International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 7 July 2021, pp: 927-929 www.ijaem.net ISSN: 2395-5252

A Review Study on Analysis of Commercial Building with and without Floating Column

Kashmira V. Kadam[1], Dr. P. S. Patil[2]
[1] PG Student, Department of Civil Engineering, RIT, Rajaramnagar, Maharashtra, India
[2]Associate Professor, Department of Civil Engineering, RIT, Rajaramnagar, Maharashtra, India

Submitted: 25-06-2021 Revised: 04-07-2021 Accepted: 07-07-2021

ABSTRACT: Floating column structures are typical features in the modern multi-storey construction in urban India. Building which have discontinuity of column and building having columns which transfers the load to beam in lateral direction. The beam successively transfers the load to alternative column below it. Such columns in structure will be analysed and designed. Results are compared in the form of storey displacement, storey shear with and without floating columns. Also the zone wise results are compared using tables and graphs to find out most optimized solution. ETABS has been used for analysing the above Building structure.

KEYWORDS: Building with Floating Column, Transfer Beam, Response Spectrum Analysis, Time History Analysis, Dynamic Analysis, ETABS.

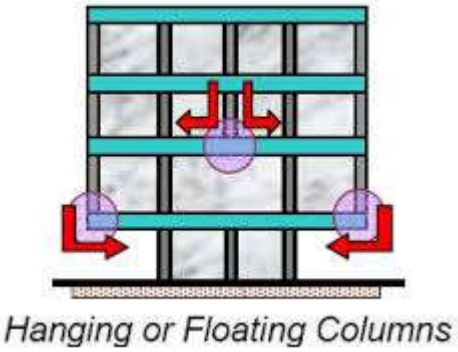
I. INTRODUCTION

Many urban multi-storey building in India today have open first storey as an unavoidable feature. This is used to accommodate parking or reception lobbies in first storey. Whereas the total seismic base shear as experienced by the building during an earthquake is dependent on its natural time period, the seismic force distribution is dependent on its distribution of stiffness and mass along the height. [2]

All recent multi-storey buildings are made by the concept of floating columns. These structures are not included in IS code because these structures cannot sustain seismic forces ad likely to get damaged. Many buildings in Gujarat Bhuj area where found were constructed with open 1st storey that collapsed in earthquake 2001. These structures are not dynamically reliable; the static reliability of the structure with floating column is required to be studied. [9]

Floating Column

The floating column is vertical member which rest on a beam which horizontal member but doesn't transfer the load directly to the foundation. The floating column acts as appoint load on the beam and this beam transfer the load to the column below it. [1] 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. The transfer girders have to be designed and detailed properly, especially in earthquake zones. As far as analysis is concerned, the column is often assumed pinned at the base and therefore taken as a point load on transfer beam. STAAD Pro, ETABS and SAP 2000 can be used to do the analysis of this type of structure. [4]



Floating Column in Building

II. LITERATURE REVIEW.

Abdul Azeed et. al (2019) [1], studied the plan of G+6 residential building with floating column were selected for the study. The building is modelled using structural software ETABS 2015. The work is carried out considering different cases of removal of columns in the different position of columns. Based on the test result it is concluded that building provided with floating column shows more storey drift and displacement as compared to building without floating column and the optimum position to provide floating column is 1st floor alternatively so that moment, shear and steel requirement of structure can be minimized.

Badgire Udhav S. et.al. (2015) [2], The main purpose of the study is to framing of the building having floating column. Existing building

comprising of G+10 structure has been selected for carrying out the project work. The above building models are generated using the software STAAD Pro 8Vi and analysed using equivalent static method. The result shows difference in probabilities of failure with floating column located at outer periphery on longer side is 16.2% more than floating column located at outer periphery on shorter side and the column shear values are increasing or decreasing significantly depending upon position and orientation of column.

Bhensdadia & shah (2015) [3], In this study an attempt is made to reveal the effects of floating column & soft story in different earthquake zones by seismic analysis. For this purpose Push over analysis is adopted. To achieve this objective, three RC bare frame structures with G+4, G+9, G+15 stories respectively will be analysed and compared the base force and displacement of RC bare frame structure with G+4, G+9, G+15 stories in different earthquake zones like Rajkot, Jamnagar and Bhuj using SAP 2000 14 analysis package. The result shows displacement of 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 and the displacement values increases when a floating column is provided in edge and middle than the outer face of the frame.

Kandukuri & Reddy (2017) [4], This paper studies the analysis of a G+4, G+9, G+14 normal building and floating column building for external lateral forces. The analysis is done using ETABS, The intensities of past earthquake i.e., applying the ground motion to the structure, from that displacement time history values are compared. It is concluded that maximum displacement and storey drift values are increasing for floating column. By checking the drift ratios, it is stated that by increasing the height of the building the displacement and storey drifts are drastically changed.

KeerthiGowda & Syed (2014) [5], examines the adverse effect of floating column in building. Models of frame are developed for the multi-storey RC building with and without floating column to carry out comparative study of structural parameters such as natural period, base shear and horizontal displacement under seismic excitation. Result obtained depicts that the alternative measures of providing lateral bracing to decrease the lateral deformation should be taken. The RC building with floating column after providing lateral bracing is analysed. A comparative study of the result obtained is carried out for all above three models. Through the parametric study of storey drift, storey shear, time period and displacement, it was found that multi-storey building with floating columns performed poorly under seismic excitation. The bracing improved seismic performance of building considerably as different parameters such as storey drift, storey displacement and time period improved up to 10-30%.

Nikhil Varma & Bhalchandra (2016) [6], In this study an attempt is made to reveal the effects of floating column in RC building effected with seismic forces. For this purpose pushover analysis is adopted because this analysis will yield performance level of building for design capacity carried out up to failure. To achieve this objective, two RC structures with G+3 stories will be analysed and compared the base force and displacement of RC structure for earthquake forces by using ETABS 2015 analysis software. It is observed that if column forces of columns below an around girder supporting floating column are compared with column force in building without floating column, it is seen that about minimum 50% of increase is observed in column forces with floating column than in building without floating column. Also the base shear of building with floating column increases slightly.

Patil A. & Kumbhar P. (2013) [7], In the present paper study of nonlinear dynamic analysis of 10 storied building considering different seismic intensities is carried out and seismic responses of such building are studied. The building under consideration is modelled with the help of SAP 2000 software. Five different time histories have been considering seismic intensities on modified mercalli's intensities scale (MMI) for establishment of relationship between seismic intensities and seismic responses such as base shear and storey displacement. The result shows that the values of base shear, storey displacement ad storey drift for seismic intensities of VI, VII, VIII,IX and X are found to be more by 1.85, 3.56, 7.86, 15.1 and 17.15 times respectively as compare to seismic intensity of V for both models and for all time history.

Pednekar S. C. et.al. (2015) [8], The paper study gives an effect of increase in number of storey on seismic responses by performing pushover analysis. Reinforced concrete structure of G+4, G+5, G+6 storey has been modelled and analysed by using CSi ETABS software. Comparison of seismic responses of the structure in terms of base shear, time period and displacement has been done by performing nonlinear static pushover analysis. From analysis result it has been observed that base shear and spectral acceleration is reduced, whereas displacement, time period, spectral displacement is increased as the number of storey increases.

Analysis also shows location of plastic hinges at performance point of the structure with different number of storey. Also the base shear decreases with increase in number of storey.

Pradeep D. et.al. (2017) [9], In this study there are 2 models as with and without floating column at different floor levels. Comparing seismic parameters such as time period, base shear, storey displacement, storey drift for both the models. Seismic analysis is done by linear static and linear dynamic method by using ETABS. According to the result obtained, the story shear force was found to be maximum for the first storey and it decreases to minimum in the top storey also building located in the medium soil experiences 25% larger base shear than building located in the hard soil.

Waykule S. B. et. al.(2016) [10], In this paper present study about analysis of G+5 building with and without floating column in highly seismic zone. linear static and time history analysis is carried out for both the models. The project requires to find out the magnitude of their loads and distribution. Modelling and analysis is done by SAP 2000 v17. Analysis shows that the building provided with floating column shows more time period, story drift and displacement compared to building without floating column.

III.CONCLUSION

From the literature review following conclusion can be drawn:

1] Many of the studies have shown seismic analysis of RCC frame with floating column which causes vertical irregularity.

2] Whenever structure is having different vertical geometric irregularity it is necessary to analyse the building at various earthquake zones.

3] Introduction of floating column causes increase in storey drift and storey displacement. Hence building must be analysed for dynamic behaviour.

4] Floating column and transfer girder must be designed properly to resist the seismic demand.

IV. ACKNOWLEGEMENT

I wish to express my sincere gratitude to Dr. Mrs. Sushma S. Kulkarni, Director of RIT, and my supervisor/Co-author Dr. Pandurang S. Patil. I am humbled by my co-author for all the guidance, encouragement, and pushing me to explore the topic to a greater depth. And lastly, I am grateful to all the staff members of RIT for all the permission and co-operation.

REFERENCES

[1]. Abdul Azeed and Sankarshan M., 2019, "Analysis and Design of Residential Building with Floating Column," IRJET Volume: 06 Issue: 05

[2]. Badgire Udhav S., Shaikh A. N. And Maske Ravi G., 2015, "Analysis of Multi-storey Building with Floating Column" International Journal of Engineering Research Volume No.4, Issue No.9, pp: 475478

[3]. Hardik Bhensdadia and Siddharth Shah, 2015, "Pushover Analysis of RC Frame Structure with Floating Column and soft storey in Different Earthquake Zone" IRJET, Volume:4 Issue: 4.

[4]. Kandukuri Sunitha and Kiran Reddy, 2017, "Seismic Analysis of Multi-storey Building with Floating Column by using ETABS" IJETSR Volume: 4 Issue: 8

[5]. KeerthiGowda B. S. and Syed Tajoddeen, 2014,"Seismic Analysis of Multi-story Buiding with Floating Coumn", ACIDIC 2014, NITK.

[6]. Nikhil N. Verma and S. A. Bhalchandra, 2016, "Pushover Analysis of RC Building with and without Floating Column", International Journal of Technical Research and Application, Volume: 4 Issue: 5 pp 44-49

[7]. Patil A. S. and Kumbhar P. D., 2013, "Time History Analysis of Multistoried RCC Building for Different Seismic Zone", International Journal of Structural and Civil Engineering, Vol. 2

[8]. Pednekar S.C., Chore H.S. and Patil S. B., 2015, " Pushover Analysis of RC structures", International Journal of Computer Applications",Vol.2

[9]. Pradeep D., Chethan V. R. and Ashwini B.T., 2017, "Seismic Analysis of Multistoried Building with Floating Column", IJSDR Volume: 2 Issue 9.

[10]. Waykule S.B. and Deshmukh C. M., 2016, "Study of Behaviour of Floating Column for Seismic Analysis of Multistoried Building", Volume: 7 Issue: 6.