Seismic Analysis of Building of Number of Floating Columns Through One Base Column

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Abstract- *A column is supposed to be a vertical member starting from the foundation level and transferring the load to the ground. The floating column is a vertical element that its lower level rests on a beam that is a horizontal member. There are many projects it can be used to floating columns are adopted, especially above the ground floor, where the transfer girders beam, so that their more open space is obtained on the ground floor. These open spaces may be required for an assembly hall or parking purposes. The girders has to be designed properly in earthquake zones. The column is a point load on the beam which supports it. ETAB can be used to do the analysis of this type of structure.*

Keywords- Floating Column, Base Shear, Storey Displacement, Storey drift.

I. INTRODUCTION

Now aday, constructions of buildings in India, the main problem are created in the housing of parking areas, reception lobbies etc. To this problem floating columns came into presence and now it has become an inescapable feature in most of the multi-storied buildings from foundation level and transferring the load to the ground. The term floating column is a vertical element that its lower level (termination level) place on a beam that is a horizontal member. The floating columns are adopted, especially above the ground floor, where transfer girders, so that more open space is available on the ground floor. These open spaces may be required for an assembly hall or parking purposes. The transfer girders have to be designed as per the IS code and detailing properly. the column is assumed pinned at the base and is taken as a point load on the transfer beam. The floating column is a vertical member which place on a beam. But such a column cannot be placed easily to construct practically since the columns bottom the termination level are not constructed with care and hence finally cause failure.

Commercial Buildings with floating columns that float on beams at an First storey and do not go all the way to the foundation have discontinuities in the load transfer path. The floating column is used for the purpose of architectural and Elevation view. It can be analysed by using E-TABs. The provisions of floating columns can be stated as most of the buildings in India are covering the maximum possible area on a plot within the available by-laws.

The column can be start on the first floor while resting on a beam. Usually, columns rest on the foundation to transfer load from slabs and beams. But the floating column rests on beam. The floating column on commercial building as shown in Fig.1

Fig.1 Model of building

II. MODELLING OF STRUCTURE

The Following structure is studied for the analysis.

In this type of structure, the structure is created floating column from 1st-floor level i.e Using only one base column is 1000x1000mm.The G +3 storey building is created for analysis.

Table 1: Properties Of Model Structure

SrNo.	Properties	SizeIn Mm	Grade
1	MainColumn	1000X1000	M35
2	FloatingColumn	300X530	M30
3	Beam Framing	230X450 150X450	M25 M25
4	BeamGrader	600X600	M25
5	Floor to floor height	3M	
6	Thickness of slab	125mm	M25
7	Soil type	Hard Soil	
8	Seismic zone	III	
9	Response reduction factor	3	
10	Important factor	1	

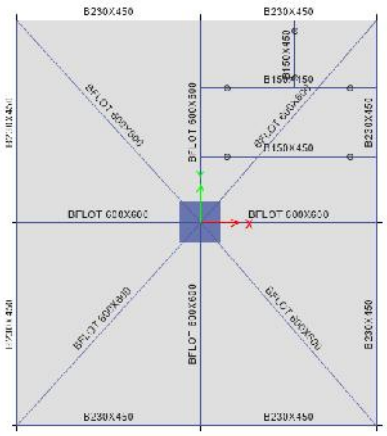


Fig.2: First Floor of Model

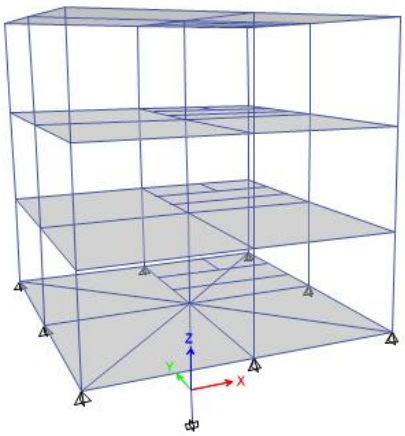


Fig.2.1: 3D View of Model

III. LOAD COMBINATION

1.5(DL+LL)
1.2(DL+LL+EQX)
1.2(DL+LL+EQY)
0.9DL+1.5ELX
0.9DL-1.5ELX

IV. LOAD CONSIDERED

The dead load on which self-weight of a factor in the Y direction and Super load of uniform force 4.5KN/m are assigned on each floor as shown below:

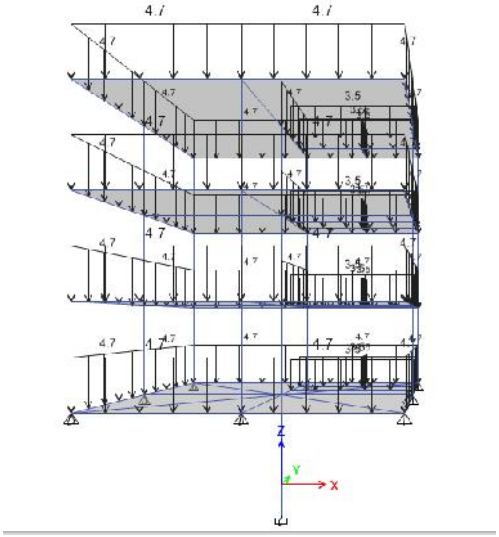


Fig. 4: Super Dead Load on Framing

V. RESULT AND DISCUSSIONS

In this study models of Three storeys, Commercial building of floating column and their seismic performances has evaluated by response spectrum and analysis and IS 1893:2016.The project requires the analysis of the building to find out the magnitude of loads and their distribution. Hence, the software has been used for the analysis was E-TABs 2017. The building was modelled with all the structural elements and floating columns. The number of loads that would act on the structure were defined along with the properties of the structural parts. The analysis can be done and the loads and the moments were determined. After which the structural elements are analysis &designed manually and have been checked for safety.

II. Calculated Base Shear

Direction	PeriodUsed (sec)	W(kN)	Vb(kN)
Y	0.514	4797.4319	319.8288

I. Applied Story Forces :

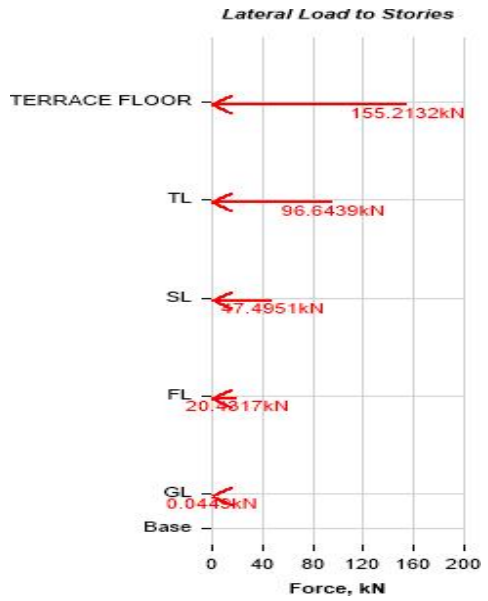


Fig. 5: All-Story Forces

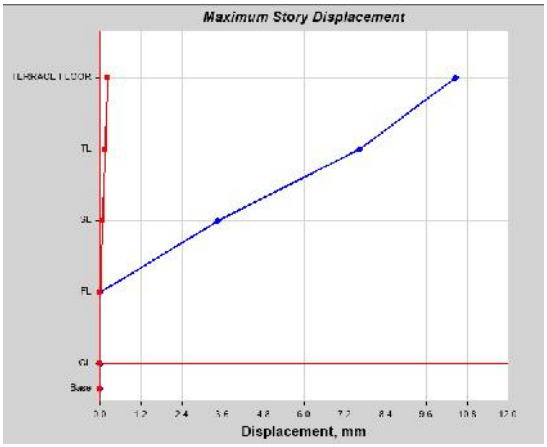
III. Modal mass participation ratio

Mode	Period sec	UX	UY	Sum UX	Sum UY	RZ	Sum RZ
1	0.558	0.8351	0	0.8351	0	0.0193	0.0198
2	0.514	0.0033	0.6803	0.8385	0.6803	0.1596	0.1794
3	0.512	0.0146	0.1546	0.8531	0.8348	0.7023	0.8822
4	0.17	0.1048	0	0.9579	0.8348	0.0023	0.8845
5	0.156	0.0024	0.0002	0.9602	0.835	0.0952	0.9798
6	0.145	2.30E-06	0.1213	0.9602	0.9563	0.0001	0.9799
7	0.093	0.0248	0	0.985	0.9563	0.0003	0.9802
8	0.085	0.0004	2.08E-05	0.9854	0.9563	0.0193	1
9	0.072	0	0.0289	0.9854	0.9853	5.12E-06	1
10	0.005	0.0146	0	1	0.9853	8.04E-06	1
11	0.005	0	0.0147	1	1	0	1

As per the IS 1893:2016, the First three modes together contribute at 65 present mass participation factors in each principal plan direction.The condition will be satisfied and the model will be safe for the torsion effect.

IV. STOREY DISPLACEMENT

In case of storey displacement in both EQx & EQy Direction. The building shows the maximum displacement.



Graph 5.4.1: Maximum Displacement In X Direction

Graph 5.4.2: Maximum Displacement In Y Direction

VI. CONCLUSION

- Hence provide the floating column is advantageous in providing a good floor space index but the risky & vulnerability of the building increases.
- The columns hear varies according to the situation and the orientation of columns.
- The immortal position to provide floating column is rest at 1st floor alternatively so that moment, shear & steel requirement of the all floor of building can be minimized.

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