REVIEW OF SEISMIC ANALYSIS Of MULTISTOREY RC BUILDING WITH AND WITHOUT FLOATING COLUMN

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ABSTRACT

The Principle objective of this project is to analyze and design the high rise building G+14 .The analysis is done by the use of software Staad pro v8i. The method use in this work is linear static analysis method. In present scenario buildings with floating column is a typical feature in the modern multistory construction in urban India. Such features are highly undesirable in building built in seismically active areas. This study highlights the importance of explicitly recognizing the presence of the floating column in the analysis of building. The behavior of a building during earthquakes depends critically on its overall shape, size and geometry, in addition to how the earthquake forces are carried to the ground. The earthquake forces developed at different floor levels in a building need to be brought down along the height to the ground by the shortest path.

KEYWORDS :- Floating column , Earthquake , Staad pro V8i, Static Analysis , Displacement.

INTRODUCTION

A column is supposed to be a vertical member starting from foundation level and transferring the load to the ground. The term floating column is also a vertical element which (due to architectural design/ site situation) at its lower level (termination Level) rests on a beam which is a horizontal member. The beams in turn transfer the load to other columns below it.There are many projects in which floating columns are adopted, especially above the ground floor, where transfer girders are employed, so that more open space is available in the ground floor. These open spaces may be required for assembly hall or parking purpose. The transfer girders have to be designed and detailed properly, especially in earth quake zones. The column is a concentrated load on the beam which supports it. As far as analysis is concerned, the column is often assumed pinned at the base and is therefore taken as a point load on the transfer beam. STAAD Pro, ETABS and SAP2000 can be used to do the analysis of this type of structure. Floating columns are competent enough to carry gravity loading but transfer girder must be of adequate dimensions (Stiffness) with very minimal deflectionrequired for assembly hall or parking purpose. The transfer girders have to be designed and detailed properly, especially in earth quake zones. The column is a concentrated load on the beam which supports it. As far as analysis is concerned, the column is often assumed pinned at the base and is therefore taken as a point load on the transfer beam. STAAD Pro, ETABS and SAP2000 can be used to do the analysis of this type of structure. Floating columns are competent enough to carry gravity loading but transfer girder must be of adequate dimensions (Stiffness) with very minimal deflection

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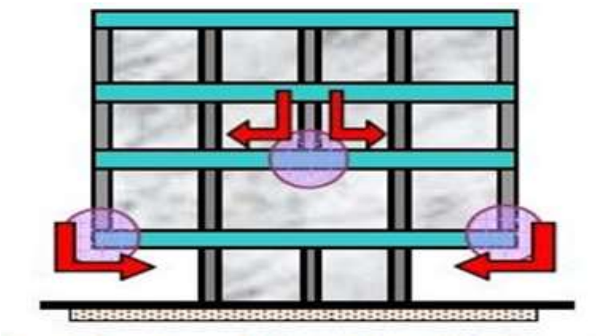


Fig No.1.1.Structure with Floating Column

1.Theory of Earthquake

An earthquake is the sudden shaking of the ground caused by the passage of seismic waves through earth's rocks. Seismic waves are produced when some form of energy stored in earth's crust is suddenly released ,usually when masses of rock straining against one another suddenly fracture and slip. Earthquake occur most often along geologic faults, narrow zones where rock masses move in relation to one another. In some parts of the world earthquake are associated with volcanic activity.

2.SeismicAnalysis

The method of Seismic Analysis that should be used to analyze the structure it depends on :-

- Externalaction
- Type of structuralmodel.
- StructuralMaterial.

Methods of Analysis :-

- ✓ Linear StaticAnalysis
- ✓ Non-Linear StaticAnalysis
- ✓ Linear DynamicAnalysis
- ✓ Non-linear DynamicAnalysis

3.LINEAR STATICANALYSIS

A linear static analysis is an analysis where a linear relation holds between applied forces and

displacements. In practice, this is applicable to structural problems where stresses remain in the linear elastic range of the used material. In a linear static analysis the model's stiffness matrix is constant, and the solving process is relatively short compared to a nonlinear analysis on the same model. Therefore, for a first estimate, the linear static analysis is often used prior to performing a full nonlinear analysis.

I. Modelling ofStructure

1. Length of building -26m
2. Width of building-26m
3. Storey Height of building –3m
4. Total height of building – 45m
5. Dimension of column - 1x0.8m
6. Dimension of beam - 0.5x 0.3m
7. Thickness of slab – 150mm
8. Depth ofFoundation=2.5m
9. Dead load on building for 0.23m thick wall - 14KN/m
10. Dead load on building for 0.15m thick wall -9KN/m
11. Dead load of Slab =5.25
12. Live load on building -3KN/m^2
13. Response Spectra - As per IS 1893 (Part-1):2002
14. Damping -5%
15. Importance Factor –1
16. Response reduction factor
    a) For OMRF -3
17. Seismic load as per zone factor and Response ReductionFactor
    a) Earthquake load in X–Direction
    b) Earthquake load in Z–Direction

This plan modeled in STAAD – PRO V8i for analyzing and design of G+14 storied building . This building is analyze for different zone (zone II, zone III, zone IV, zone V)

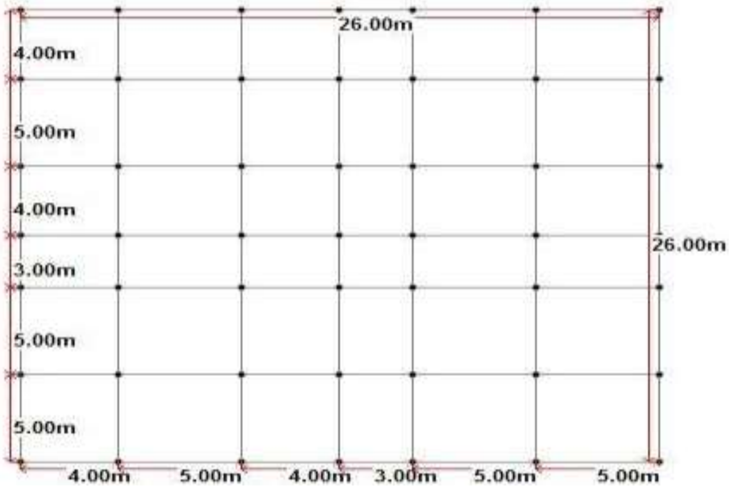


Fig no.4.1.1. Plan of strcture

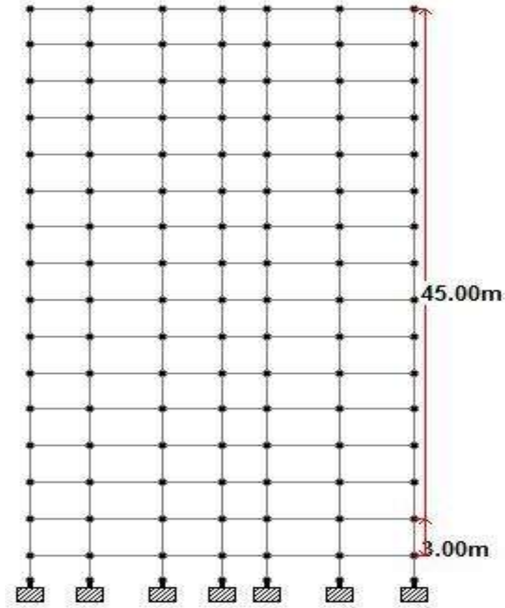
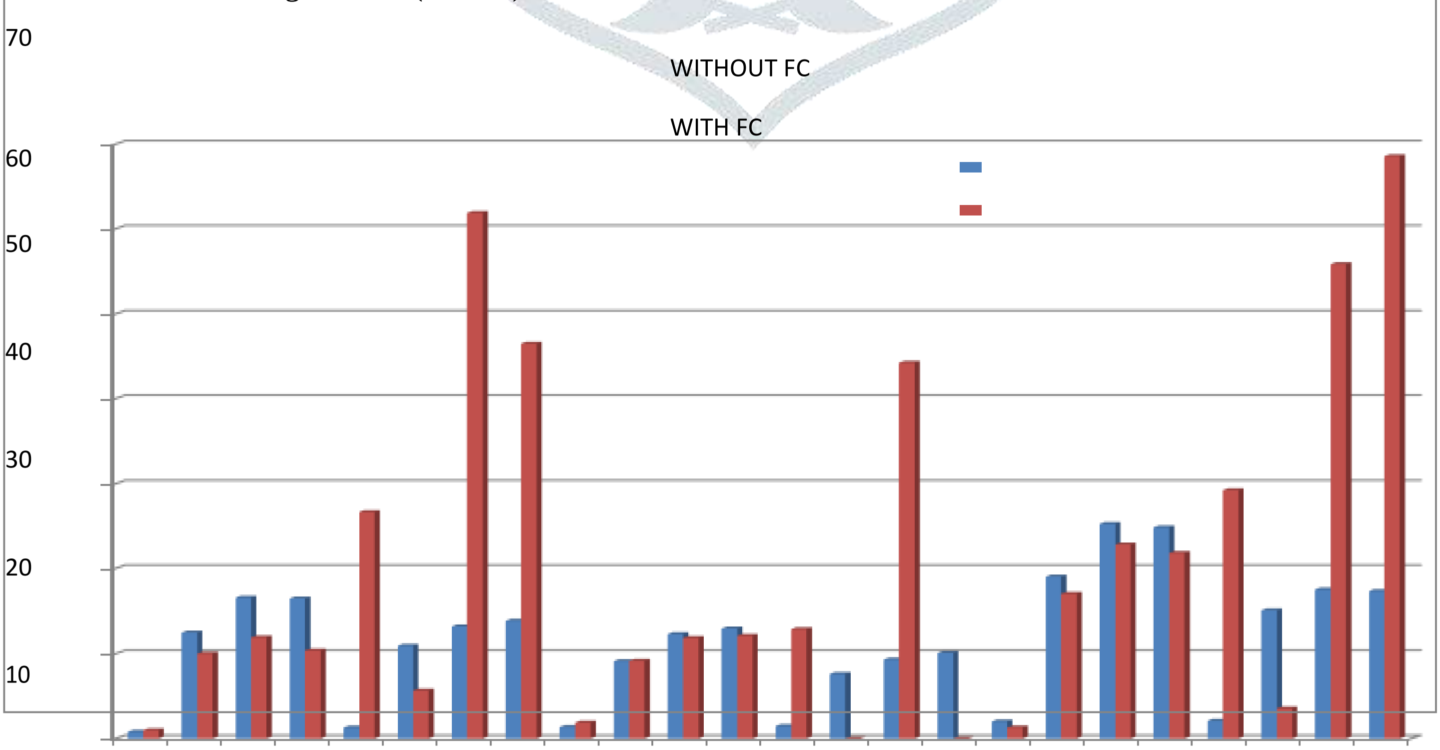


Fig no.4.1.2. Elevation of Structure

COLUMN NO.	ZONES	
	WITHOUT FC	WITH FC
38	0.791	0.98
255	12.399	9.985
388	16.537	11.844
521	16.424	10.364
45	1.285	26.645
262	10.912	5.65
395	13.129	61.864
528	13.798	46.474
39	1.346	1.877
256	9.091	9.148
389	12.237	11.783
522	12.887	12.036
46	1.472	12.807
263	7.593	FC
396	9.295	44.219
529	10.067	FC
40	1.999	1.296
257	19.009	16.987
390	25.241	22.804
523	24.831	21.802
47	2.09	29.225
264	15.033	3.546
397	17.505	55.86
530	17.302	68.557

II. Analysis

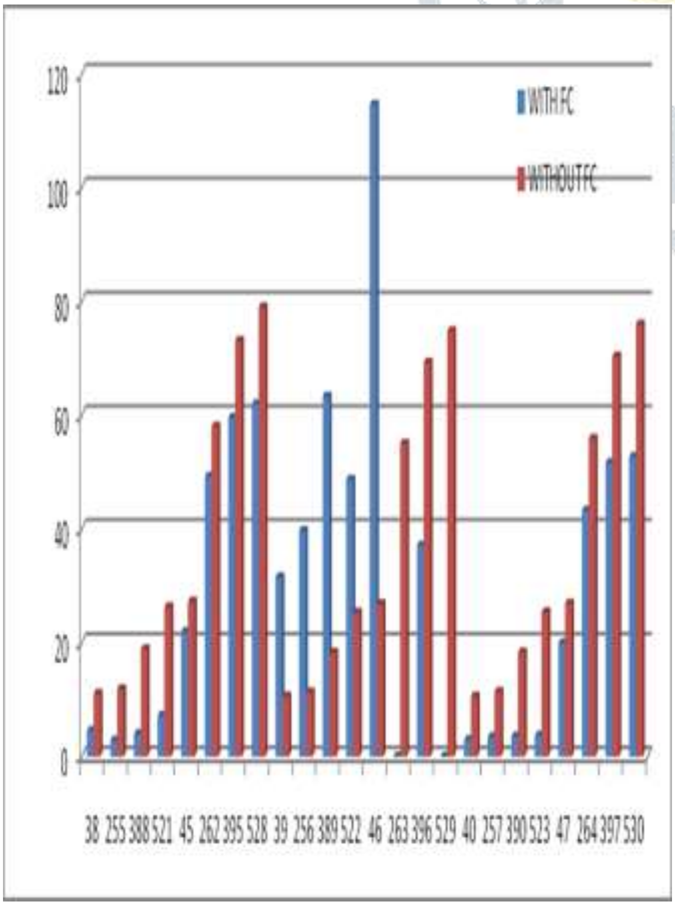
5.1 Shear force results for six column nearer to floating column (Zone 5)



Bending Moment results for columns nearer to

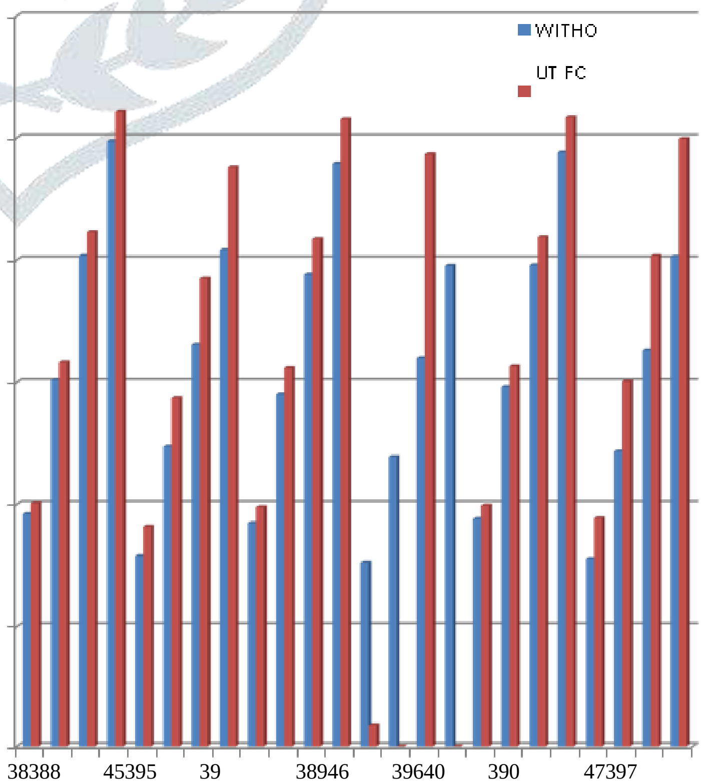
Floating Column(zone 5)

COLUMN	ZONE 5	
	WITH FC	WITHOUT FC
38	4.475	10.992
255	2.807	11.827
388	3.968	18.848
521	7.175	26.241
45	21.91	27.176
262	49.153	58.006
395	59.489	73.014
528	61.89	78.962
39	31.517	10.559
256	39.652	11.269
389	63.258	18.191
522	48.628	25.235
46	114.496	26.791
263	FC	54.983
396	37.054	69.205
529	FC	74.744
40	2.837	10.524
257	3.377	11.319
390	3.471	18.27
523	3.652	25.324
47	19.926	26.896
264	43.22	55.808
397	51.568	70.267
530	52.584	75.879



.3 Displacement results for six Columns nearer to floating column (Zone 5)

COLUMN NO.	ZONE5	
	WITHOUT FC	WITH FC
38	1.923	2.012
255	3.02	3.163
388	4.036	4.23
521	4.972	5.215
45	1.578	1.817
262	2.474	2.873
395	3.309	3.851
528	4.083	4.76
39	1.847	1.978
256	2.901	3.117
389	3.882	4.174
522	4.79	5.154
46	1.523	0.177
263	2.389	FC
396	3.199	4.868
529	3.954	FC
40	1.885	1.992
257	2.961	3.131
390	3.959	4.19
523	4.882	5.171
47	1.554	1.891
264	2.437	3.009
397	3.262	4.035
530	4.028	4.992



6. Design

6.1 Design of column on first storey.(for casting purpose we perform grouping)

COLUMN TYPE	ZONE 5					
Normal building	As REQ.	As PRO.	Ac	DIA.	NOS	TIE R/F(mm)
BIAXIAL COLUMNS(EXTERNAL)	8320	8796	791680	20	28	8-300c/c
UNIAXIAL COLUMNS (EXTERNAL)	12125	12566	787874	40	10	10-300c/c
AXIAL COLUMNS(INTERNAL)	15580	15707	784419	32	8	16-300c/c
with floating column						
BIAXIAL COLUMNS (EXTERNAL)	8960	9248	791040	16	46	8-255c/c
UNIAXIAL COLUMNS(EXTERNAL)	21836	22518	778163	32	28	8-300c/c
AXIAL COLUMNS(INTERNAL)	15568	15707	784431	25	32	8-300c/c

CONCLUSION

From above results it is concluded that parameters like bending moment, shear force, displacement are greater in building with floating column as compare to normal building.

From above results,it is observed that the area of steel and area of concrete are approximately equal in quantity for normal building and floating column building,since the building with floating column proves to be economical.

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