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Design And Analysis Of High-Rise Building With And Without Floating Columns

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Abstract- *Present buildings with floating column are a representative feature in the present multistory construction in densely populated India. There are many engineering projects in which the floating columns are adopted, especially above the ground floor, where girders are used, so that more open space is available in the ground floor. As the load distribution in the floating columns is not continuous, they are more unsafe to the seismic activity. Sometimes, to meet the requirements these type of aspects cannot be avoided though these are not found to be of safe. Hence, here an attempt is taken to study the behavior of a G+15 multi storey building in which some storey's are considered for commercial and remaining storey's are for residential purpose. This paper deals with the study of the comparison & seismic analysis of the multistory buildings with floating column and without floating column. At last, analysis & results in the for various parameters such as storey drifts, storey displacement, and Base shear are shown in this study. Design and Analysis was carried out by using (ETABS-2016) Software.*

KEY WORDS: Base shear, Story drift, Static analysis, Multi-story, Floating column.

1. INTRODUCTION

Many new multi storey buildings today have open first storey as an uneludible feature. This is used to accommodate parking or reception lobbies in the first storey. The behavior of a building during an earthquakes depends upon its overall size, shape and configuration. The earthquake forces developed at different floors in a building need to be transferred down along the height to the ground by the shortest path. Any difference or break in this load transfer path results in poor performance of the building. Buildings with vertical setbacks cause a sudden jump in earthquake forces at the level of discontinuity. Many Buildings with columns that float on beams half-way and do not go down to the foundation, have discontinuities in the load transfer path. The floating column rests on the transfer beam and this beam transfer the forces to the columns below it. In present this is a common feature.

2. PROBLEM STATEMENT

A G+15 storied building with and without floating column located in India designed as per IS code 1893(Part1):2002 were taken into consideration. In this case study initially a normal building without floating column is analysed as model-1 and in model 2 floating column is located at various floors, Designing and analysis will be carried out in (ETABS 2016) software.

Table No -1: Parameters

Parameters	**Without floating column building Model1**	**Floating column at 5st floor building Model2**
Soil type	Hard soil	Hard soil
Seismic zone	III	III
Response reduction factor	5	5
Importance factor	1	1
Height of building	58.8m	58.8m
Floor to floor height	3.6m	3.6m
Thickness of slab	150mm	150mm
Beam sizes	300*450mm	300*500mm
Column sizes		
Ground to 2nd floor	230*600m	300*900m

3rd floor to 5th floor	230*450mm	300*750mm
Material properties	M-25 Grade of concrete	M-25 Grade of concrete

3. ANALYSIS IN ETABS

The first step we have to do is to set grid dimensions in ETABS. This includes setting number of lines in X and Y direction and the spacing between grid lines. After that other parameters are defined which includes setting the number, height of top and bottom storey. The type of the slab which is to be designed is also mentioned.

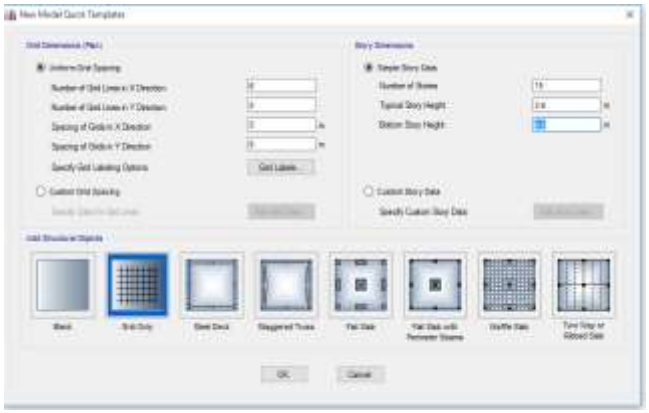

Fig No.1 Assigned properties

3.1 Designing:

A G+15 building is considered for anlaysis (without floating columns) in case 1 and in the case 2 another building having first 10 storeys for commercial purpose and from there onwards 11th storey to roof is for residential purpose in which the floating column is placed. the plan and the configurations of both the buildings are shown in the figure.

1)Case –1: Here a normal building with all normal columns is considered as model-1 with dimensions of beams as 300mm X 450 mm and column as 230mmX600mm upto third storey and 230mm X450mm till roof.

2)Case –2: A building with floating columns is considered with dimensions of beams as 300 mmX500mm and column size as 300mmX900mm up to third storey and 300mmX750mm till roof. the floating columns are introduced from 11th floor. The beam dimensions are needed to be changed. the structure is made safe by increasing the beams and sizes of column. A transfer beam carries the heavy load typically of a column. The safety of the structure is to be fully considered while designing otherwise the structure will fail and can lead to serious problems.

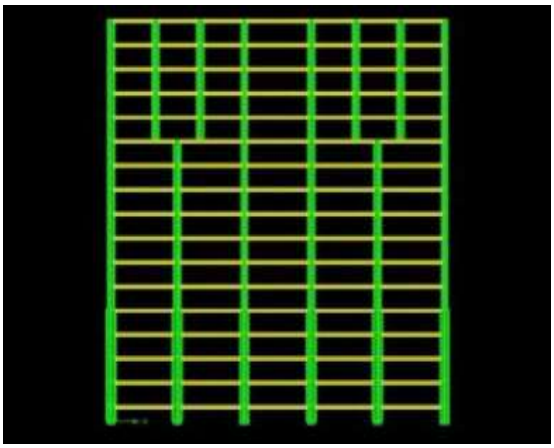

Fig No.3 Elevation of Model 2

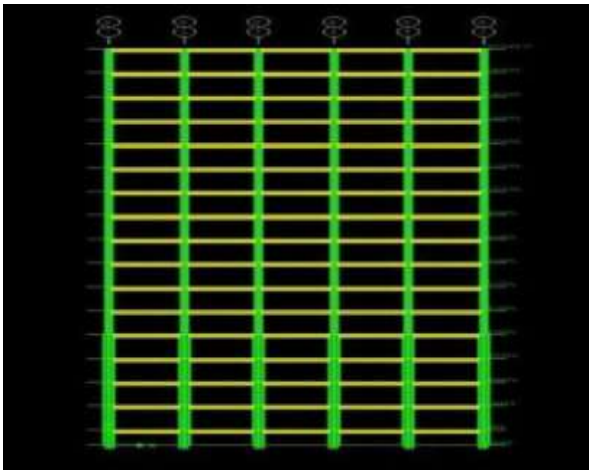

Fig No.2 Elevation of Model 1

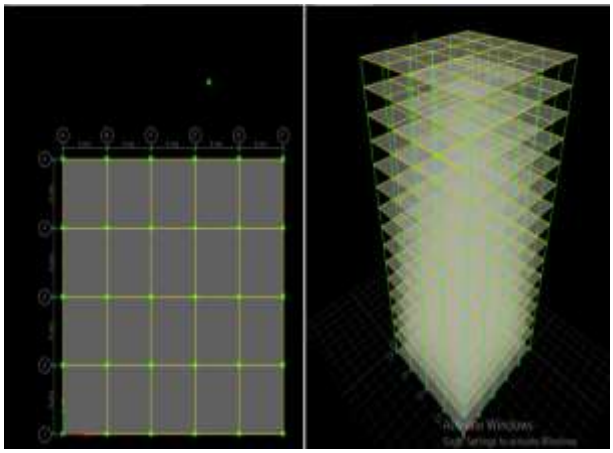

Fig No.4 Plan And Elevation

4. RESULTS AND DISCUSSIONS

A. Story Drift EQPY

Table No -2:

STORY	WITHOUT FC	WITH FC			
			8	0.00178	0.00285
15	0.00073	0.00103	7	0.00189	0.00295
14	0.00092	0.00142	6	0.00197	0.00302
13	0.00104	0.00176	5	0.002	0.00304
12	0.00109	0.00236	4	0.0017	0.00257
11	0.00112	0.00246	3	0.00166	0.0025
10	0.0012	0.00253	2	0.00153	0.0023
9	0.0016	0.00271	1	0.00117	0.00175
-	-	-	GF	0.00045	0.00068

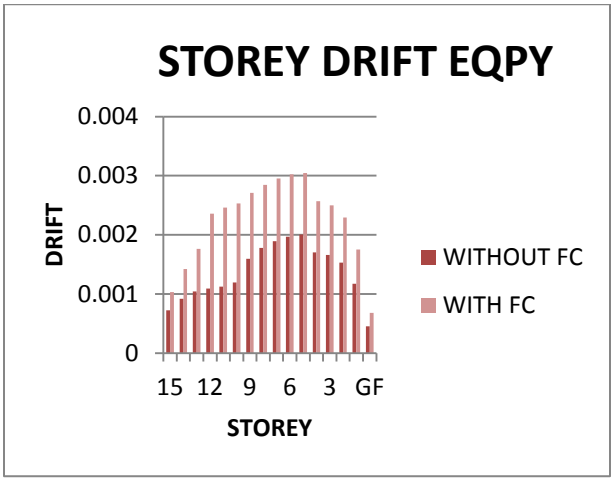

Chart -1:

B. Story Drift WLX

Table No -3

STORY	WITHOUT FC	WITH FC			
			8	0.0011	0.00137
15	0.00029	0.00033	7	0.00124	0.0015
14	0.0004	0.00048	6	0.00137	0.00163
13	0.0005	0.00064	5	0.00149	0.00175
12	0.00058	0.00098	4	0.00135	0.00156
11	0.00057	0.00104	3	0.00138	0.00158
10	0.00068	0.00109	2	0.00133	0.00152
9	0.00094	0.00123	1	0.00106	0.0012
-	-	-	GF	0.00042	0.00047

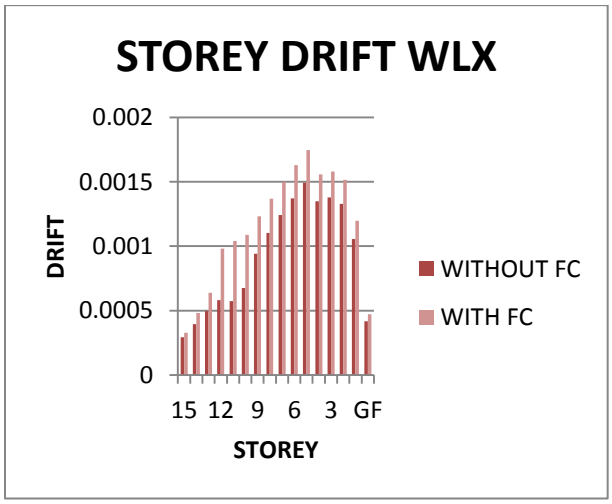

Chart -2:

C. Story Shear in X-Direction

Table No -4:

STORY	WITH FC	WITHOUT FC			
15	871.68	527.89	8	2741.86	1796.18
14	1273.12	752.69	7	2859.85	1909.9
13	1621.68	947.88	6	2949.07	1995.88
12	1921.1	1115.56	5	3013.53	2058.01
11	2175.11	1257.8	4	3058.41	2101.26
10	2403.51	1470.08	3	3086.91	2128.73
9	2591.09	1650.86	2	3101.99	2143.27
-	-	-	1	3107.88	2148.94
			GF	3108.29	2149.33

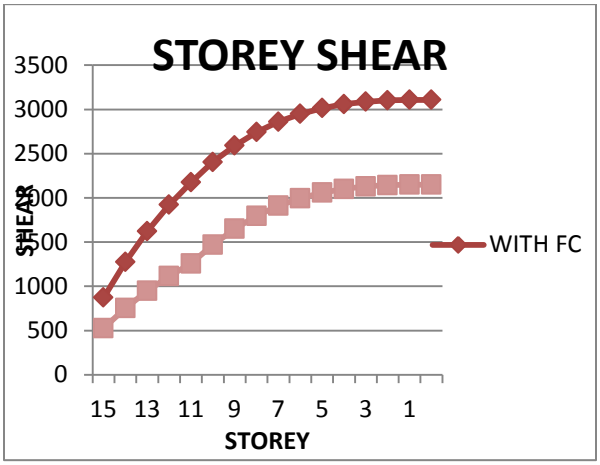

Chart -3:

D. Lateral Displacement EQPY

Table No -5:

STORY	WITHOUT FC	WITH FC
15	0.00148	0.00188
12	0.00146	0.00183
9	0.00095	0.00144
6	0.00062	0.00122
3	0.00036	0.00066

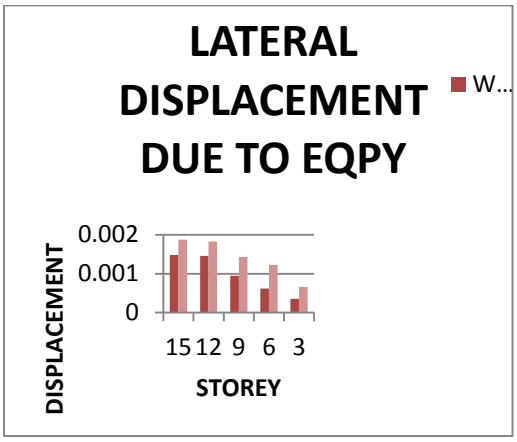

Chart -4:

E. Lateral Displacement EQPX

Table No -6:

STORY	WITH FC	WITHOUT FC
15	0.00187	0.00149
12	0.00182	0.00146
9	0.00143	0.00095
6	0.00122	0.00062
3	0.00066	0.00036

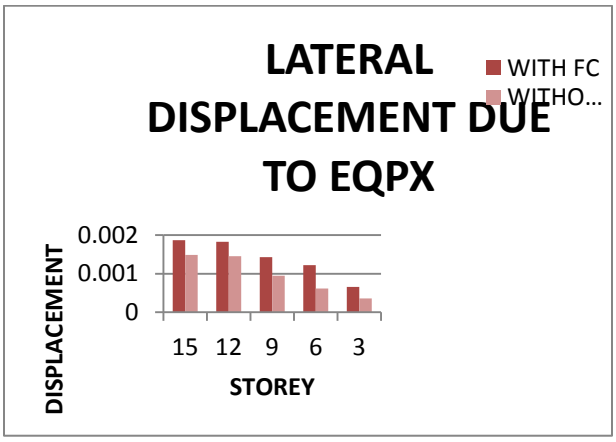

Chart -5:=

4. CONCLUSION

The conclusions made based on the investigation carried during the process are as follows:

1) While applying the loads in X & Y-direction the lateral displacements of floating column building are more as compared to that of a normal building. So we conclude that the building with floating column building is not safe for construction when compared to a normal building.

2) Storey drift at each floor for the buildings with floating column is found to suffer extreme storey drift compared to that of a normal building. The storey Drift at 5th and 6th storey is found to be maximum.

3) The storey shear in building with floating columns is more than that of the normal building. This is due to the use of more quantity of materials than a normal building.

4) The final remarks made on the use of floating column is that we do not prefer to construct floating column in buildings unless there is a necessary and functional purpose.

REFERENCES

1. Anil Mundada and Sunil Sawdatkar, "Comparative study of seismic analysis of multistory Building with and without floating column".

2. Pankaj,Manish"Earthquake resistant structures", New Delhi.

3. Elguhazouli and Gogins, "Earthquake response analysis of concentrically-braced sub-frames".

4. Sukumar"Seismic analysis of multistory building with floating column,

5. Shrikanth "Seismic response of complex building with floating column and without floating column,

6. Maison and Ventura, Members of ASCE computed dynamic properties and response behaviours of 13 storey building.

7. Santosh,Dyavanal and Annigeri "Performance based Seismic Evaluation of Symmetric Multi storey Buildings.

8. Roy "Behavioral studies of floating column on framed structure ".

9. Patyush"Comparative study of effect of floating column on the cost analysis of a structure designed on staad pro v8i.

10. Shirule"Time history analysis of base isolated multistory building".