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Comparitive Study of Rcc Framed Structure With and Without Floating Columns –Review

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Abstract – In present scenario, buildings with floating columns are of typical feature in the modern multistory construction practices in urban India. Such types of constructions are highly undesirable in building built in seismically active areas. This paper studies the analysis of a G+4 storey normal building and a G+4 storey-floating column building. The analysis is done using ETABS 2015. For analysis response spectrum method is used for a multistoried building with and without floating columns. Different cases of the building are studied by varying the location of floating columns floor wise and within the floor. The structural response of the building models with respect to Fundamental time period, Spectral acceleration, Base shear, Storey drift and Storey displacements is investigated. This study is to find whether the structure is safe or unsafe with floating column when built in seismically active areas and to find floating column building is economical or uneconomical.

1. INTRODUCTION

Now a days multistorey buildings constructed for the purpose of residential, commercial, industrial etc., with an open ground storey is becoming a common feature. For the purpose of parking, usually the ground storey is kept free without any constructions, except the columns, which transfer the building weight to the ground. 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.
Floating columns in a building may result in a concentration of forces or deflection or in an undesirable load path in the vertical lateral-force-resisting system. In extreme cases, this can result in serious damage or collapse of the building, since the lateral load resisting system is often integral with the gravity load resisting system. Vertical irregularities typically occur in a storey that is significantly more flexible or weaker than adjacent stories. Many buildings with vertical discontinuities collapsed or were severely damaged during the 2001 Bhuj earthquake in Gujarat.

LITERATURE REVIEW

[1] A.P. Mundada and S.G. Sawdatkar (2014): In this paper, the study is carried out on a building with and without floating columns. The building considered is a residential building having G+7. Total building consists of 2 phases. 1st phase consists of lower two storey provided for parking purpose.2nd phase is of residential flats from 1st floor to 7th floor. Three cases were considered:

Case 1

It is the model in which all the columns are rested on the ground. All the columns rise up to the top floor of the building and no column is floated or terminated at any level .it refers to normal frame building.

Case 2a

In this all the column are not rested on the ground level. Certain columns are floated from the first floor to upper floors. Also some columns are terminated at 1st floor from which the columns are floated. In this case, the plan covers more area than as compared to case1. Cantilever projections are also provided at certain points.

Case 2b

It is same as case 2.a except that struts are provided below the floating columns in order to balance the moments and provides stability. Certain columns i.e. similar columns in all three models are considered and checked for its moments in X and Z directions, deflection and column shear at each floor. The results are presented in the form of graphs using STADD.Pro. Based on the analysis results following conclusions are drawn,

- The probability of failure of Case 2a is higher by comparing values of Mx and Mz with other cases.
- The probabilities of failure of without floating column are less as compared to with floating column. In this case, the moment values are significantly less than with floating column (Case 2a)
- The difference in the probabilities of failure with floating column is more than floating column with inclined compressive member i.e. struts. (Case2b).
- From the study, It is found that, the deflection in Case 2a (with floating column) is more than the deflection in Case 2b (floating column with struts).

[2] Isha Rohilla, S. M. Gupta, Babita Saini. (2015): In this paper author discussed the critical position of floating column in vertically irregular buildings for G+5 and G+7 RC buildings for zone II and zone V. Also the effect of size of beams and columns carrying the load of floating column has been assessed. The response of building such as storey drift, storey displacement and storey shear has been used to evaluate the results obtained using ETABS software. On the basis of analysis and results following conclusions have been made:

- Floating columns should be avoided in high-rise building in zone 5 because of its poor performance.
- Storey displacement and storey drift increases due to presence of floating column.
- Storey displacement increases with increase in load on floating column.
- Storey shear decreases in presence of floating column because of reduction mass of column in structure.
- Increase in size of beams and columns improve the performance of building with floating column by reducing the values of storey displacement and storey drift.

  Increasing dimensions of beams and columns of only one floor does not decreases storey displacement and storey drift in upper floors so dimensions should be increased in two consecutive floors for better performance of building

[3] Sarita Singla, Ashfi Rahman (2015): He analysed a multistorey building with and without floating columns by using response spectrum analysis. Different cases of the building are studied by varying the location of floating columns floor wise and within the floor. In this study first a normal building (NB) without any floating columns is modelled. Then, two types of models, namely 1 and 2 are modelled. In model 1, the floating columns are located at ground floor and in model 2 they are located at first floor. For each model three different cases are studied by varying the location of floating columns. The conclusions were as follows:

- It was observed that in building with floating columns there is an increase in fundamental time period in both X-direction as well as Z-direction as compared to building with floating columns
- By introduction of floating columns in a building base shear and spectral acceleration decreases. Thus, it has this technical and functional advantage over conventional construction.

[4] Nikhil Bandwal, Anant Pande, Vaishali Mendhe, Amruta Yadav (2014): In this paper the author has analyzed the building with all architectural complexities for all conditions including earthquake load. The building chosen was 16.8 m high building. To study the effect of various loads in various Earthquake zone the building was modeled as per plan and the plan was re-modified in four different ways so that total number of cases are four namely

- Normal RC Building without any floating column.
- RC Building with External floating columns.
- RC Building with Internal floating columns.
- RC Building with Internal and External Floating columns.

The Authors Concluded that:

- Provision of Case 2 (External Floating columns) may Increase displacements at various nodes.
- With the provision of Case 4 (External and Internal Floating columns) and case 3(Internal Floating Columns) may increase Axial Force Fx and Shear in z direction (Fz) at all floors.
- It is observed that case 4 (Internal and External Floating columns) Increases the Mx and Mz Values at all floors for All zones.

OBJECTIVES

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

- The primary aim of this work is the comparative study of floating columns and non-floating columns with and without seismic behavior.
- Determination of seismic response of both the models by using response spectrum analysis in ETABS 15 software and STADD-PRO v8i
- To study the effect of internal and external floating columns on the building under earthquake loading for different seismic zones.
- Cost evaluation of both the models if designed as earthquake resistant.
- Finding out effects on various parameters of RC building under seismic events due to presence of floating columns
- To check the seismic response of any existing structure with floating columns.
- To determine which structure is superior to another in higher earthquake zones

2. METHODOLOGY

Several analysis methods, both elastic and inelastic, are available to predict the seismic behavior of the structures. A Response Spectrum Analysis (RSA) will be carried out using ETABS15 software.ETABS15 is a fully integrated program that allows model creation, modification, execution of analysis, design optimization, and results review from within a single interface. ETABS15 is a standalone finite element based structural program for the analysis and design of civil structures. It offers an intuitive, yet powerful user interface with many tools to aid in quick and accurate construction of the models, along with sophisticated technique needed to do more complex projects. A total 3 number of problems will be taken for with and without floating columns and for with and without seismic behavior. The problems will include, comparative study of seismic analysis of building without floating columns, seismic and non seismic analysis of a building with floating columns. The output results will be expressed in terms of roof displacements, inner-storey drift, base shear and comparison of amount of steel and concrete required in different cases.

3. CONCLUSION

Literature review presents the seismic behavior of buildings with floating columns and without floating columns for different structural complexities. It was observed that, provision of floating columns at different locations affects the performance of building during earthquake also different parameters such as storey drift, storey shear, displacement increases. It was also observed that, buildings with floating columns are not economical if designed as earthquake resistant.

4. REFERENCES

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