

ANALYSIS AND DESIGN OF FLOATING COLUMNS: A REVIEW

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ABSTRACT— Framed structures are very popular in India and column plays an important role in structural engineering. A column is a vertical member which starts from foundation and transfers the structural load to the ground through foundation. The term floating column is also a vertical member at its lower level rests on a beam which is a horizontal member. The beams in turn transfer the load to other columns below it. This paper studies the comparison of a multistorey building with and without floating column using Extended Three Dimensional Analysis of Building Systems (ETABS) software. The values of shear force and bending moment for normal and floating columns are extracted and compared using ETABS.

KEYWORDS—Columns, Floating Columns, G+10, ETABS.

I. INTRODUCTION

In recent times many architects and structural designers have adopted the idea of floating columns to accommodate parking or reception lobbies on the upper storey. In order to achieve above objective the idea of floating columns as been used. [4] Floating column is a vertical structural member which rests on a beam which is a horizontal structural element. The beams which in turn transfers the load to surrounding columns below it. [4] Because of the advantage that more open space is available due to the limit use of columns without many obstacles. These are more commonly used in urban areas where space is an issue.[1] All the recent multi-storey buildings are made by the concept of floating columns. [4] These structures are not included in IS code because these structures cannot sustain seismic forces and are likely to get damaged.[2] Many buildings with columns that float on beams at an intermediate storey and do not go all the way to the foundation, have discontinuities in the load transfer path. This can be done by Transfer beams. [4] In high rise buildings this is a common feature now.

A. Floating Columns:

A column is supposed to be vertical member starting from foundation level and transferring the load to the ground. The word floating column is also a vertical member at its lower level rests on a beam which is a horizontal member. The beams in turn transfer the load to other columns below it.

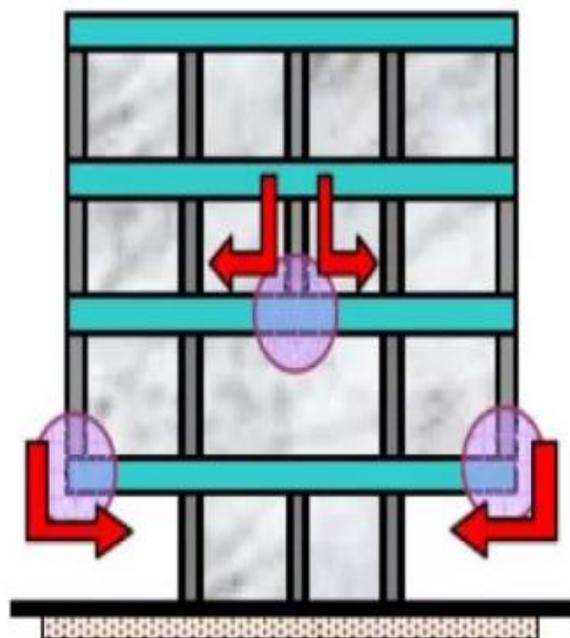


Fig 1: Hanging or Floating Column
(Source: iitk.ac.in/nicee/EQTips)

B. Transfer Beam:

A transfer beam is defined as a beam which transfers the loads of the column to the nearby columns. In framed structure when column is not allowed to continue downward due to certain restrictions, problem is resolved by using transfer beam. A transfer beam carries the load of an especially heavy load, normally a column. Utmost importance should be given to transfer beams as

the whole floating column depends upon transfer beams. If transfer beams deflect by 1 inch then the whole structure will atleast deflect by 1 inch.

C. High Rise Buildings:

Buildings which are having heights of 32 meters or greater are classified as high rise buildings. High rise buildings generate a lot of revenue and can accommodate a lot of inhabitants. Due to advancement of global technology construction of these buildings is lot easier and is a reasonable solution to overcrowded places. The main challenge of these buildings is to have strong foundation which can bear large column loads.

II. LITERATURE SURVEY

Detailed comparison between normal columns and floating columns has been done. The comparison is based upon shear force and bending moment for both normal columns and floating columns. Various design parameters required for normal columns has been given in IS 456:2000 [10].

The use of ETABS for different plan configurations has been given by Abhay Guleria by computing shear forces, bending moments and maximum storey displacement. The researcher analysed the structure which reflected that the displacement increased with storey height [7]. Different cases of the building are studied by Ms. Waykule.S.B, Dr.C.P.Pise, Mr.C.M.Deshmukh, Mr.Y.P.Pawar, Mr.S.S.Kadam, Mr.D.D.Mohite, Ms.S.V.Lale. They varied the location of floating columns floor wise. The structural response of the building models with respect to base shear, and storey displacement was investigated [3].

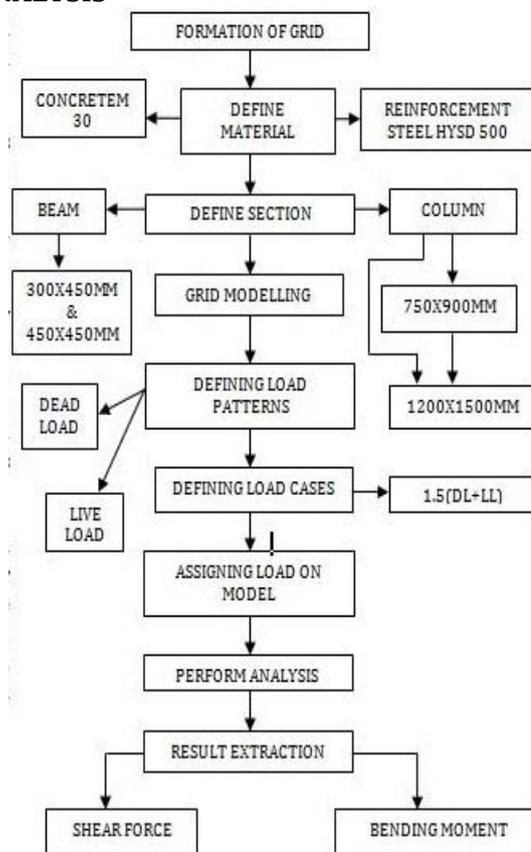
Comparative study of behavior of building with and without floating column for regular and irregular building plan was studied by Snehal Ashok Bhojar. The study was carried out on three crucial parameters i.e. lateral distance, Storey shear, Storey drift which concluded that failure of building with floating column was found to be more than building without floating column [9].

Study of G+3,G+5,G+10 having normal column and floating columns by Shiwli Roy, Gargi Gagan De showed that the bending moment and shear force increased with increase in storey height which means that the bending moment and shear force is proportional to storey height [1].

Jayashri Sarode and Mr.Amol.S.Pote compared three models classified as normal structure, floating column structure with RCC beam girder and floating column structure with composite beam girder using ETABS as their software. The study showed that the maximum displacement was observed in floating column structure with composite beam girder [2].

K.V.Sudheer, Dr.E.Arunakanthi studied the comparison and seismic analysis of the multistory buildings with and without floating columns. They analysed the high rise building based on storey drifts, storey displacement and base shear. The researchers finally concluded that preference to floating columns should not be given unless there is a specific need or functional purpose [4].

III. TYPICAL METHODOLOGY FOR STRUCTURAL ANALYSIS



Flow chart No. 1

IV. OUTCOMES AND CONCLUSIONS

By referring research papers the researchers have concluded that:

- (1) The maximum moment obtained is more in case of structure having floating column as compared to normal column.
- (2) The floating column is subjected to maximum shear force as compared to the structure having normal column.
- (3) In order to curb the failure of floating column the stirrups should be spaced closely in the position where the floating column is placed.
- (4) The dimensions of transfer beams should be greater than normal beams
- (5) Floating column experiences more lateral displacement than normal column.
- (6) Floating column is more susceptible to seismic load which was observed by the researchers.
- (7) It was also observed that there is no provision of specific design code for floating column which is generally provided to normal column.
- (8) Preference should not be given to floating column unless there is a need or purpose.
- (9) Proper care should be taken for the construction of floating column.
- (10) The most important conclusion is that normal columns are safer than floating columns.

REFERENCES

- 1) Shiwli Roy,Gargi Danda de “Behavioural studies floating column on framed structure,” Volume: 09 Issue : 09|September -2015
- 2) Jayashri Sarode and Mr. Amol.S. Pote “Analysis of floating column building of composite and R.C.C beam girder & comparion with R.C.C frame structure by using ETABS V9.7.0.” August 2016
- 3) Ms. Waykule . S.B, Dr.C.P.Pise, Mr. C.M. Deshmukh, MR. Y.P. Pawar , Mr S.S Kadam, Mr. D.D. Mohite, Ms.S.V Lale.“Comparative study of floating column of multi storey building by using software,”Vol. 7, Issue 1, (Part-3) January 2017, pp. 31-38
- 4) K.V. Sudheer, Dr.E. Arunakanthi, “Design and Analysis of a High-Rise Building with and without Floating Columns,” Vol. 3, Issue 10, 2015.
- 5) Rohitkumar.B.R,Sachin.P.Dyavappanavar,Sushmith a.N.J, Sunitha.V, Vinayak.Yadwad, “Analysis and design of Multi storey Structure using ETABS,” Volume: 04 Issue: 05 May 2017.
- 6) C.V.S Lavanya, Emily.P.Pailey, Md. Mansha Sabreen, U.P.B.C. Sekhar, “Analysis and design of G+4 residential building using ETABS,”Volume 8, Issue 4, April 2017
- 7) Abhay Guleria, “Structural Analysis of a multi-storeyed building using ETABS for different Plan configurations,” Vol. 3 Issue 5, May 2014.
- 8) S Abhishek, Manoj S K, Roopa B D, Bhagyashree M S, Guruprasad C H M, “Design and Analysis of residential building using ETABS,” Vol: 05 Issue: 05 | May-2018
- 9) Snehal Ashok Bhoyar, “Effect of floating column on building performance subjected to lateral load”, Vol 1 Issue 2, June 2017.IS CODE 456:2000