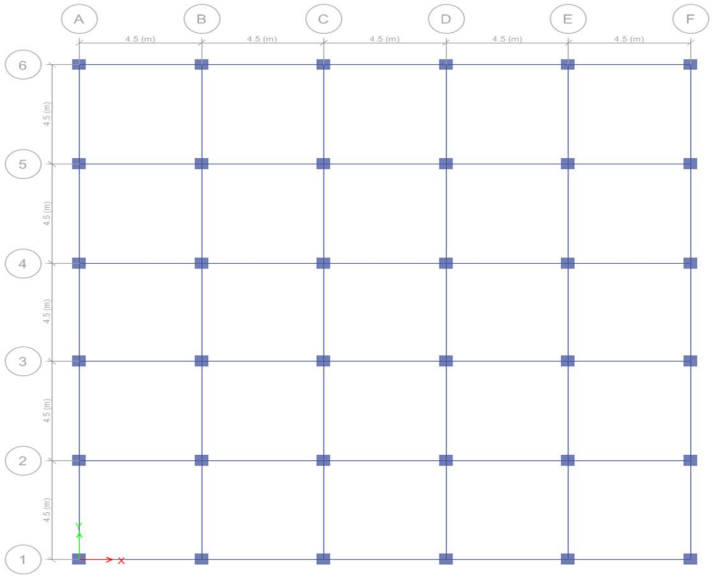


Fig 1- Typical floor building.

Calculation Of Base Shear

| Number of Storey | Fixed Base | Isolated Base |
|---|---|---|
| G+5 | 3600.9946 | 1012.894 |
| G+10 | 6289.1541 | 3356.4534 |
| G+15 | 6418.3179 | 5059.5389 |
| G+20 | 6465.9956 | 6723.4584 |

Storey Drift G+5

| Story Level | Fixed Base | Isolated Base |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 4.768 | 5.755 |
| 2 | 8.169 | 3.682 |
| 3 | 7.974 | 2.753 |
| 4 | 6.533 | 2.121 |
| 5 | 4.501 | 1.574 |
| 6 | 2.399 | 1.139 |

Storey Drift G+10

| Story Level | Fixed Base | Isolated Base |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 8.567 | 18.319 |
| 2 | 15.228 | 11.822 |
| 3 | 16.08 | 9.547 |
| 4 | 15.389 | 8.338 |
| 5 | 14.341 | 7.352 |
| 6 | 13.226 | 6.409 |
| 7 | 12.013 | 5.456 |
| 8 | 10.509 | 4.484 |
| 9 | 8.534 | 3.499 |
| 10 | 5.982 | 2.534 |
| 11 | 3.296 | 1.739 |

Storey Drift G+15

| Story Level | Fixed Base | Isolated Base |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 8.857 | 27.598 |
| 2 | 15.978 | 18.053 |
| 3 | 17.28 | 15.102 |
| 4 | 17.043 | 13.82 |
| 5 | 16.485 | 12.891 |
| 6 | 15.866 | 12.033 |
| 7 | 15.174 | 11.165 |
| 8 | 14.398 | 10.268 |
| 9 | 13.557 | 9.335 |
| 10 | 12.64 | 8.367 |
| 11 | 11.628 | 7.361 |
| 12 | 10.506 | 6.32 |
| 13 | 9.186 | 5.243 |
| 14 | 7.472 | 4.141 |
| 15 | 5.271 | 3.056 |
| 16 | 3.062 | 2.161 |

Storey Drift G+20

| Story Level | Fixed Base | Isolated Base |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 8.987 | 36.674 |
| 2 | 16.343 | 24.218 |
| 3 | 17.895 | 20.649 |
| 4 | 17.878 | 19.342 |
| 5 | 17.5 | 18.52 |
| 6 | 17.099 | 17.801 |
| 7 | 16.701 | 17.074 |
| 8 | 16.248 | 16.311 |
| 9 | 15.717 | 15.508 |
| 10 | 15.143 | 14.663 |
| 11 | 14.559 | 13.774 |
| 12 | 13.95 | 12.841 |
| 13 | 13.27 | 11.864 |
| 14 | 12.5 | 10.843 |
| 15 | 11.668 | 9.781 |
| 16 | 10.801 | 8.686 |
| 17 | 9.84 | 7.563 |
| 18 | 8.606 | 6.378 |
| 19 | 6.981 | 5.152 |
| 20 | 5.005 | 3.943 |
| 21 | 3.153 | 2.949 |

## IV. CONCLUSION

E-tab contains a number of parameters which are designed as per
IS: 456(2000). As we can see by the result that Base shear is maximum for a fixed base and minimum in base isolation likewise storey drift is minimum in base isolation for low to medium rise building but as we go for a higher building base isolation is not properly working so, base isolation is not good for high rise building

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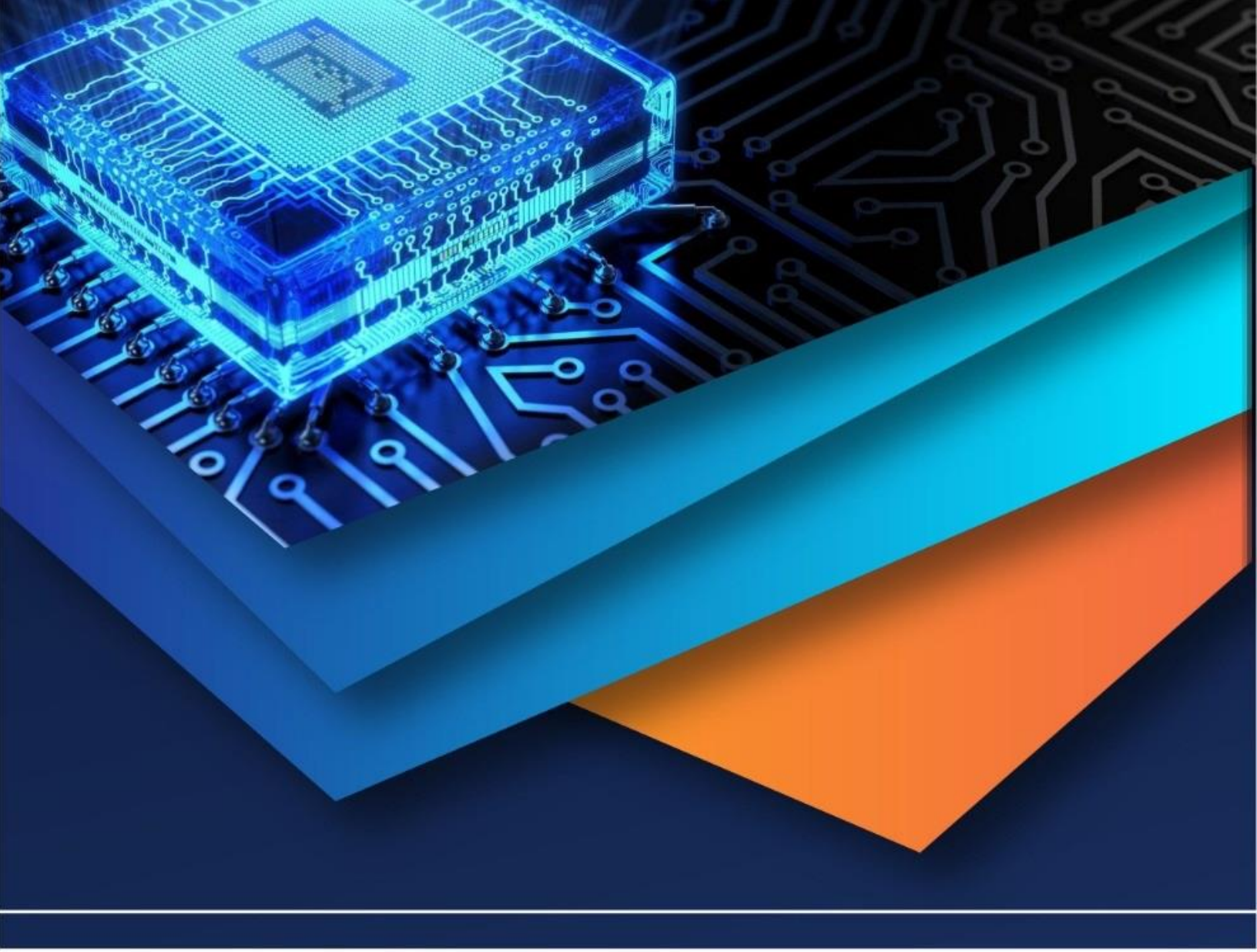

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