



Review on Analysis of Floating Column with Lateral Load Resisting System by Using STAAD Pro

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Abstract: Many urban multistorey 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 term floating column is a vertical member which ends at its lower level rests on a beam which is a horizontal member. The beams in turn transfer the load to other column below it. In present scenario buildings with floating column is a typical feature in the modern multistorey construction in India. In present paper effort has been taken to review the behavior of building with floating column.

Index Terms - Multistorey, seismic, floating column.

I. 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.

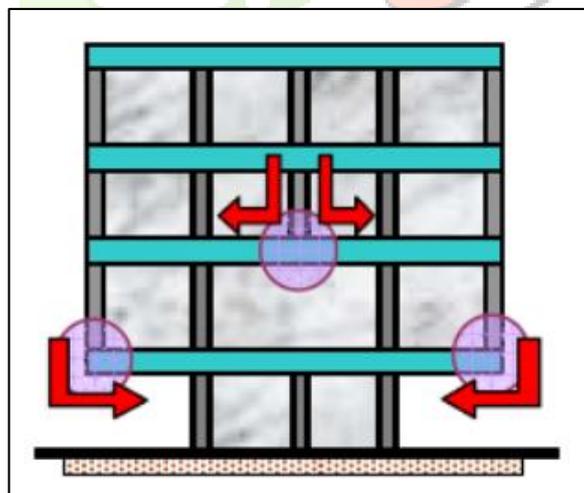


Fig 1.1 : Floating Column

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 deflection.

Looking ahead, of course, one will continue to make buildings interesting rather than monotonous. However, this need not be done at the cost of poor behavior and earthquake safety of buildings. Architectural features that are detrimental to earthquake response of buildings should be avoided. If not, they must be minimized. When irregular features are included in buildings, a considerably higher

level of engineering effort is required in the structural design and yet the building may not be as good as one with simple architectural features. Hence, the structures already made with these kinds of discontinuous members are endangered in seismic regions. But those structures cannot be demolished, rather study can be done to strengthen the structure or some remedial features can be suggested. The columns of the first storey can be made stronger, the stiffness of these columns can be increased by retrofitting or these may be provided with bracing to decrease the lateral deformation.

II REVIEW PAPERS

1. N.Elakkiyarajan, G.Iyappan And A Naveen

In this paper behavior of structure with and without column was studied. Structure was first analyzed without floating column and the with floating column and it was observed that the strength of the structure get reduced due to introduction of floating column. Model having no floating column shows very less amount of bending moment as compared to model with floating column. Due to introduction of floating column there is a sudden increase in shear force and bending moment at bottom storey, whereas for other stories change is gradual. Behaviour of different structural materials like concrete, steel and composite materials were also checked. In case of deflection criteria concrete gives good result as compared to steel, in concrete value of deflection increases rapidly with increase of seismic zone. In case of steel and composite section values of deflection increases gradually as compared to concrete with increase in seismic zone. For shear performance of steel structures is much better than the concrete and composite model. In above study author conclude that from ductility point of view behavior steel and composite sections is quite good than the concrete as the stiffness of steel is less than the concrete.

2.Chandan Kumar, G. Ragul, V.Jayakumar, Prasad E Prakash

In this study behavior of G +10 storey building was carried out by static analysis. For the purpose of comparison columns were grouped as exterior, interior and core columns and parameters like storey drifts, displacement and base shear studied and compared. After analyzing the structure it was found that stiffness of building does not affected by the use of floating column provide that the floating column and beam column joint designed carefully and ductile detailing was made as per IS 13920:1993. Drift for both the structure increases gradually from bottom to top. There is a increase in drift observed in case of structure provided with floating column, still the value of drift satisfied the serviceability criteria. Values of shear force and axial load increases in structure with floating column for all three groups mentioned above. Behaviour of both the structure is same for displacement and there is increase in displacement in floating column. In above study author conclude that the design of structure with floating column can be possible by satisfying serviceability and economical criteria.

Kandukuri Sunitha, Mr. Kiran Kumar Reddy

In this paper author carried out analysis of G+4, G+9 and G+14 buildings with and without floating column for external lateral forces. Location of building is in Zone III and forces are applied as per IS1893:Part 1:2002. In this study seven models were studied first normal building without floating column and other six with floating column with shear wall and bracing. Study shows in static analysis maximum displacement and storey drift values increases for floating column. Height of the building also have a significant effect on deflections and storey drifts and both are changed drastically with increase in height. Due to provision of floating column axial loads on other column increases due to transfer of load from floating columns to the conventional columns. Building with shear wall behaves well in all cases whereas building with bracing system behaves well for smaller height building. Bending moment varies for each stories it is maximum in top stories and lesser in bottom stories.

Vivek Soni, M. P. Verma

In this study G+7 buildings has been chosen for analysis. The building models are designed by E-TABs 2018. The study is carried out on a building with floating columns. The plan layout of the building is shown in figure.

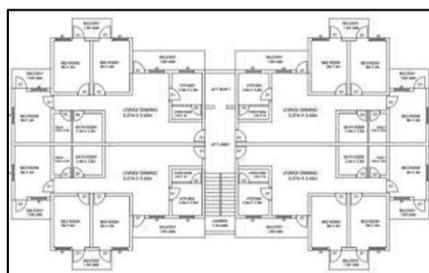


Fig 2.1 : Typical architectural plan

The building is taken into account as residential building having G+6. Height of every storey is kept same as other prevalent data. Based on the analysis data it is concluded that the optimum position of floating column is at first floor.

Badgire Udhav S., Shaikh A.N., Maske Ravi G

Main purpose of this study is to analyses the building with floating column. G+10 building has been selected for the purpose of analysis and software STAAD Pro V8i is used. The G+10 with floating column having moment resisting frame in orthogonal directions were selected. The building considered to be located in zone III and analysis is carried out as per IS1893:2002. Lateral loads were applied in X and Z directions and structure analyzed for various load combinations and displacement and base shear for each storey noted. It is found that shear values increases and decreases drastically depending upon the position and orientation of column.

Ankit kumar and Durgesh nandan verma

In this study a building model has been made in stad-pro to study their properties such as Storey drift, Storey displacement, Max. Displacement with floating column and without floating column. This properties compared with various load combination provided in IS code 1893 so that to find out floating column is reliable to use in seismic zone. By using static analysis design spectrum, total four models were analyzed by varying the location of floating column. The change in the values of Displacement and storey drift depends on the position of floating column in horizontal as well as vertical direction. The value of displacement and storey drift by using floating column at base has more as compared to floating column at first and second storey. And also Storey drift increases rapidly till third floor and starts decreasing while displacement keep on increasing.

In above study author conclude that floating column produces high Storey drift and displacement due to which floating column is not safe to use in high seismic zone.

Trupanshu patel, Jasmin Gadhiya, Aditya bhatt

In this paper work behavior of G+3 Building having floating column is studied to obtain the infill walls and mass variation on behavior of floating column and normal building. Different building models were analysed with or without provisions of infill walls based on SAP 2000 version 18 by providing floating column at corner of ground floor. By applying different load combination maximum horizontal and vertical displacement of typical floor for each case were obtained. Various models comparison had been carried out according to the position of floating column, with and without increment of live load, with and without effect of infills.

In above study author conclude that floating column with corner provision considered as critical case. As the position changes from corner to centre of typical floor there is decrement in displacement value. After comparing with horizontal one higher decrement seen in vertical displacement. Without infills sudden increment occurs in the value of displacement as compare with infill hence it will reduce seismic response and make structure economical.

Chimanna chaitali R, Mohite Prakash M, Mohite kiran K

In this paper G+13 multistoried building with floating column resting on RCC Transfer girder and post tensioning transfer girder has been discussed for the comparison of seismic response. By using ETABS Software the response of building such as storey displacement, storey shear and storey drift has been used to evaluate the result. This model consists of 22 no. of columns which supports 1 m thick transfer slab and this 1 m transfer slab supports 64 floating column. This column terminates at its first level.

In above study author conclude that Time period, Displacement and drift storey of a building with floating column resting on RCC transfer girder is greater than building with floating column resting on P.T transfer girder. But base shear of a building with floating column resting on P.T transfer girder is greater than building with floating column resting on RCC transfer girder.

Nikhil N verma, S.A. Bhalchandra

In this study pushover analysis is carried out for 2 RC structure with floating column and without floating column having G+3 stories by using ETABS 2015 and compared the base force and displacement of RC structures for earthquake forces. Some special arrangements are made to increase the lateral strength and stiffness of member and hence to avoid damages due to earthquake. dynamic analysis of building carried out to designed strength, stiffness effect and inelastic deformation on members accordingly. The column below floating are found to be critical when pushover analysis is performed on the building with floating column. In above study author conclude that roof displacement, column forces of columns, base shear, displacement, drift etc. increase in building with floating column as compared to building without floating column.

Kapil dev Mishra, Dr. A.K. Jain

In this study analysis of (G+2+3) multi-storied PLAZA building at two different zones (zone III and zone IV) having different position of floating columns at different height of building is carried out by using Stad pro for seismic analysis of structure. In this work different combination of office and residential floors are considered. Support reaction at the base and maximum moment at joint also result from the software are some considerations on which comparisons are based. In the above study author conclude that Structure with floating column having higher maximum bending moment and maximum support reaction than that structures without floating column and also zone IV are more affected by earthquake than zone III

II. CONCLUSION

From the study of all literature review it was observed that study is required for improving the response of building with floating column under the effect of lateral loads. Following are the key observation of above review.

- When floating column is used then the performance of steel structure is better than the concrete and composite structure.
- Design design of structure with floating column can be possible by satisfying serviceability and economical criteria.
- Building with shear wall behaves well for high rise building and bracing is good for building of medium height.
- Optimum position of floating column is on first floor.
- Shear values increases and decreases drastically depending upon he position and orientation of column.
- Structure with floating column having higher maximum bending moment and maximum support reaction than that structures without floating column and also zone IV are more affected by earthquake than zone III

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