

## SEISMIC ANALYSIS OF MULTISTOREY BUILDING WITH FLOATING COLUMN

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### ABSTRACT:

Nowadays in the majority of the industrial along with household structures reduces floorings has reception halls, display rooms, meeting room, big garage and so on. The moment background of flooring dislodging, entomb tale float, base shear, falling min are signed up for both the coverings with as well as without skimming area. The evaluation is done on structure designs having various varieties of floor of RCC with easy and also complicated layout with drifting columns. Limited component base software application specifically ETABS, Staad pro v8i are utilized for the evaluation which can conveniently establish the specification such as side pressures, flexing minute, shear pressure, axial pressure, floor shear, floor drift, base shear. All these services calls for big continuous area unlike very closely spaced columns on top floorings, thus the idea of drifting column began. This paper intends in the direction of the testimonial of researches executed on Seismic Analysis of the structure with Floating column by numerous writers in the past. FEM codes are produced for 2D multi tale details with as well as without skimming area to think of the responses of the framework under different seismic trembling excitations having distinct reappearance material maintaining the PGA and also time period aspect regular.

*Keywords: FEM, Staad pro, shear force, axial force, Multi stored building.*



## 1. INTRODUCTION:

The practices of a structure throughout quakes depends seriously on its total form, dimension as well as geometry, along with exactly how the quake pressures are reached the ground. The quake pressures established at various flooring degrees in developing demand to be lowered along the elevation to the ground by the quickest course; any type of variance or interruption in this lots transfer course causes inadequate efficiency of the structure. Structures with upright troubles (like the resort structures with a couple of floors bigger than the remainder) trigger an abrupt enter quake pressures at the degree of stoppage. Structures that have less columns or wall surfaces in a certain floor or with abnormally high floor often tend to damages or collapse which is started because floor. Numerous structures with an open

round floor meant for vehicle parking broke down or were seriously harmed in Gujarat throughout the 2001 Bhuj quake. Structures with columns that hang or drift on beam of lights at an intermediate floor as well as do not copulate to the structure, have suspensions in tons transfer course. However Provision of drifting columns relaxing at the pointer of taper looming light beams boosts the susceptibility of the side lots withstanding system as a result of upright suspension. This kind of building does not develop any type of trouble under upright loading problems. However throughout a quake a clear lots course is not offered for moving the side pressures to the structure. Side pressures collected at the top flooring throughout the quake need to be sent by the predicted cantilever beam of lights. Overturning pressures hence established bewilder



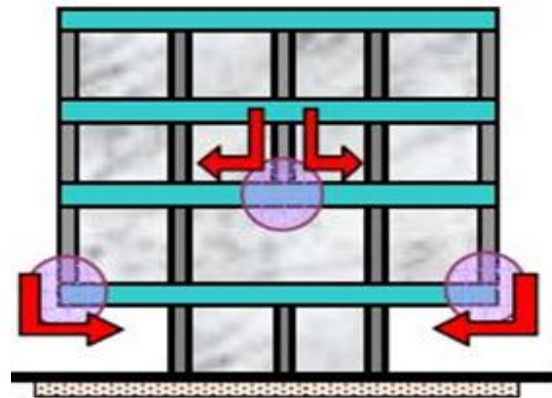
the columns of the very beginning. Under this scenario the columns start to warp and also twist, leading to complete collapse. This is due to main shortage in the toughness of first stage columns, forecasting cantilever light beams and also pliable describing of beam of light column joint. There are numerous tasks in which drifting columns are taken on, specifically in the air flooring, where transfer girders are utilized, to make sure that even more open area is readily available in the first stage. These open areas might be needed for setting up hall or auto parking function. The transfer girders need to be developed and also outlined effectively, particularly in planet quake areas.

## 2. RELATED STUDY:

Boundary worth troubles are occasionally additionally described as area worth issues. It can be stated to be a mathematical trouble in which

several reliant variables should please a differential formula anywhere within the domain name of independent variables as well as likewise please particular details problems at the limit of those domain names. The area worth troubles in FEM normally has area as a domain name of rate of interest which usually stands for a physical framework. The area variables are hence controlled by differential formulas as well as the border worth describe the defined worth of the area variables on the borders of the area. Seismic evaluation is a part of architectural evaluation and also the computation of the feedback of a building framework to earthquake. It belongs of the procedure of architectural style, quake design or architectural analysis in area where a quake is prevailing. A structure has the prospective to 'swing to and fro throughout a quake (and even an extreme wind tornado). This

is 'essential setting' as well as is the most affordable regularity of constructing response. Most structure, nonetheless greater settings of reaction, which are distinctly turned on throughout a quake. There is even more boost in the variation for the drifting column structures compared to the normal structure. The inter-story drift additionally boosts as the boost in the variety of floor's. The floor drift is extra for the drifting column structures due to the fact that as the columns are eliminated the mass obtains boosted for this reason the drift. As the mass and also tightness enhances the base shear additionally boosts. Consequently, the base shear is extra for the drifting column structures contrasted to the traditional structures. Thus, from the research study it was wrapped up that as for feasible, the drifting columns are to be stayed clear of specifically, in the seismic susceptible locations.



**Fig.2.1.Floting Column**

### 3. METHODOLOGY:

The analysis was done by the use of E-Tabs software by using equivalent static analysis they also studied the variation of the both structures by applying the intensities of the past earthquakes i.e., applying the ground motions to the both structures, from that displacement time history values are compared .The present paper deals with the variation of time period, displacement of structure, base shear, seismic weight of building from manual calculations and E-Tabs. It was found that floating column building is unsafe than a Normal

building. The objective of the present work is to study the behaviour of multi-storey buildings with floating columns under earthquake excitations. Finite element method is used to solve the dynamic governing equation. Linear time history analysis is carried out for the multi-storey buildings under different earthquake loading of varying frequency content. The base of the building frame is assumed to be fixed. Newmark's direct integration scheme is used to advance the solution in time. A four storey two bay 2D frame with and without floating column are analyzed for static loading using the present FEM code and the commercial software STAAD Pro. Following conclusion was drawn the static and free vibration results obtained using present finite element code are validated. The dynamic analysis of frame is studied by varying the column dimension. To achieve this objective, three RC bare

frame structures with G+4, G+9, G+15 stories respectively will be analyzed 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.

#### 4. ANALYSIS MODELS:

The following are the input data of the test specimen:

Size of beam – 0.1 X 0.15 m

Size of column – 0.1 X 0.125 m

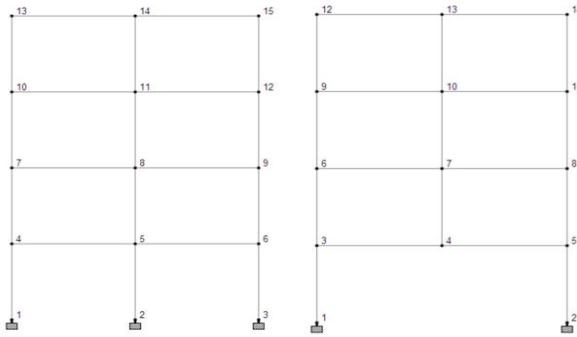
Span of each bay – 3.0 m

Storey height – 3.0 m

Modulus of Elasticity,  $E = 206.84 \times 10^6 \text{ kN/m}^2$

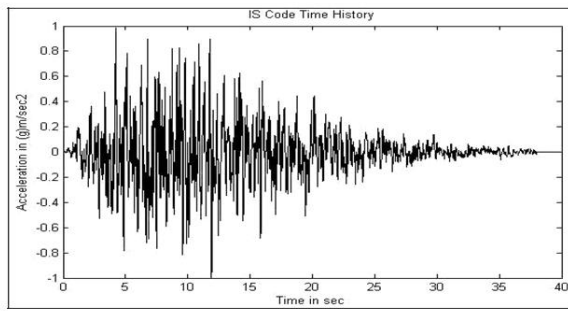
Support condition – Fixed

Loading type – Live (3.0 kN at 3<sup>rd</sup> floor and 2 kN at 4<sup>th</sup> floor)



**Fig.4.1. 2D Frame with usual columns.**

Free vibration frequencies of the 2D steel frame with floating column are presented in Table 4.6. In this table the values obtained in present FEM and STAAD Pro are compared. Table 4.7 shows the comparison of maximum top floor displacement of the frame obtained in present FEM and STAAD Pro which are in very close agreement.



**Fig.4.2. Compatible time history as per spectra.**

## 5. CONCLUSION:

The actions of multistory structure with and also without drifting column are examined under various quake excitations. The suitable time background as well as Electro quake information has actually been taken into consideration. The PGA of both the quake has actually been scaled to 0.2 g and also period of excitation is maintained exact same. A limited aspect version has actually been created to examine the vibrant actions of multi tale structure. The fixed and also complimentary resonance outcomes gotten making use of existing limited aspect code is confirmed. The vibrant evaluation of structure is researched by differing the column measurement. It is wrapped up that with rise in very beginning column the optimum variation; inter



floor drift worth are decreasing. The base shear and also rescinding minute differ with the adjustment in column measurement. The behavior of multi storey developing with and also without drifting column is researched under various quake excitations. The fixed evaluation is done and also It is ended that by the optimum variation and also floor drift worth are enhancing for drifting columns. It reveals that criteria such as floor drift, floor variation and so on enhances with intro of drifting column. Therefore, it ought to be prevented in quake susceptible areas ideally. Whereas in frameworks with intricate arrangements there is great deal of job to be done. Future examination ought to be collective on the settings forms which mirror the real architectural behavior of the structure.

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