Analysis of Multi Storey Building with & without Floating Columns: A Review

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Abstract— This review paper is based on some of the previous studies relating to the "Seismic Analysis of Multi-storey Buildings with Floating Column". Conclusions are drawn based upon the respective results of all the mentioned research papers. For a hotel or commercial building, where the lower floors contain banquet halls, conference rooms, lobbies, show rooms or parking areas, large interrupted space required for the movement of people or vehicles. Closely spaced columns based on the layout of upper floors are not desirable in the lower floors. So to avoid that problem floating column concept has come into existence.

Key words: Floating Column, Seismic

I. INTRODUCTION

Buildings with vertical setbacks (like the hotel Building with a few stories 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 storey or with unusually tall storey tend to damage or collapse which is initiated in that storey. Many buildings with an open ground storey 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 storey and do not go all the way to the foundation, have dis continuities in the load transfer path.

Many urban multi-storey buildings in India today have open first storey as an unavoidable feature. This is primarily being adopted to accommodate parking or reception lobbies in the first storey. Whereas the total seismic base shear as experienced by a building during an earthquake is dependent on its natural period, the seismic force distribution is dependent on the distribution of stiffness and mass along the height.

The behavior of a building during earthquake 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; any deviation or discontinuity in this load transfer path results in poor performance of the building.

II. FLOATING COLUMN

The floating column is a vertical member which rest on a beam and doesn't have a foundation. The floating column act as a point load on the beam and this beam transfers the load to the columns below it. But such column cannot be implemented easily to construct practically since the true columns below the termination level are not constructed with care and hence finally cause to failure.

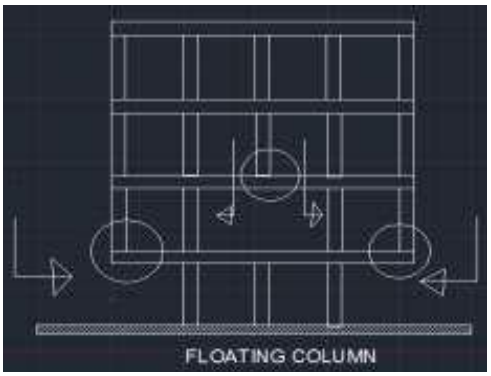

Fig. 1: Floating Column in Building

III. LITERATURE REVIEW

1) Sabari (2014) has done analysis of RCC framed structures having different stiffness and keeping the base of the building frame fixed. The author did time history analysis using FEM package SAP2000. By changing column size the author carried out dynamic analysis and concluded that with increase in column size, the maximum deflection and inter storey drift are reduced.[4]
2) Mundada (2014) studied the architectural drawing framing drawing of the building having floating column. The author considered existing residential building of G+7 for the study of load distribution on the floating column and various effects due to it. In the study the author studies three cases i.e. Building without floating column, Building with floating column and building with floating column with strut. By this study the author concludes that the probabilities of failure of building without floating column are less as compared to that of building with floating column and the possibility of failure of structure with floating column is more than that of the structure with floating column with strut and the deflecting is much more in case of floating column than floating column with strut.[5]
3) Srikant M K (2014) has performed the whole work consist of four models i.e., models, FC (floating column is provided in particular floor, location), FC+4(floating column is provided by rising height by 4m), FC+ HL (floating column is provided by applying heavy load), FC+4+HL (floating column is provided by rising the storey height by 4m). The design methodology employs the fully combined process that allow modeling, analyzing, designing. From this study the author observed that, the displacement of the building increases from lower zones to higher zones, because the magnitude of intensity will be more for higher zones, similarly for drift, because it is correlated with the displacement. Storey shear will be more for lower floors, then the

higher floors due to the reduction in weight when we go from bottom to top floors. And with this if we reduce the stiffness of upper floors automatically there will be a reduction in weight on those floors so in the top floors the storey shear will be less compared to bottom stories.

4) P.V. Prasad &T.Raja Sekhar (2014), carried out study on the behaviour of multi-storey building with and without floating columns under different earthquake excitation. The compatible time history and Elcentro earthquake data has been considered. The PGA of both the earthquake has been scale d to 0.2g and duration of excitation n are kept same. A finite element model has been developed to study the dynamic behaviour of multi-story frame. The dynamic analysis of frame is studied by varying the column dimension. It is concluded that with increase in ground floor column the maximum displacement is reducing and base shear varies with the column dimensions.

IV. OBJECTIVE OF STUDY

The aim of this work is to compare the response of RC frame buildings with and without floating columns under earthquake loading the major objectives of this work are as follows:

1) The primary aim of this work is the comparative analysis of floating columns and non-floating columns for various loading.
2) Determination of seismic response of both the models by using response spectrum analysis STAAD PRO v8i software.
3) Finding out effects on various parameters of RC building under seismic events due to presence of floating columns
4) To determine which structure is more stable for earthquake zones

V. CONCLUSIONS

The present study models is limited upto the structure with simple configuration with medium soil for parameter bending moment, shear force, storey drift, and displacement. Whereas the structure with complex configuration more study to be required future investigation should be concerted on the modes shape which reflect the structure behavior of the building

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