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INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

CRITICAL STUDY OF SEISMIC ANALYSIS OF MULTISTOREY BUILDING WITH AND WITHOUT FLOATING COLUMN

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Abstract
This paper presents critical study of seismic analysis of multistory building with floating and without floating columns. This work includes the analysis and design of the floating column and non-floating column structures by using software ETABS-2015. The best way is to select the type of construction, depending on the circumstances and type of structure. Load transfer path has a great importance in case of structural stability in very major earthquake. There are numerous observations of damages caused by irregularity in buildings such as vertical irregularity is predominant to structure while earthquake excitation, the earthquake forces developed at different floor levels in building need to be brought down along the height to the ground by the shortest path, any deviation or discontinuity such as floating columns results in poor performance of building. The aim of this work is to compare the response of RC frame buildings with and without floating columns under earthquake loading and under normal loading. The idea is to reach a definite conclusion regarding the superiority of the two structures over one another. Finally, analysis results in the building such as storey drifts, storey displacement

Keywords: dynamic analysis, floating column, ETABS, response spectrum method

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INTRODUCTION:

The term floating column is also a vertical member which at its lower level rests on a beam which is a horizontal member. The beams in turn transfer the load to other columns below it. The building can be categorized into two type, regular building and irregular building. Building containing floating column comes into irregular type of building. This type of building is mainly known as irregular building. So building with floating column, there will be discontinuity in load transfer path. The forces which are generated will be transferred to the ground through the shortest possible path. In order to convert it into a building with floating column, some of the columns at storey one is removed and two cases are considered. These buildings were analysed for two different zones i.e. zone III

FLOATING COLUMN

The floating column is a vertical member which rest on a beam and doesn't have a foundation. The floating column act as a point load on the beam and this beam transfers the load to the columns below it.

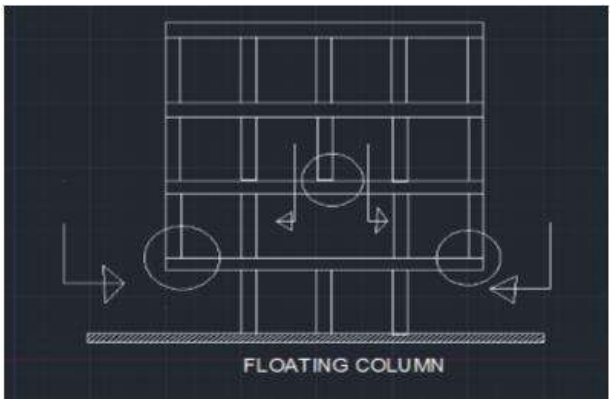

Figure 1 Floating column in building.

The main objectives of the proposed work are: 1. To compare the modal response of all the models (Mode shapes, Time period, Frequency). 2. To compare the Base shear, Storey drift, Storey displacement and maximum displacement of each storey

MODELLING DETAILS:

In present study, seven storey normal building is considered and in normal building columns of storey one

are removed with different arrangements to make it into building with floating column. For this evaluation two different cases are considered along with normal building. These cases are evaluated for two different zones i.e. zone III and zone V. Building has storey height of 3m. The building has plan area of 20m x 20m. The spacing of columns in X direction is 5m and spacing of columns in Y direction is 5m. For building with floating column, two different cases are considered.

MEMBER PROPERTIES:

A. MEMBER DIMENSIONS

Beams	Columns
350mm×500mm	350mm×350mm
550mm×700mm	550mm×550mm

Take slab thickness 125mm

B.LOADS

Floors	L.L= 4 kN/m^2 F.F= 1.5 kN/m^2
Walls	External Wall=12 kN/m Internal Wall=6 kN/m Parapet=4.6 kN/m

*Use **M35** Grade of Concrete & **HYSD500** of Steel.

Building plan &elevation of normal building with and without floating column is shown below:

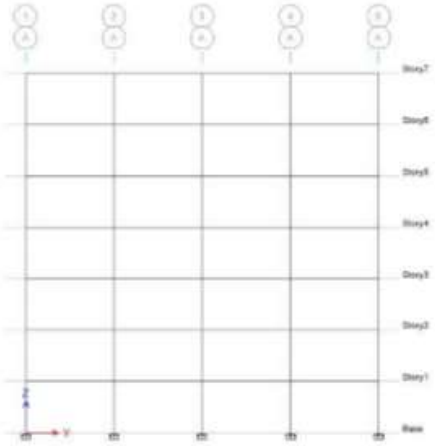

Fig 2 Elevation of normal building

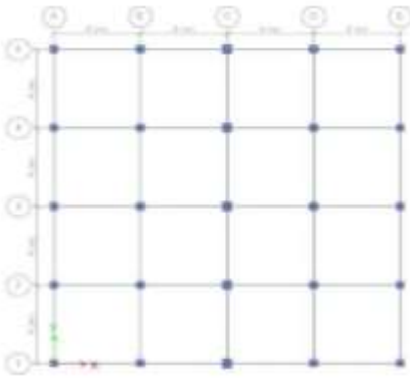

Fig 3 Plan of normal building

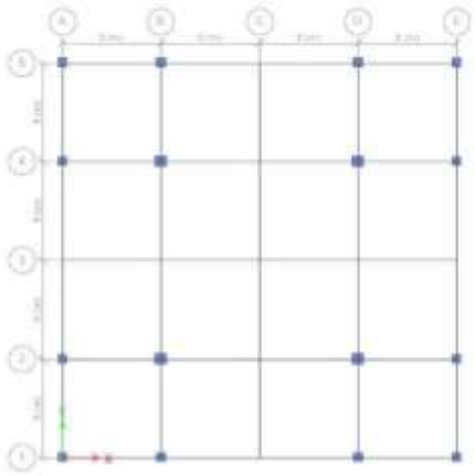

Fig.4 Plan of building with floating column

RESULTS AND DISCUSSION

Following table shows Storey Displacement for building of Zone III

TABLE I. STOREY DISPLACEMENT FOR ZONE III

Storey	Normal	Case 1	Case 2
Base	0	0	0
Storey 1	2	2.8	2.8
Storey 2	5.3	5.9	6.1
Storey 3	8.4	9	9.2
Storey 4	11.1	11.6	11.8
Storey 5	13.2	13.7	13.8
Storey 6	14.7	15.2	15.3
Storey 7	15.4	16	16

Following graph shows the comparison of Storey Displacement for Zone III

Fig 5 Comparison of storey Displacement for Zone III

Storey Drift: Storey Drift is defined as the relative difference between the displacements of adjacent storey. Storey Drift for normal building and both cases of building with floating column and their comparison are shown below:

Table III Storey drift for Zone III

Storey	Normal	Case 1	Case 2
Storey 1	2.386	2.799	2.826

Storey 2	2.785	3.111	3.294
Storey 3	3.18	3.211	3.12
Storey 4	2.802	2.875	2.745
Storey 5	2.319	2.327	2.271
Storey 6	1.689	1.695	1.65
Storey 7	0.933	0.957	0.903

Following graph shows the comparison of Storey Drift for Zone III

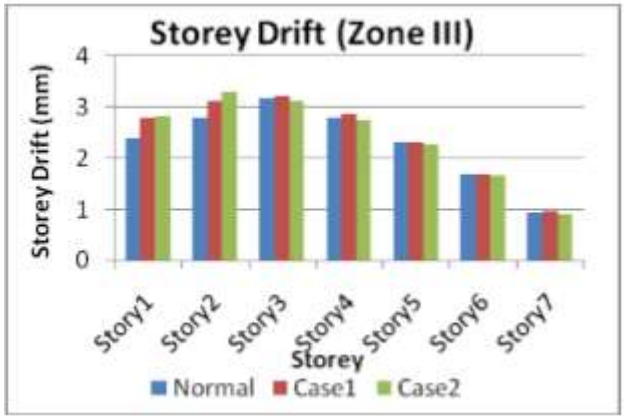

Fig 6 comparison of storey drift for Zone III

Storey Forces: The Forces which are induced at every storey during an earthquake is known as Storey Forces. Storey Forces induces in a building with floating column will be less as compared to normal building since the mass is less for building with floating column

TABLE V. STOREY FORCES FOR ZONE III

Storey	Normal	Case 1	Case 2
Storey 1	1638	1576	1556
Storey 2	1564	1447	1437
Storey 3	1403	1357	1347
Storey 4	1220	1141	1135
Storey 5	1113	1102	1092
Storey 6	749	740	732
Storey 7	346	335	325

Following graph shows the comparison of Storey Forces for Zone III

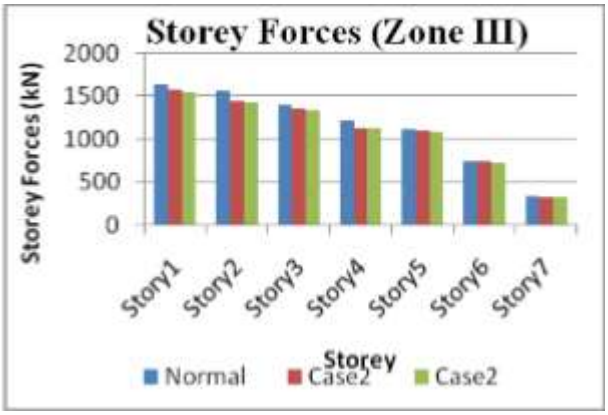

Fig 7 comparison of storey forces for Zone III

CONCLUSION

From the analysis done and the results obtained, the following conclusions were drawn:

a) Storey Displacement: With the introduction of floating column in the building, storey displacement increases.
b) Storey Drift: As storey displacement increases, storey drift also increases for a building with floating column.
c) It was observed that in building with floating column has less base shear as compared to building without floating column.
d) Storey forces: Storey Forces in a building with floating column is less as compared to the normal building since there is less number of columns.
e) Floating columns should be avoided the areas of high seismic zones because of its poor performance.
f) The performance of building can be improved by increasing the dimensions of beams and columns where floating columns are provided.

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