

A REVIEW ON SEISMIC ANALYSIS OF MULTISTOREY BUILDING WITH FLOATING COLUMN

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Abstract - Now a day's lots of multistorey buildings are constructed with floating column for purpose of getting more space at parking areas for movement. But same case highly damaged during highly seismic zone as compared to normal building in earthquake. And this paper also studies the seismic behavior of multistorey building with and without floating column considered. To find whether the structure is safe or unsafe with floating column when built in seismically active areas.

Keywords-Floating columns, seismic Behavior, Lateral Displacement, StoryDrift, Shear wall, Base shear.

I. INTRODUCTION

In recent times, multi-story buildings in urban cities are required to have column free space due to shortage of space, population and also for aesthetic and functional requirements. For this buildings are provided with floating columns at one or more story. These floating columns are highly disadvantageous in a building built in seismically active areas. The earthquake forces that are developed at different floor levels in a building need to be carried down along the height to the ground by the shortest path. Deviation or discontinuity in this load transfer path results in poor performance of the building. 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; any deviation or discontinuity in this load transfer path results in poor performance of the building. Buildings with vertical setbacks (like the hotel buildings with a few story's wider than the rest) cause a sudden jump in earthquake forces at the level of discontinuity. Buildings that have fewer columns or walls in a particular story or with unusually tall story tend to damage or collapse which is initiated in that story. Many buildings with an open ground story intended for parking collapsed or were severely damaged in Gujarat during the 2001 Bhuj earthquake. Buildings with columns that hang or float on beams at an intermediate story and do not go all the way to the foundation, have discontinuities in the load transfer path^[1]

Floating column

Column is supposed to be a vertical member starting level to foundation level and transferring the load to the ground. And floating column is also a vertical element which ends (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. Such column where the load was considered as point load. Theoretically such structures can be analyzed and designed. In practice, the true columns below the termination level [usually the stilt level] are not constructed with care and more liable to failure.^[1]

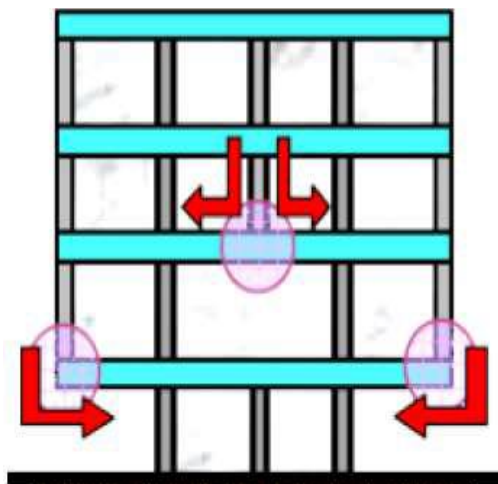


Figure 1.Floating column^[3]

II. LITERATURE REVIEW

A. Seismic Analysis of Multistory Building with Floating Column; Department Of Civil Engineering, National institute Of Technology Rourkela- 769008, May2012.

Prof. A V Asha & Prof. K C Biswal "In this thesis 2D frames with and without floating column having same material property and dimension were analyzed under same loading by using FEM (finite element method) and software STAADpro. And compatible time history as per spectra IS 1893 (part 1): 2002 applied on the structures. It concluded that, with increase in ground floor column the maximum displacement, inter story drift values are reducing. The base shear and overturning moment vary with the change in column dimension.^[1]

B. Comparative Study Of Column and Non –floating Columns With and Without Seismic Behavior; International Journal of Research in Engineering, Science and Technologies ,ISSN 2395-6453, Dec 2015.

Nakul A. Patil, Riyaz Sameer Shah "In this paper they summarized, comparative study of seismic analysis of building with and without floating column and they also give output results will be expressed in terms of story displacements, inner-story drift and comparison of amount of steel and concrete required in different cases by using ETABS software. Following same graphs of result.

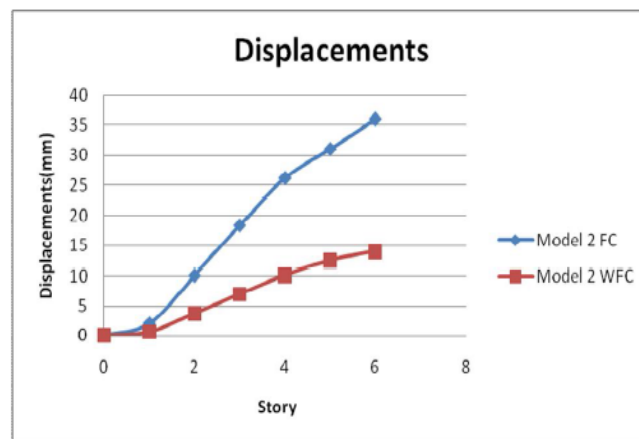


Figure2. Comparisons of Lateral Displacements for Model2FC & Model2WFC ^[2]

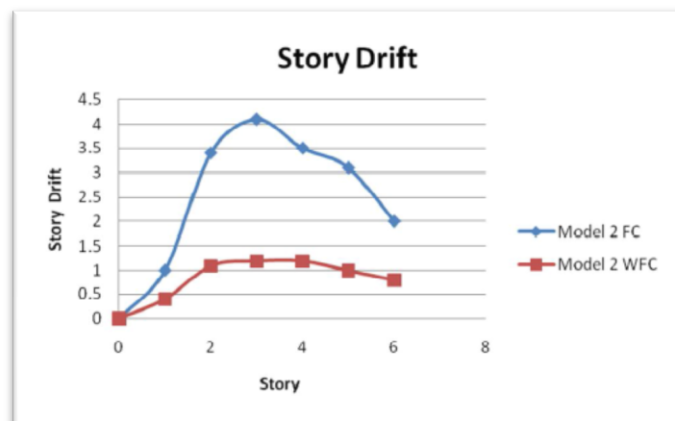


Figure3. Comparisons of Story Drifts for Model2FC & Model2WFC ^[2]

It was concluded that, with floating column not preferable in higher earthquake zones because of high value displacements according to code.^[2]

C. Seismic Response of Multi-Story building with Vermicular Irregularity as Floating column; International Journal for Innovative Research in Science and Technology, volume2, Issue11, April 2016.

Joshi Shridhar D, TandeShrirang N "In this paper floating column provided different floor where location center of building was analyzed is carried out using FEM and ETABS software. And they study about importance of explicitly recognizing the presence of the floating column in the analysis of building. For the present study response spectrum and

time history analysis are carried out to know the various structural parameters like base shear, story shear, story displacement.

It was concluded that, Increase in size of beams and columns improve the performance of building with floating column by reducing the values of story displacement. And Fundamental time period and base shear of normal building is maximum compared with all other floating column buildings.^[3]

D. Study of Behavior of Floating Column for Seismic Analysis of Multistory Building; International Journal of civil Engineering and Technology, volume7, Issue6, December 2016.

S.B Waykule, Dr. C.P. Pies at all. “In this paper compare base shear, story drift, Story displacement and maximum displacement of each story and also compare response of all the models(mode shape, time period, frequency) using LSM and sap2000 in building is without and with floating column.

It was concluded that,

1. It was observed that in building with floating column has less base shear as compared to building without floating column
2. It was observed that displacement of floating column building was more as compared to without floating Column building.
3. It was observed that building with floating column has more story drift as compared to building without Floating column.
4. From dynamic analysis it was observed that floating column at different location results into variation in Dynamic response.^[4]

III. CONCLUSIONS

From the above literature it was concluded that

- 1) The story drift and displacement was more for floating column buildings because as the columns were removed the mass gets increased and hence drift and displacement also increases.
- 2) The maximum value of Displacement and Drift were more for the models with increased height.
- 3) The Increase in size of beams and columns improve the performance of building with floating column by reducing the values of story displacement.
- 4) Fundamental time period and base shear of normal building was maximum compared with all other floating column buildings.
- 5) Time history analysis was advantageous method over response spectrum method for analysis of floating column buildings.
- 6) From dynamic analysis it was observed that floating column at different location results into variation in Dynamic response.

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