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SEISMIC ANALYSIS OF MULTISTOREY BUILDING HAVING FLOATING COLUMN

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ABSTRACT

In current times, multi-storey homes in urban towns are required to have column loose vicinity because of small area, population and also for classy and sensible requirements. For this homes are supplied with hanging columns at one or more storey. Inside the earthquake regions the development of these hanging columns are especially disadvantageous. The earthquake forces which can be advanced at one-of-a-kind ground stages in a constructing need to be carried down along the height to the ground via the smallest route. Turning aside or discontinuity in this load switches path effects in terrible basic overall performance of the building.

The item of the prevailing artwork is to have a take a look at the conduct of multistory buildings having hanging columns beneath seismic forces and study the effect of shear wall within the specific building. For that cause three times of multi-storey houses are taken into consideration having 8 storeys, twelve storeys and sixteen storeys. All the 3 instances are taken into consideration having hanging columns furnished with and without shear partition, and moreover analyzed for zone V the usage of software ETABS 2016 .observation shows that the supply of hanging columns is nice in growing FSI of the building however is a volatile component and increases the vulnerability of the building. Its miles observed from the evaluation that lateral displacement and storey waft of the constructing will boom from decrease to better zones due to the fact the significance of depth might be more for higher zones. Through the usage of shear wall those parametric values reduces in all of the models.

This analysis work affords a beneficial help on the parameters lateral displacement and storey go together with the waft inside the multistory buildings having hanging columns with and without shear partition.

KEYWORDS: Floating column, Earthquake analysis, ETAB.

1. INTRODUCTION

Earthquake resistant layout of RC homes is a continuing place of studies for the reason that earthquake engineering has started out not simplest in India however in different developed countries also. The buildings nonetheless damage because of some one or the other reason in the course of earthquakes. Regardless of all the weaknesses in the structure, both code imperfections and blunders in evaluation and layout, the structural configuration device has performed a crucial role in catastrophe.

Floating Column:

A column is meant to be a vertical member starting from foundation level and moving the burden to the ground. The term floating column is likewise a vertical element which results (due to architectural design/ website online state of affairs) at its decrease level (termination degree) rests on a beam that is a horizontal member. The beams in flip transfer the load to different columns below it.

Such columns in which the weight become taken into consideration as factor load. Theoretically such structures may be analyzed and designed. In practice, the true columns beneath the termination degree [usually the stilt level] are not built with care and extra susceptible to failure. Hypothetically, there is no want for such floating columns – the spans of all beams want no longer be nearly the equal and a few spans can be large than others. This way, the columns supporting beams with larger spans could be designed and constructed with more care. For hanging columns, the transfer Girder and columns assisting transfer Girder needs unique

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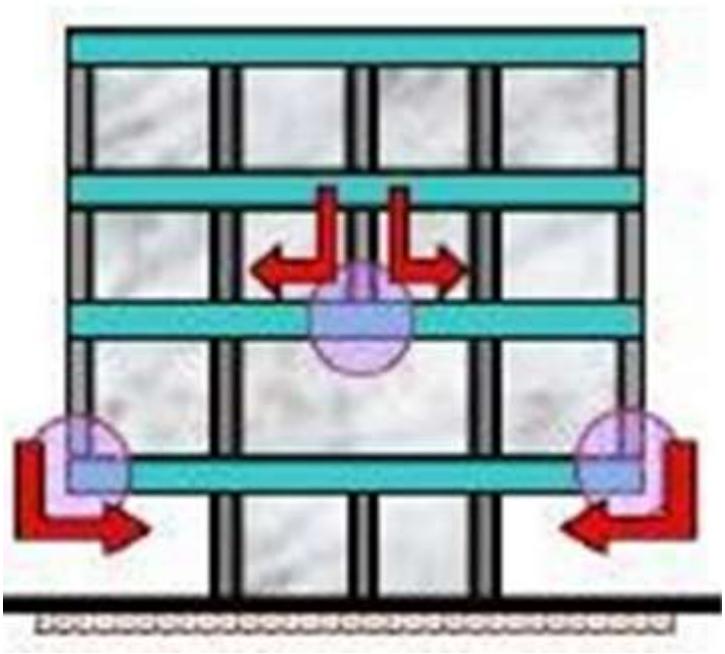
attention. If load component desires to be augmented (for switch Girder and its columns) to have additional protection of shape, will be followed. Within the given device, floating columns need now not be handled to hold any Earth Quake forces. Therefore whole Earth Quake of the device is shared by using the columns/shear walls without thinking about any contribution from waft columns. However in design and information of drift columns, minimum 25% Earth Quake need to be catered similarly to full gravity forces. This manner the overall machines as a few breathing protections during Earth Quake. However, Floating columns are in a position enough to hold gravity loading however transfer Girder must be of adequate dimensions (Stiffness) with very minimal deflection. Even though floating columns ought to be discouraged, there are many tasks in which they're adopted, specifically above the floor, where transfer girders are hired, so that extra open area is to be had in the floor. The switch girders have to be designed and distinct nicely, in particular in Earth Quake zones. If there aren't any lateral masses, the design and detailing is not tough. There might not be paper detailing the diff. of adopting floating columns. We ought to do a three dimensional analysis and be very cautious at the joints wherein the floating columns meet the switch girders.



2. OBJECTIVE OF STUDY

In the present dissertation paintings distinct cassses of multistory constructing having floating columns were taken to study the behavior below seismic loading. The targets of the prevailing work are:

- To have a look at the conduct of multistory homes having floating columns under earthquake excitations.
- To observe the impact of shear wall inside the building having floating columns below earthquake loads.
- To evaluate the conduct of multistory homes having floating columns with and without shear wall under earthquake loads.

3. LITERATURE REVIEW

Shivam Tyagi et .al, may [2018]

Structural planning and design is an art and science of designing with economy and elegance and durable structures. In present scenario buildings with floating column is a typical feature in the modern multistory construction in urban India. Such features are highly undesirable in building built in seismically active areas.

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Tremendous increase in the use floating column can be seen these days cause of spacious and aesthetic appearance but that could not be achieved on the risk of failure of building. This study highlights the importance of explicitly recognizing the presence of the floating column in the analysis of building. The study is carried out to analyze the building with floating columns and to find out its comparison with the building without floating column in terms of storey drift, base shear and time period frequency using designing software.

Kishalay Maitra et. al, 2 April [2018]
In the modern multi-story construction, floating column is an unavoidable feature of buildings. Such features are highly undesirable in building built in seismic prone areas. This study highlights the performance of floating column building and compared with normal building under seismic load. In this study, static and dynamic analyses using response spectrum method have been carried out for multi-story building with and without floating column

Zozwala Mohammed Mustafa et. al, December [2017]
This paper aims towards the review of studies carried out on Seismic Analysis of the building with Floating column by various authors in the past. The analysis is done on building models having different numbers of storey of RCC with simple and complex floor plan with floating columns. Finite element base software namely ETABS, Staad pro v8i are used for the analysis which can easily determine the parameter such as lateral forces, bending moment, shear force, axial force, storey shear, storey drift, base shear. Time history method or response spectrum method is used for the dynamic analysis for simple and complex building configuration

Karishma I.patel et. al, November [2017]
In this paper study of multistory buildings are constructed with floating column for purpose of getting more space at parking areas for movement. But same case highly damaged during highly seismic zone as compared to normal building in earthquake. And this paper also studies the seismic behavior of multistory building with and without floating column considered. And find whether the structure is safe or unsafe with floating column when built in seismically active areas.

Ms.Waykule et al, January [2017]
Floating columns are a typical feature in the modern multi-storey construction in urban India and are highly undesirable in buildings built in seismically active areas. In this paper static analysis is done for a multi-storey building with and without floating columns. Different cases of the building are studied by varying the location of floating columns floor wise. The structural response of the building models with respect to, Base shear, and Storey displacements is investigated. The analysis is carried out using software sap2000v17.

Gangadari Vishal Kumar et. al, November [2016]
This study highlights the importance of explicitly recognizing the presence of the floating column in the analysis of building. Alternate measures, involving stiffness balance of the first storey and the storey above, are proposed to reduce the irregularity introduced by the floating columns. FEM codes are developed for 2D multi storey frames with and without floating column to study the responses of the structure under different earthquake excitation having different frequency content keeping the PGA and time duration factor constant. The time history of floor displacement, inter storey drift, base shear, overturning moment are computed for both the frames with and without floating column

4. METHODOLOGY

The item of the existing work is to examine the behavior of multi-storey buildings having floating columns with and without shear walls below seismic forces. For this purpose 3 instances of multi-storey homes are taken into consideration. To lessen lateral displacement and storey drift shear partitions were supplied.

In case-I, overall 8 storeys are furnished. Building area provided is 28 m x 28 m up to lower 4 storeys and 32 m x 32 m up to top four storeys.

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In case-II, general 12 storeys are furnished. Constructing vicinity furnished is 28 m x 28 m up to decrease 4 storeys and 32 m x 32 m up to top eight storeys.
In case-III, total 16 storeys are provided. building place supplied is 28 m x 28 m up to lower four storeys and 32 m x 32 m up to higher 12 storeys.
To have a look at the behavior the reaction parameters decided on are lateral displacement and storey waft. All the instances are assumed to be located in region V. all of the 3 instances are analyzed with and without shear wall.

Summary of the variables

Parameters	Variables
Zone	V
Position of Shear Walls	No Shear Walls, SWC(SW at centre)
Plot size	28m x 28m up to lower 4 storeys in all cases.
Case-I	32m x 32m in upper 4 storeys
Case-II	32m x 32m in upper 8 storeys
Case-III	32m x 32m in upper 12 storeys

Loadings Considered:
Dead Load- 1.25KN/M2 It is taken by software itself.
Live Load- 3 KN/m^2 on all the floors.
Earthquake Load- As per IS 1893 (part-I):2002.
Wall load (at all beam)- 12KN/M

4.2.1 Load Combinations:
Load combinations considered are as follows:
1. 1.5(DL + LL)
2. 1.5(DL + EQL)
3. 1.2(DL + LL + EQL)

4.2.2 SEISMIC LOAD DETAIL
1.Seismic zone- v (0.36)
2.RRF -5
3.Importance factor -1
4.Mass source - DL+0.25LL

5. RESULTS

After analysis of the building with and without floating column it is found that the displacement more in floating column building as compare to building without floating column.

TABLE IBEAM AND COLUMN SIZE CASES

CASE I	Beam size (300mm x 500mm)
	Column size (Interior 400 x 400) (Periphery 600 x 600)
	The thickness of shear partition is150mm.
	Beam size (300mm x 500mm)

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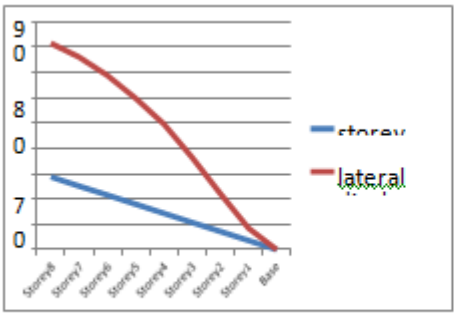
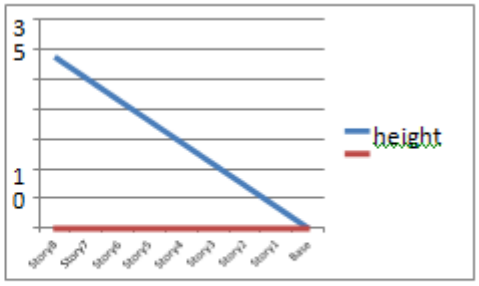
CASEII	Column size (Interior 400 x 400) (Periphery 600 x 600)
	The thickness of shear partition is150mm.
CASE III	Beam size (300mm x 500mm)
	Column size (Interior 400 x 400) (Periphery 600 x 600)
	The thickness of shear partition is150mm.

(A) Graph for 8 storey building without shear wall

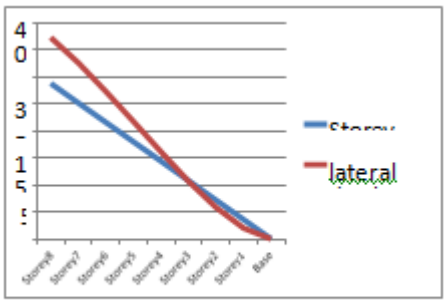


Storey height v/s lateral displacement

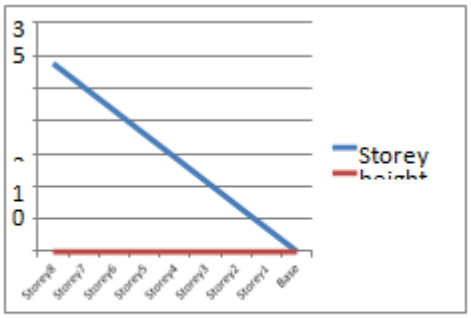


storey height v/s storey drift

(B) Graph for 8 storey building with shear wall



Storey height v/s lateral displacement



storey height v/s storey drift

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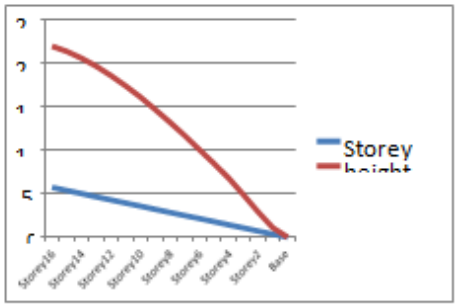
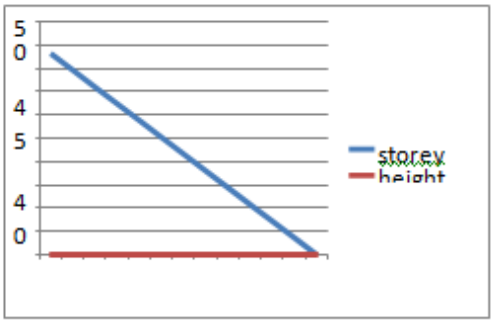
(C) Graph for 12 storey building without shear wall

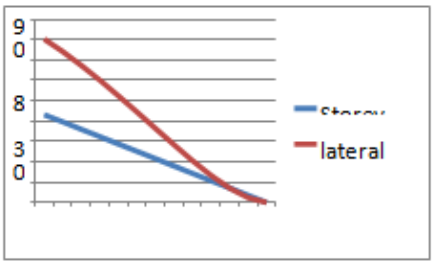


Storey height v/s lateral displacement

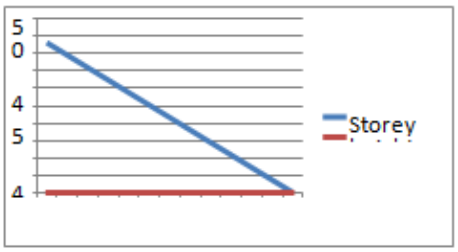


storey height v/s storey drift

(D) Graph for 12 storey building with shear wall

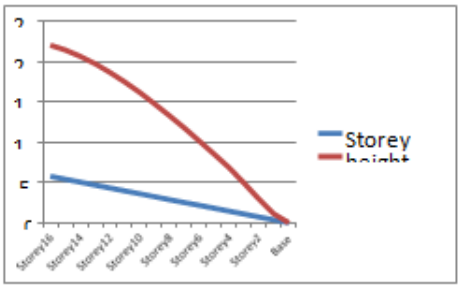


Storey height v/s lateral displacement

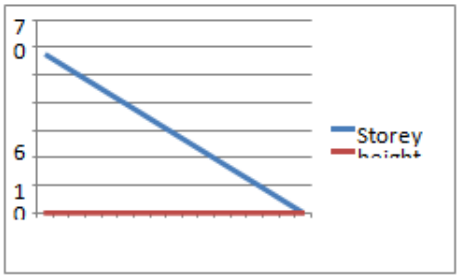


storey height v/s storey drift

(E) Graph for 16 storey building without shear wall



Storey height v/s lateral displacement



storey height v/s storey drift

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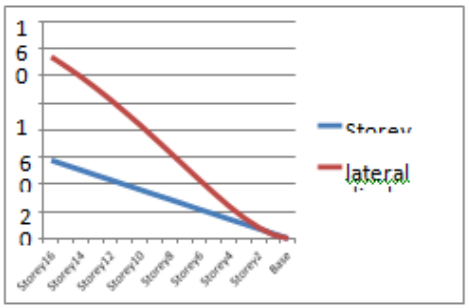
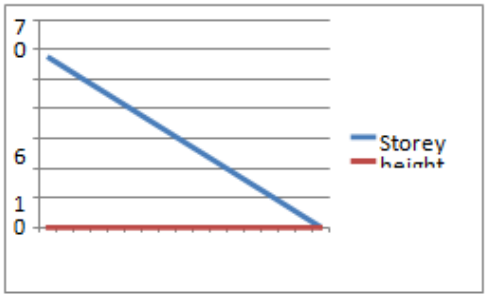
(F) Graph for 16 storey building with shear wall



Storey height v/s lateral displacement



storey height v/s storey drift

6. CONCLUSION

- For all the cases taken into consideration drift values comply with around comparable path along storey peak with maximum value lying someplace near approximately the center storey.
- For all of the models taken into consideration displacement values follow around similar gradually growing immediately route along storey height.
- In the entire models storey waft and displacement values are much less for lower zones and it goes on increases for better zones due to the fact the significance of depth can be the greater for higher zones.
- The storey float and displacement is extra for floating column homes due to the fact as the columns are eliminated the mass receives accelerated and therefore waft and displacement also will increase.
- By way of supplying shear wall go with the flow and displacement values reduce in comparison to without shear wall fashions for all of the zones.
- As float values are safe inside maximum permissible limits in without shear wall models so there may be no necessity of supplying shear walls from flow view factor. As we have provided the shear walls at all the four junctions which makes it total stable in both the aspects lateral displacement as well as storey drift
- As we have provided shear walls at all the junctions which provides more strength up to 70% problem is solved for the seismic point of view
- As we have done analysis for the v zone it safe for the III and fourth zone also

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