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Review on Analysis of Multi-storey Building with and without Floating Columns

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Abstract: ***There are many studies carried out on analysis of structure with floating and without floating column, also studied seismic analysis of RC framed building for different strata and studied comparison of shear wall structure included floating column structure for the parameters displacement, storey shear, time period and base shear of structure under earthquake excitation. Floating column is use to satisfy the space requirement and to get good elevations to the structure. From the reviews it is founded that floating column structure are not economical if designed as earthquake resistant also the use of floating columns results in the increase in the displacement, bending moment, storey shear, time period and Steel requirement of structure.***

Keywords: Floating column (FC), Storey shear, Base Shear, Storey displacement, ETabs.

I. INTRODUCTION

Multi-storey buildings are constructed for industrial, residential and commercial purpose with open ground storey. The main problem is to get space for the parking, reception lobbies or halls**.** At present time, India's infrastructure system has grown up tremendously and parallel with lots of research has been done in the field of construction**.** For commercial or hotel buildings lower floor required conference halls, reception lobbies, showroom or parking areas for that required large open space for the easy movement of vehicles and people. Based on the planning of upper floors closely spaced columns are not useful in the lower floors. For the solution of that problem concept of floating column has evolve**.** Vertical member of structure called column begin from the base that is foundation and transfers load of structure to the ground. Floating column is not different from the regular column but it is rest on beam which is horizontal member. It acts as a point load on a beam and the load transfer to the column below the beam. Buildings with floating column are designed for the vertical loads not designed for the seismic loads so structure with floating columns are not safe under seismic prone areas**.** Now a day's earthquake resistant design got main attention in design of any type of structure**.**

II. LITERATURE REVIEWS

Sasidhar [1], In this paper Equivalent static analysis has done. Six cases were considered depending on position of removal of columns. G+5 storey structure in zone II are considered. The results of different cases for the parameters displacement, bending moment , shear force, and area of reinforcement compared with the regular structure that have regular columns. From the analysis author concluded that structure with floating column has more base shear and required more steel compared to normal building also floating column is not suitable in higher seismic zones. Prerna [2], In this paper studied on structure has floating columns under seismic loading for the change in soil conditions. Response spectrum analysis was done to analyze different building models. Two models were considered of G+3 and G+5 building in that six different cases are considered for each model. Results were obtained for soil type II and soil type III, conditions for all cases and checked the variation for parameters like storey shear, bending moment. From the analysis it concluded that base shear is more in medium soil compared to hard soil in both cases. From response spectrum analysis concluded that floating column at corner of exterior frame found critical than other locations.

Kirankumar [3], Studied on two different structure one with the floating column and structure without column also shear wall structure considered. Analysis was done using equivalent static and response spectrum method for seismic zone v. Considered four models of G+20 storey buildings. Model 1. Normal building, Model 2. Floating column building, Model 3. Shear wall building, 4. Shear wall and floating column structure. Analysis was done for the parameters storey shear, displacement, , storey drift and time period. From the analysis and after comparing the parameters it is obsereved that the structure with shear wall gives better performance, lesser displacement and more strength. Time period for floating column structure is more compared to other models.

Nakul [4], Studied on two structures with and without seismic loading, structure one is the floating columns structure another without floating columns structure. Response spectrum analysis is used for the analysis. Analysis has done to find out roof displacement, inner storey drift, base shear and comparison of amount steel and concrete required in different cases. The results of

analysis is that floating column model has more displacement value according to code it is not permitted to provide in higher zones. Similarly for drift floating column model has more drift value than the normal building also the increasing height of building increases storey drift and storey displacement. Performance of floating column structure is less during earthquake. structure with floating column is not economical if designed as earthquake resistant.

Dipak [5], Studied variation of Storey Shear, Base Shear, and Moment on high rise structures for Different Seismic Zones. Staad pro software used for the anlysis. Different models were considered G+3, G+5, G+7, G+9 storey buildings for different plan area and different seismic zones. Considered two plan areas of 9m X 12m and 12m x 15m. from the analysis it observed that base shear and storey shear increased with increase in seismic zones and storey height for both the plan areas.

Deekshitha [6], Studied comparative study of G+5 storey building of structure with floating columns and with regular columns for different parameters drift value, base shear and horizontal displacement. Analysis has done in Etabs software. Conclusion of analysis is that storey displacement increase as the height of building increases. Displacement is more in floating column building specially for the corner floating building compare to normal building. Storey drift increases as storey displacement increases and base shear value decreases due to introduction of floating columns.

KeerthiGowda [7], Studied on structure with floating columns and without floating columns under seismic loading. Analysis was done using Etabs software for the seismic zone v. Three models were considered of G+10 storey, Model 1. Reinforced concrete building without floating columns. Model 2. Sturucture with floating columns and Model 3. Structure with floating column after providing bracings. From the results author concluded that storey drift for structure of floating column is 5.87 % more than normal building. After providing bracings storey drift of structure of floating columns reduced by 18.28%. Storey shear value of regualr building compare to structure of floating columns is higher by 4.11%. After providing bracings the building storey shear of floating column has increased by 31.78%. Structure with floating columns has time period value is 4.04% more than that of normal building, after providing bracings the value of time period for structure with floating column has reduced by 10.94%. Displacement of building with floating columns is 4.74% more than that of normal building. The displacement of building after providing bracings has been reduced by 9.83%. From the results concluded that structure of floating column performed poor under seismic loading. Performance of structure under seismic loading improved by providing bracings in structure of floating columns.

Kandukuri [8], Studied on structure of floating columns under seismic loadings. Equivalent static analysis was done. Considered six models of G+4, G+9 and G+14 storey building with floating column and without floating column bullding. Equivalent static analysis has done for zone III in Etabs. Conclusion of analysis is that storey drift increase as zone intensity increases. Drift value and lateral displacement increase for floating column model. Height of building increase , Increases the storey drift and deflection. Shear wall structure is safe compared to other structure but not economical for less height structure. Building with bracings perform well in case of small height structure than high rise building.

Amit[9], Looked At the reactions of RC frame buildings with various kinds and possible locations of floating columns & also without floating column under earthquake loading. RSA used for the analysis of models with the help of ETABS. The (G+12) with a floating column building, with SMRF specially moment resisting frames in two orthogonal directions is selected for the study. The structure is viewed as situated in Zone III according to IS 1893:2002. Different cases are considered Type A) Structure without floating column, Type B) Structure With one side floating Column, Type C) Structure with both side floating column – Fig 4 Type D) Structure with one side floating column with strut support. Each type of structure considers for analysis for 3 more cases on the basis of distance of cantilever i.e. floating column from original column. Cases are as following. a) Distance considered is equivalent to 1.2 m b) Distance considered is equivalent to 1.5 m c) Distance considered is equivalent to 2.0 m. In view of investigation following ends can be drawn. Displacement of the structure is getting reduce in type D structure (Structure with floating column with strut support). Strut support is safer for large cantilever of 1.5 m and 2.0 m to reduce deflection of the building. Storey shear comparison carried out to know effect of lateral force on building structure. Storey shear highly affect Type C building because double floating column increasing mass of the building structure, as it is less for Type D (at strut support) which gives more stability to structure and will consume less reinforcement as compare to other type of structure.

Kishalay [10], Studied assessment of seismic performance of structure with floating columns. A 10 story structure with area 13440 sq. ft. Length in x-course 16' and straight range in y-course 14'. Five unique cases are thought of for analysis. Equivalent static analysis, Modal analysis, Response spectrum analysis are the methods used for analysis of models. From the investigation it is presumed that, torsional irregularity does not depend on floating column number or ground floor column size, it is mainly depend on floating column location. Story stiffness is less in structure with floating columns compared to regular structure. Floating column should be provided symmetrically to avoid torsional irregularity as well as column size should be increased to get rid of from soft story effect.

Allacheruvu [11], Studied relative seismic investigation on strengthening of structure with floating columns using bracings. In this current examination four models are utilized particular, 'Model 1 (G+9 Normal RC Building)', 'Model 2 (G+9 RC structure with floating columns)', 'Model 3 (G+9 RC structure with floating columns with Bracings at corner)', 'Model 4 (G+9 RC structure with floating columns with Bracings at centre)'. Seismic analysis is completed on every one of four cases using equivalent static method and RSA in two zones (V, III). Correlation of results Storey Drifts, Storey shears, Time period, Base shear and Maximum Displacement, for every one of the four models are noted. From every one of these outcomes can see that the "structure with bracings at centre" (Model 4) performs very much contrasted with all the models. Model 4 resulted in resisting higher base shear values compared to Model 3 with small displacement values.

Sharma [12], Studied the analysis of G+5, G+7, G+9, G+11 and G+13 storey structure with floating column and structure without floating. The analysis is done by using Staad Pro V8i software by using RSA. To study the effect of floating column which is at corner of building and resting on two cantilever beams at the free tip end under seismic loading for severe seismic zone. From the response spectrum analysis it is noticed that the floating column building is having more displacements than a building without any floating column. So structure with floating columns is unsafe than a normal building. Structure with floating column becomes uneconomical as compare to normal building. Due to increase in sizes the cost of construction increases so that the structure with floating columns becomes uneconomical. So construction of floating column building should be avoided.

Kuldeep [13], The time history of overturning moment, inter storey drift, floor displacement, base shear are computed for the frames with floating column. Analysis by STAAD ProV8i software. 1. Static Analysis (Plane Frame Element) 2. Dynamic Analysis (Time History Analysis, New mark's Method). In this analysis author get the results that structures are safe under static loading condition, structure with floating column found unsafe under dynamic loads. Structure with floating column can make safe by increasing members size, about 27% concrete quantity required more for the structure of floating columns. Structure with floating column is uneconomical. By applying floating column in structure building make serviceable for utilization purpose.

Avinash [14], In this paper the seismic exhibition of working with and without FC sections are introduced as far as different parameters, for example displacement, storey drift, maximum column forces, time period of vibration etc. The structure having different areas of drifting segments for example FC beginning from various stories are considered for the examination. The building is modeled by using finite element software ETABS. Equivalent static analysis and response spectra dynamic analysis are performed on the various buildings and their seismic performance is evaluated. Four unique cases were thought of. Plan region 24m x 18m with 16 number of stories for the seismic zone IV. Investigation came about that FC structure not reasonable in high seismic zone since unexpected change in firmness was watched. Required huge size of brace pillar to help FC, By utilizing FC huge utilitarian space can be given which can be useful. FC prompts irregularity in building.

III.CONCLUSIONS

A. Use of floating columns is good for more space index and architectural view.
B. Shear wall structure gives good performance, lesser displacement and more strength compared to other models like floating column structure or normal structure.
C. Building with floating column are not economical if designed as earthquake resistant.
D. Floating column structure gives increase value of storey drift, lateral displacement and time period.
E. Increase height of building increases the storey displacement.

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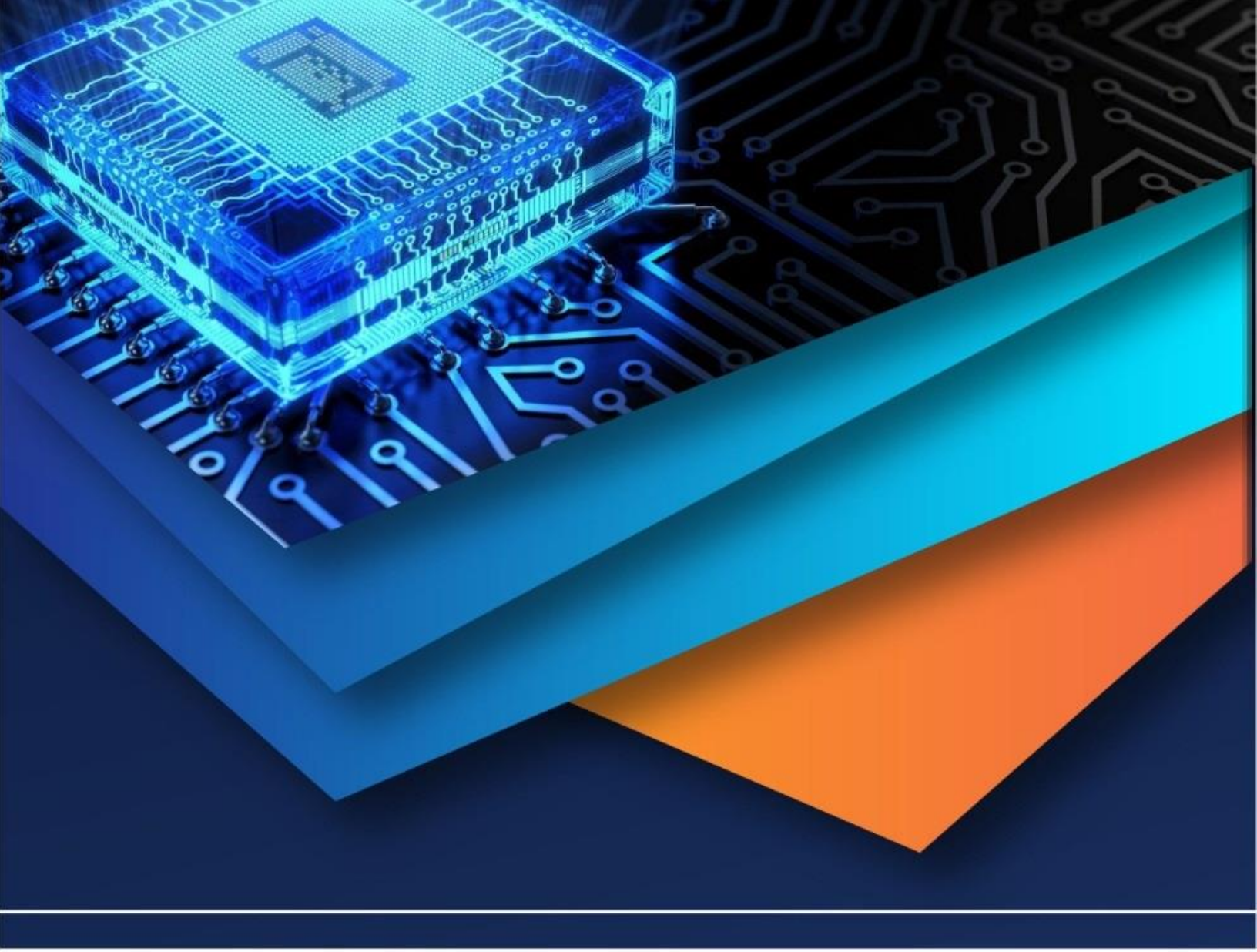

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