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Seismic Analysis of Multistorey Floating Column Building with Lateral Load Resisting System

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Abstract: The primary object of the review is to know the way behaving of multistory building with floating column as for the shear wall and bracings under seismic power for various zone i.e zone 3, zone 4, zone 5. The review is done for G+7 building utilizing ETABS programming. Contrasting the outcome got in various cases and closing which kind of system provides more effectiveness.
Keywords: Floating column building, Bracings, Shear wall, Storey displacement, Storey drift, Base shear

I. INTRODUCTION

Floating columns are the structures which have columns that relaxation on beams, beam being guide to the columns on the first slab and above the structures. The bottom ground is saved open by means of the use of minimum wide variety of columns which might take the whole load on the way to come from beams to the basement columns and switch it to the floor. The floating column systems has a bonus that greater space is to be had because of the restrict use of columns without any obstacles as properly as it cannot maintain seismic forces and can get damage

The column is a vertical member beginning from basis stage and moving the weight to ground. The time period floating column is a vertical element which at its decrease stage rests on a beam that is a horizontal member. The beam switch the weight to different column below. There are many initiatives wherein floating columns are followed in particular above the floor ground, in order that extra open space is to be had inside the floor floor and these open space may be utilized as birthday party corridor, meeting hall and parking motive.

II. LITERATURE REVIEW

Neha pawer et. All(2021) carried on ''Effect of floating column on buildings subjected to seismic forces''-in this paper they analyzed the G+8 building with floating column in ETABS. The analysis carried by changing the upper storey height, removing exterior and interior columns and also changing the size of the column. They conclude that theinterior placement of floating column reduces the seismic hazard of structure as compared to outer periphery floating columns. After increasing the diameter of the column the displacement is reduced.

Maneesh Ahirwar, Rahul Satbhaiya(2020) carried on ''Reliability analysis of multistorey building with floating column by Staad.pro-V8i''- in this paper they analyzed G+2 building with and without floating column in Staad Pro software by static analysis as well as dynamic analysis method. Under static loading, found that both building were safe and under dynamic loading floating column structure was unsafe. With increasing the quantity of concrete by 27.40% and reinforcement of structures by 15.05% the building safe under dynamic loading also.

Gulchaman Khan and Mayur Singi(2019) carried out research on ''Seismic Analysis of Multistorey Building Having Floating Column''-in this paper they analyzed the 8 storey, 12 storey and 16 storey building with the floating column furnished with and without shear position for zone V by using the software ETABS 2016 and concluded that providing the shear wall, the storey displacement can be reduced compared to without shear wall. By providing shear wall at all the four junction makes the building total stable in lateral displacement as well as storey drift.

Kiran Kumar Gaddad and Vinayak Vijapur(2018) carried on ''Comparative study of multistorey building with and without floating column and shear walls ''- in this paper they analysed the G+20 building, with four different structures using ETABS software. They concluded that the building with shear wall possess better performance, lesser displacement, more strength compare to other models.

Payal k Jayswal, Amey R Khedikar(2018) carried on'' Seismic analysis of multistorey building with floating column and regular column''-in this paper they analysed the G+6 building with floating column and regular column in STAAD Pro software. They concluded that by introducing the floating column to the building, moment increases in both x and y direction. Axial force as well as shear also increases in both the direction and may increases the displacement at various nodes.

A.   Objectives
1) To model the multistorey building i.e G+7 with floating column in ETAB software.
2) Seismic design of the multistorey building with floating column.
3) To analyse the multistorey building with floating column.
4) To study the structural response of the building models with respect to storey displacement, storey drift and base shear.
5) To compare the structural response building with floating column with respect to different zones.
6) To provide the bracing and shear wall for multistorey building with floating column.
7) To compare the structural response of multistory building with floating column with respect to bracings and shear wall.
8) To compare the structural response of floating column building with respect to the lateral load resisting structures.

III.   METHODOLOGY

1) *Step 1:* Seismic design of a multi storey building i.e G+7 with the floating column.
2) *Step 2:* Modelling of the G+7 building with the floating column for zone 3, floating column building for zone 4 and floating column building for zone 5 in ETABS software
3) *Step 3:* Analyzing the above model or the building in the software and taking the values of storey drift, storey displacement and base shear.
4) *Step 4:* Again modeling the G+7 floating column building by providing bracing for zone 3, zone 4 and zone 5.
5) *Step 5:* Analyze the models of floating column building with bracings and take the values of storey drift, storey displacement and base shear.
6) *Step 6:* Modeling the G+7 floating column building by providing the shear wall for zone 3, zone 4amd zone 5.
7) *Step 7:* Analyze the models with shear wall and take the values of storey drift, displacement and base shear.
8) *Step 8:* Compare the values of different models and plot the graph foe respective ones.
9) *Step 9:* Concluding the system which provides more efficiency.

A.   Response Spectrum Analysis
Response spectrum plot gives the greatest relocation, most extreme speed, greatest speed increase or some other boundaries to the regular recurrence exposed to indicated excitation for straight single degree of
freedom system oscillators.
These plots are exposed to explicit damping and it changes as damping changes.
To decide the most extreme response of a straight single degree of freedom system from the accessible spectral graph, for indicated seismic tremor excitation , one necessities just to know the natural frequency of the system and damping.
The response spectrum is involving the similar standards as time history.
Just rather than time history, it is greatest upside of the response.At the point when the time history profile isn't free for a specific dynamic event, then the response spectrum used.
Response spectrum analysis provides more moderate outcome than time history.

B.   Building Description
1) The building is of 20m length in x direction, 20m length in y direction with the storey height of 3m.
2) Spacing of column is 5m
3) The building consists of 8 storey i.e G+7 storey
4) Size of the beam is 300*500mm
5) Size of the column is 300*600mm
6) Size of the slab is 200mm
7) Size of the shear wall is 200mm
8) Grade of concrete is M30 grade of steel is Fe415

Parameters considered for the building design

Parameters	Type/ value
structure type	floating column building
resisting system	bracing, shear wall
area of structure	400m^2
live load	5 KN/m^2
importance factor	1
R	3
Zone	3, 4, 5
Floor finish	1 KN/m^2
Soil type	Medium
Density of concrete	25KN/m^2

C. Model description

Model 1- Building provided floating column for zone 3

Model 2- Building provided floating column for zone 4

Model 3- Building provided floating column for zone 5

Model 4- Floating column building with bracings for zone 3

Model 5- Floating column building with bracings for zone 4

Model 6- Floating column building with bracings for zone 5

Model 7- Floating column building with shear wall for zone 3

Model 8- Floating column building with shear wall for zone 4

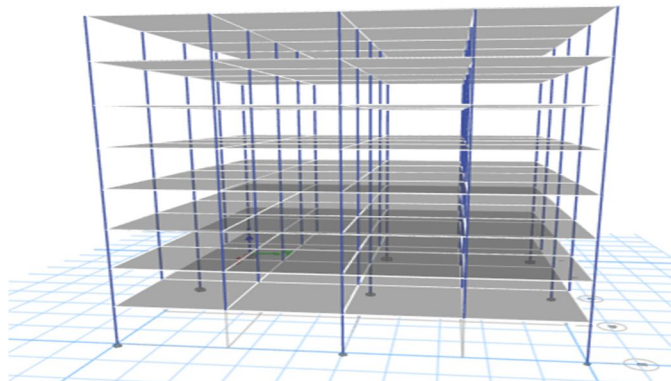Model 9- Floating column building with shear wall for zone 5

ETABS models
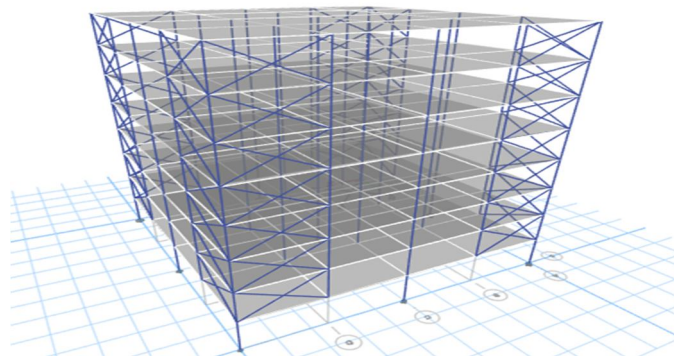

Fig.1 Model 1, Model 2, Model 3
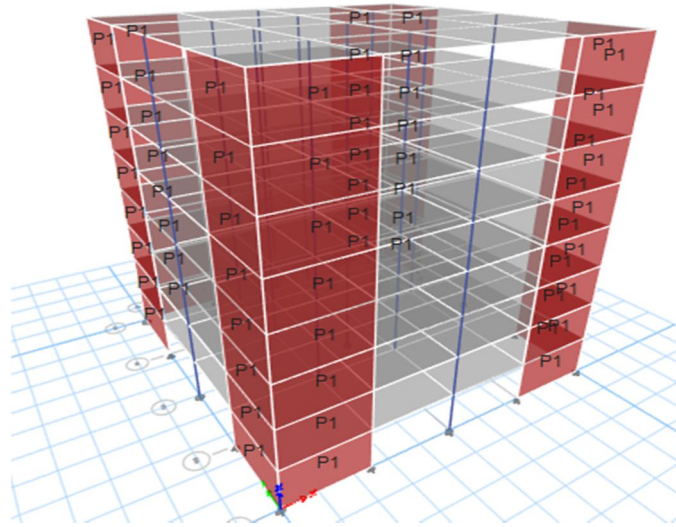

Fig.2 Model 4, Model 5, Model 6

Fig.3 Model 7, Model 8, Model 9

IV. RESULT AND DISCUSSION

A. Storey Displacement

Story	STOREY DISPLACEMENT IN mm			
	Model 1	Model 2	Model 3	Model 4
Story8	95.496	106.816	123.797	66.342
Story7	91.095	101.735	117.695	60.954
Story6	84.418	94.043	108.479	54.886
Story5	75.438	83.769	96.265	48.338
Story4	64.304	71.143	81.403	41.333
Story3	51.19	56.414	64.25	33.947
Story2	36.408	39.965	45.302	26.396
Story1	20.555	22.473	25.349	18.429
Base	0	0	0	0
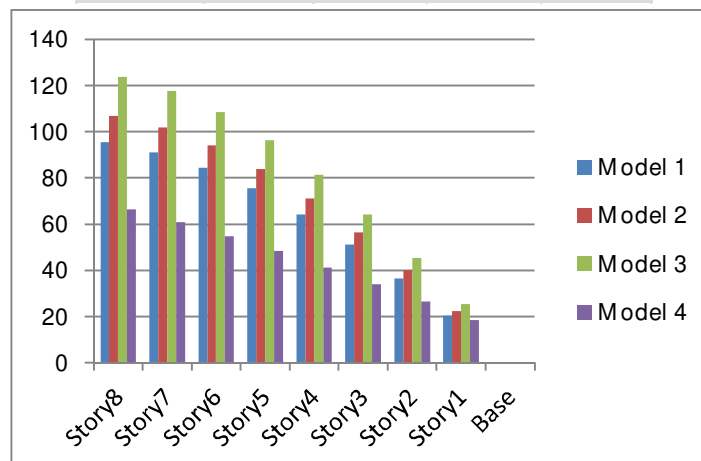
Fig.4 storey v/s displacement

Story	Model 5	Model 6	Model 7	Model 8	Model 9
Story8	74.205	86.001	13.001	14.935	17.837
Story7	68.091	78.797	11.198	12.849	15.325
Story6	61.199	70.669	9.285	10.635	12.659
Story5	53.774	61.928	7.361	8.411	9.986
Story4	45.855	52.637	5.465	6.225	7.366
Story3	37.536	42.919	3.667	4.161	4.903
Story2	29.065	33.068	2.057	2.323	2.721
Story1	20.183	22.816	0.789	0.884	1.027
Base	0	0	0	0	0
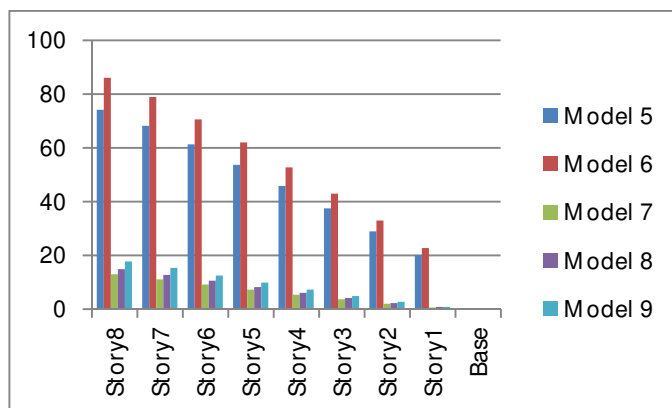
Fig.5 storey v/s displacement

B. *Storey Drift*

Story	STOREY DRIFT			
	Model 1	Model 2	Model 3	Model 4
Story8	0.001469	0.001696	0.002037	0.001829
Story7	0.002226	0.002564	0.003072	0.002023
Story6	0.002993	0.003425	0.004072	0.002183
Story5	0.003712	0.004209	0.004955	0.002336
Story4	0.004375	0.004914	0.005722	0.002464
Story3	0.004947	0.005504	0.00634	0.002538
Story2	0.005385	0.00594	0.006773	0.002724
Story1	0.006826	0.007463	0.008418	0.006103
Base	0	0	0	0
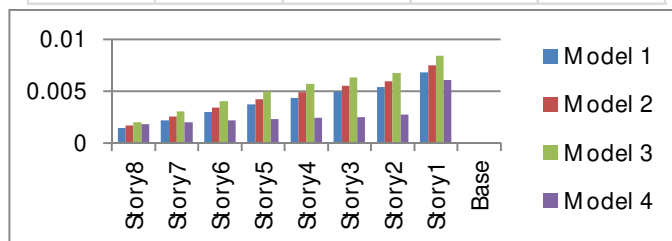
Fig.6 storey v/s storey drift

Story	Model 5	Model 6	Model 7	Model 8	Model 9
Story8	0.002076	0.002446	0.000618	0.000714	0.000858
Story7	0.002297	0.002709	0.000638	0.000738	0.000889
Story6	0.002475	0.002913	0.000642	0.000741	0.000891
Story5	0.002641	0.003098	0.000632	0.000729	0.000873
Story4	0.002775	0.003242	0.000599	0.000688	0.000821
Story3	0.002846	0.003309	0.000537	0.000613	0.000727
Story2	0.003034	0.003499	0.000433	0.000492	0.00058
Story1	0.006684	0.007556	0.000263	0.000295	0.000342
Base	0	0	0	0	0
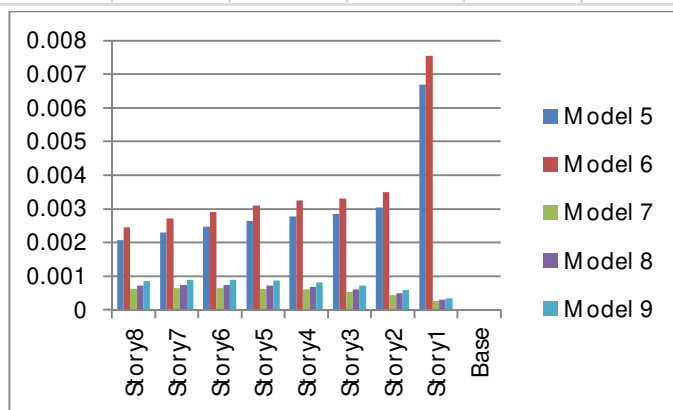
Fig.7 storey v/s storey drift

C. Base Shear

Story	BASE SHEAR IN KN			
	Model 1	Model 2	Model 3	Model 4
Story8	921.6725	1082.509	1323.763	926.3918
Story7	1782.529	2073.794	2510.691	1794.31
Story6	2574.179	2961.268	3541.902	2591.148
Story5	3307.269	3760.903	4441.355	3327.841
Story4	3992.447	4488.67	5233.005	4015.324
Story3	4640.359	5160.538	5940.808	4664.534
Story2	5261.653	5792.48	6588.72	5286.404
Story1	5866.87	6400.305	7200.457	5891.695
Base	0	0	0	0
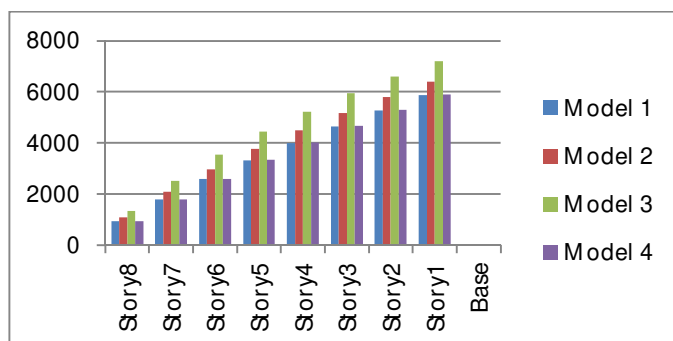
Fig.8 storey v/s base shear

| Story	Model 5	Model 6	Model 7	Model 8	Model 9
Story8	1089.588	1334.382	970.5529	1155.829	1433.744
Story7	2091.465	2537.197	1902.073	2253.109	2779.664
Story6	2986.722	3580.082	2745.639	3218.458	3927.687
Story5	3791.761	4487.641	3514.781	4072.172	4908.258
Story4	4522.986	5284.479	4223.033	4834.549	5751.824
Story3	5196.8	5995.201	4883.924	5525.886	6488.829
Story2	5829.607	6644.41	5510.987	6166.481	7149.721
Story1	6437.542	7256.313	6117.644	6776.466	7764.698
Base	0	0	0	0	0
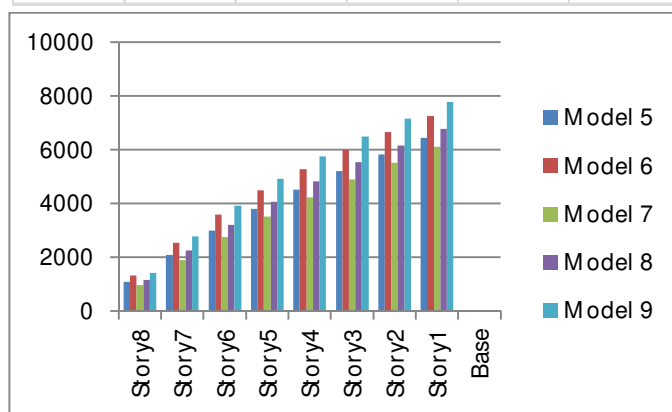
Fig.9 storey v/s base shear

V. CONCLUSION

A. Storey Displacement

1) According to the result the floating column building experiences more storey displacement and drift compared to the building with bracing and shear wall
2) The result shows that the building experience the 11 % more displacement in zone 4 and 29 % more displacement in zone 5 compared to zone 3.
3) It shows that the floating column building with shear wall experiences 85% less displacement and floating column building with bracings experiences 30% less displacement compared to the floating column building.

B. Storey drift

1) It shows that the building experience the 15 % more drift in zone 4 and 40 % more drift in zone 5 compared to zone 3.
2) It shows that the floating column building with shear wall experiences 70% less drift and floating column building with bracings experiences 9% less drift compared to the floating column building.

C. Base Shear

1) It shows that the building experience the 17% more base shear in zone 4 and 40 % more base shear in zone 5 compared to zone 3.
2) It shows that the floating column building with shear wall experiences 5.3% more base shear and floating column building with bracings experiences 0.5% more base shear compared to the floating column building.
3) By providing the bracings for G+7 floating column building , the strength increases by 30%.
4) By providing the shear wall for G+7 floating column building , the strength increases by 85%.
5) By comparing all of this, the study concluded that floating column building with shear wall provides more efficiency compared to the floating column building with bracings as well as building with floating column.

REFERENCES

[1]   Badgire Udhav S et. all(2015) carried on ''Analysis of multistorey building with floating column'

[2]   Gulchaman Khan and Mayur Singi(2019) carried out research on ''Seismic Analysis of Multistorey Building Having Floating Column''

[3]   Kiran Kumar Gaddad and Vinayak Vijapur(2018) carried on ''Comparative study of multistorey building with and without floating column and shear walls

[4]   Maneesh Ahirwar, Rahul Satbhaiya(2020) carried on ''Reliability analysis of multistorey building with floating column by Staad.pro-V8i''

[5]   Neha pawer et. All(2021) carried on ''Effect of floating column on buildings subjected to seismic forces''

[6]   Nithin N Shinde' R M Phuke(2015) carried on ''Analytical study of braced unsymmetrical RCC building''

[7]   Payal k Jayswal, Amey R Khedikar(2018) carried on'' Seismic analysis of multistorey building with floating column and regular column''

[8]   Rohan Suresh Duduskar, Dr D S Yerudkar (2021) carried on ''Seismic analysis of multistorey building with and without floating column and shear wall''

[9]   Shreyans Kumar Jain and Nidhi Gupta(2017) carried on ''Comparative parametric study of seismic behavior of RC framed building with and without floating column in different configuration''

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