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Seismic Analysis of G+6 Framed Structures With And Without Floating Columns and its Comparison With Zone Ii To Zone Iv

KEYWORDS: Floating columns, Shear wall, Equivalent static method, Response spectrum and Time history.

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ABSTRACT *Floating columns in multi-storey framed structure is becoming popular stability used structural integrity of such structures while resisting earthquake becomes critical. In the paper G+6 storey RCC structure in considered for earthquake analysis. For comparison of two models are used, one with floating column, second without floating column. All the two methods Equivalent static method, response spectrum and time history method were used for analysis ETABS Software was used and structure was assumed to be situated in earthquake Zone II on a medium soil(type II). The parameters evaluated were Base shear, Storey drift and Displacement. The multi-storey building with shear walls which had performed better than other models(normal building and multi-storey building with masonry infill walls) in resisting earthquake as per IS 1893:2002.*

1. INTRODUCTION

Floating Columns: 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 ends at its termination level rests on a beam which is a horizontal member. The beams in turn transfer the load to other columns below it. Such columns where the load was considered as point load.

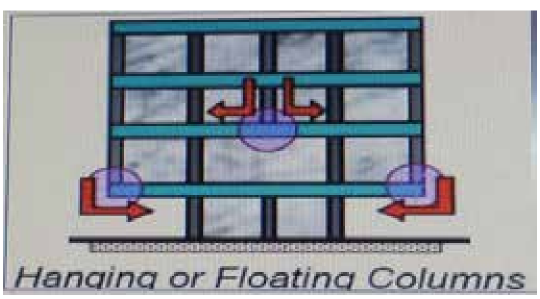

Fig 1: Floating Columns

The floating columns will be provided above the ground floor, there will be more space is available for parking purpose, auditorium purposes and assembly hall. The column is assumed pinned at the base and it will be acting as point load on the beams or girders and all loads will transfer to beam to foundation.

Shear Wall :

A shear wall is vertical structural element that will resist lateral forces in the plane of the wall through shear and bending. Such a wall acts as with a beam part of its strength derives from its depth. The shear wall provides large strength and stiffness to buildings in the direction of their orientation, which way to reduced lateral swing (sway) of the building and there by reduces damage to structure. Shear walls carry large horizontal earthquake force; the overturning effects on them are large. The opening will be provided in shear walls, but their size must be small to ensure least time interval (interruption) to force flow through walls.

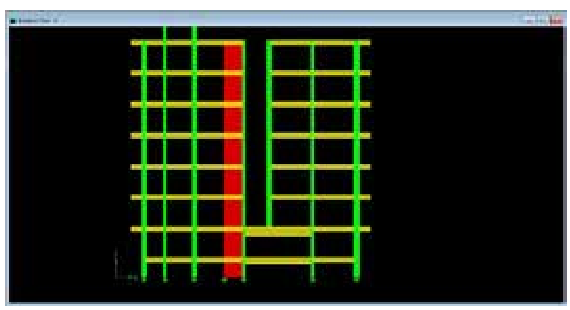

Fig 2: Elevation of the building columns With floating.

Plan dimension	26m x 30m
No of storey's	G+6
storey height	3.2m
wall	230mm
Thickness of external wall	150mm
Thickness of internal wall	150mm
Thickness of slab	150mm

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Floor finish	1kN/m2
Live load on floors	3kN/m2
Live load on roof	2kN/m2
Density of concrete	25kN/m3
Density of brick	18kN/m3
Grade of concrete(fck)	M25
Grade of steel(fy) Fe	415

Beam Details:

Beam No	Beam SIZE
B1	230x375mm
B2	230X600mm
B3	500x800mm
B4	230x450mm
B5	300x600mm
B6	600x900mm

Column Details:

Column No	Column SIZE
C1	230x450mm
C2	300x600mm
C3	300x750mm

Analysis of Building:

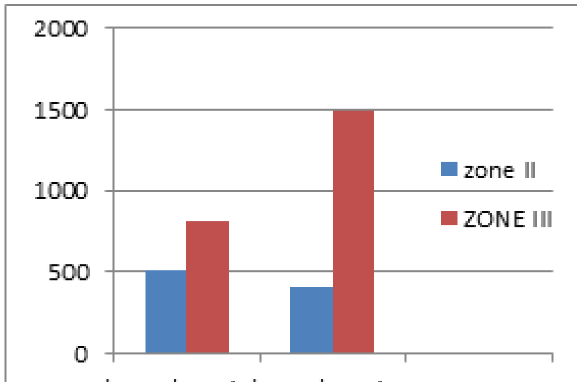
Equivalent static and response spectrum method and time history are used for the analysis of with and without floating columns having shear walls and masonry infill walls. In equivalent static analysis single mode of vibrations are considered. Base shear can be determined by multiplying total seismic weight of building to coefficient of acceleration spectrum value. In response spectrum method, dynamic characteristics are considered for analysis. In this method multiple modes of vibrations are considered where base shear of each mode can be calculated separately. It can be calculated by determining the modal mass and modal mass participation factor for each mode. EQX-Equivalent static in X direction EQY- Equivalent static in Y direction RSX- Response spectrum in X direction

RSY- Response spectrum in Y direction THX-Time history in X direction THY- Time history in Y direction.

3. RESULTS AND DISCUSSION

1. Base shear (Without floating columns)

	Zone II	Zone III
Base shear in x	509.73	815.57
Base shear in y	413.76	662.01

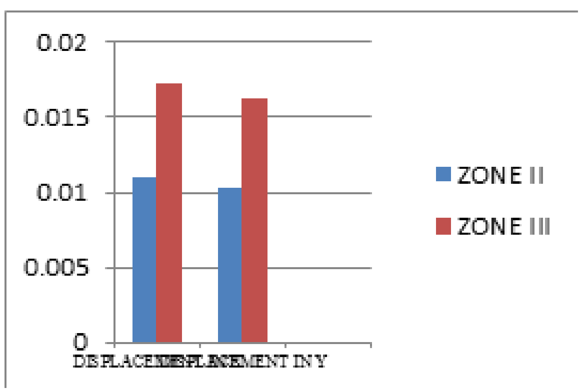


2. Base shear (with floating column)

	Zone II	ZONE III
Base shear in x(kn)	623.87	998.19
Base shear in y (kn)	550.2	880.31

DISPLACEMENT (WITHOUT FLOATING COLUMN)

	Zone II	ZONE III
Displacement in x	0.011	0.017275
Displacement in y	0.010271	0.0163



DISPLACEMENT (WITH FLOATING COLUMN)

	ZONE II	ZONE III
DISPLACEMENT IN X	0.009616	0.01538
DISPLACEMENT IN Y	0.007371	0.011793

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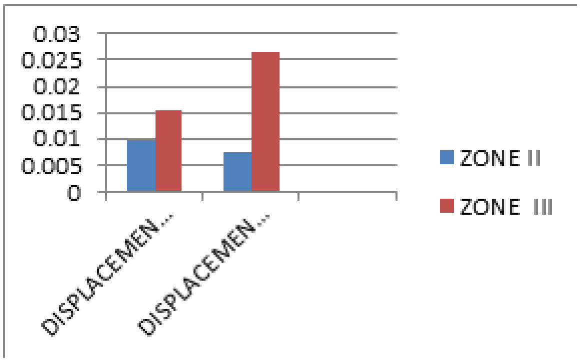
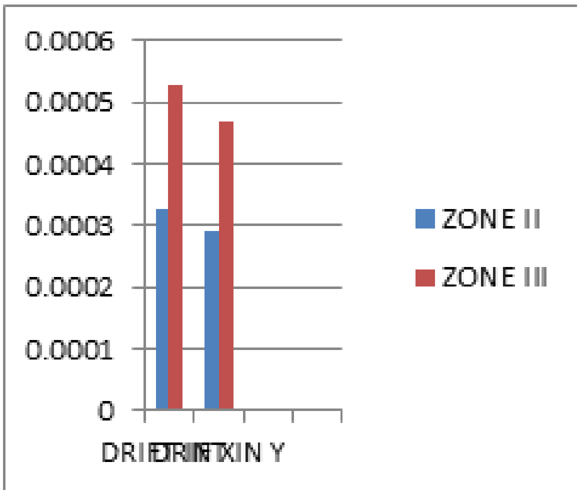


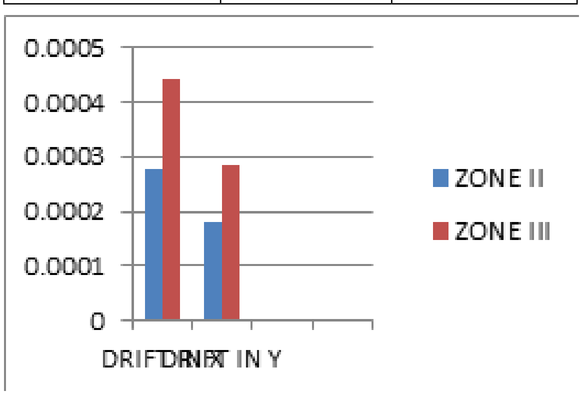
DRIFT (WITHOUT FLOATING)

	ZONE II	ZONE III
DRIFT IN X	0.000328	0.00053
DRIFT IN Y	0.000291	0.000470



DRIFT(WITH FLOATING COLUMN)

	ZONE II	ZONE III
DRIFT IN X	0.000276	0.000441
DRIFT IN Y	0.000178	0.000285



4. CONCLUSION

Following are the broad conclusions in case of seismic analysis of RCC G+6 framed structure with floating columns.

- Base shear at the base of structure increases as the assumed zone increases. In this research the base shear value in the zone III is more than Zone II either it may be of floating column or non- floating column.
- Displacement of the structure increases as the assumed zone increases. In this research the displacement value in the zone III is more than Zone II either it may be of floating column or non- floating column.
- Storey Drift in the structure increases as the assumed zone increases. In this research the Storey Drift value in the zone III is more than Zone II either it may be of floating column or non- floating column.

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