

Dynamic Analysis of Multistorey Building with and without Floating Column using ETABS

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ABSTRACT: In present scenario buildings with floating column is a typical feature in the modern multistorey construction in India. Such features are highly undesirable in building built in seismically active areas. In the unavoidable circumstance floating columns are adopted in building. Brief analysis will be made for the structure with and without floating column. Floating columns are placed different story levels and different position in the structure, for different seismic excitation by changing the frequency of vibration using ETABS. Final results for maximum story displacement, maximum inter-story drift, story base shear with different seismic excitation. The safer and economical method to reduce the cost of floating column beam is suggested.

KEYWORDS: Designs, Floating Column, E-tabs, Multi Storey Building

I. INTRODUCTION

ETABS

ETABS is to use for special purpose analysis and design program developed specifically for building systems. ETABS features an intuitive and powerful graphical interface coupled with unmatched modeling, analytical, and design procedures, all integrated using a common database. It is quick and easy for simple structures. ETABS can also handle the largest and most complex building models. ETABS mainly offers following types of analysis:

1. Linear
2. Nonlinear
3. Pushover Analysis
4. P Δ Effect Analysis

This program has been thoroughly tested and used in using the program. However, the user accepts and understands that no warranty is expressed or implied by the developers or the distributors on the accuracy or the reliability of the program. This program is very useful tool for the design check of concrete structures.

The user must exactly understand the assumption of the program and must independently verify the results. Incorporating 40 years of continuous research and Visualization tools, blazingly fast linear and nonlinear analytical power. Sophisticated and comprehensive design capabilities for a wide-range of materials, and insightful graphic displays, reports, and schematic drawings that allow users to quickly and easily decipher and understand analysis and design results.

From the start of design conception through the production of schematic drawings, ETABS contain every aspect of the engineering design process. Creation of models has never been easier intuitive drawing command allow for the rapid generation of floor and elevation framing. The CAD drawings can be converted directly into ETABS models or used as templates into which ETABS & we can easily analyze and design of building.

Design of steel and concrete frames, composite beams, composite columns, steel joists, and concrete and masonry shear wall is included, as is the capacity check for steel connections and base plates.

Models may be realistically rendered, and all results display directly on the structure. Comprehensive and customizable reports are available for all analysis and design output, and schematic construction drawings of framing plans, schedules, details, and Cross sections may be generated for concrete and steel structures.

BASIC DEFINITIONS

FLOATING COLUMN-A column is a vertical member which transfers the loads from beam to foundation whereas a floating column is a vertical member which transfers the load from beam to another beam. The load transfer in any building is usually from slab to beams to columns and then foundation. But a floating column, instead of transferring the load to foundation transfers the load on to the beam. The beam on which the floating column rests transfers the load to the columns below. The load is transferred in the form of a point load.

BASE SHEAR- Base shear is an estimate of the maximum expected lateral force on the base of the structure due to seismic activity.

STOREY DRIFT - Drift is defined as the lateral displacement. Storey drift is the drift of one level of a multi-storey building relative to the level below. Inter-story drift is the difference between the roof and floor displacements of any given story as the building sways during the earthquake, normalized by the story height. For example, for a 10-foot high story, an inter-story drift of 0.10 indicates that the roof is displaced one foot in relation to the floor below. The greater the drift, the greater the likelihood of damage. Peak inter-story drift values larger than 0.06 indicate severe damage, while values larger than 0.025 indicate that the damage could be serious enough to pose a serious threat to human safety. Values in excess of 0.10 indicate probable building collapse.

DISPLACEMENT- Story displacement is the absolute value of displacement of the storey under action of the lateral forces

II. OBJECTIVES

- To study behavior of multi-storey building with floating column under earthquake excitation.
- To analysis R.C.C. frame building with floating column and without floating column using ETABS.
- To compare analysis for base shear storey drift and displacement between floating column and without floating column.
- To analysis story drift, displacement, shear, storey stiffness on different floor.

III. METHODOLOGY

The existing work is to examine the behavior of multi-storey buildings having floatingcolumns with and without seismic forces.

Model-1 G+23 structure without floating column

Model-2 floating column at ground floor

Model-3 floating column at 5th and 10th floor

Model-4 floating column at 8th and 16th floor

Model-5 floating column from 18th floor to terrace

Model-6 floating column at 5th, 10th, 15th, 20th floor

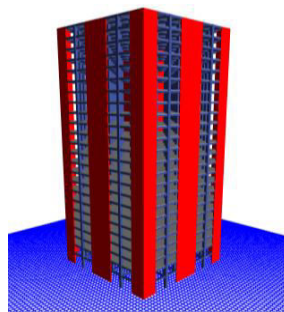
Model-7 floating column at 8th, 11th, 13th, 17th floor

Model-8 floating column at 9th, 10th, 16th,17th floor

Model-9 floating column at groundfloor, 1st, 2nd, 3rd floor

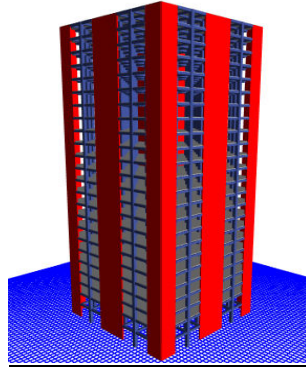
Model-10 floating column at 6th, 12th,18th floor

MODEL-1 G+23 STRUCTURE WITHOUT FLOATING COLUMN



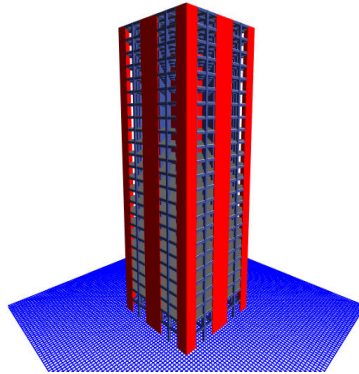
G+23 structure without floating column

MODEL-2 FLOATING COLUMN AT GROUND FLOOR



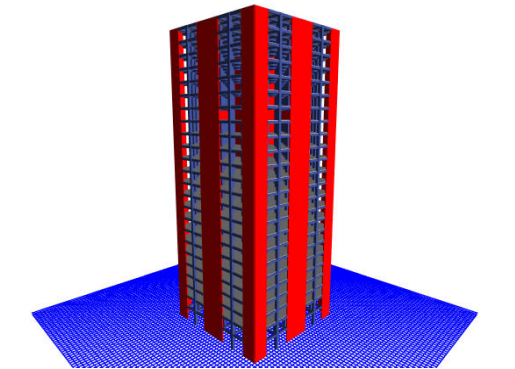
Floating column at ground floor

MODEL-3 FLOATING COLUMN AT 5TH AND 10TH FLOOR



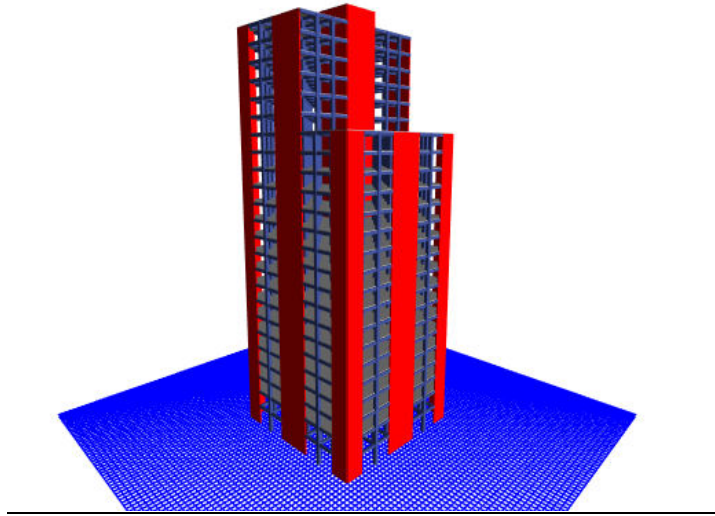
Floating column at 5th and 10th floor

MODEL-4 FLOATING COLUMN AT 8TH AND 16TH FLOOR



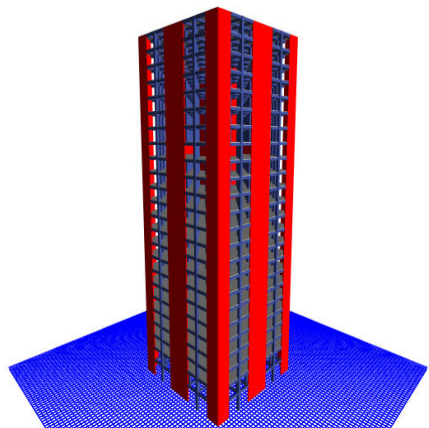
Floating column at 8th and 16th floor

MODEL-5 FLOATING COLUMN FROM 18TH FLOOR TO TERRACE



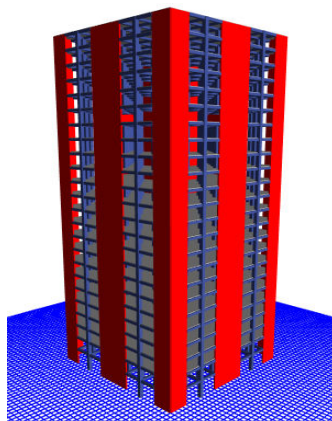
Floating column from 18th floor to terrace

MODEL-6 FLOATING COLUMN AT 5TH, 10TH,15TH,20TH FLOOR



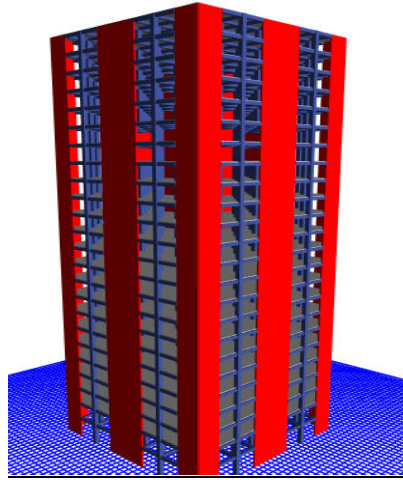
Floating column at 5th, 10th,15th,20th floor

MODEL-7 FLOATING COLUMN AT 8TH, 11TH,13TH,17TH FLOOR



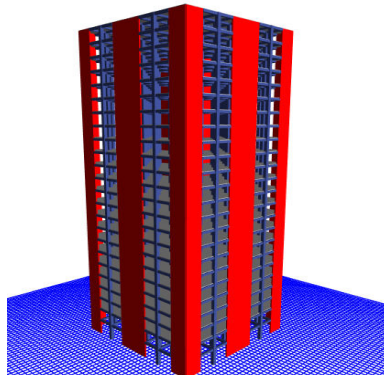
Floating column at 8th, 11th,13th,17th floor

MODEL-8 FLOATING COLUMN AT 9TH, 10TH, 16TH, 17TH FLOOR



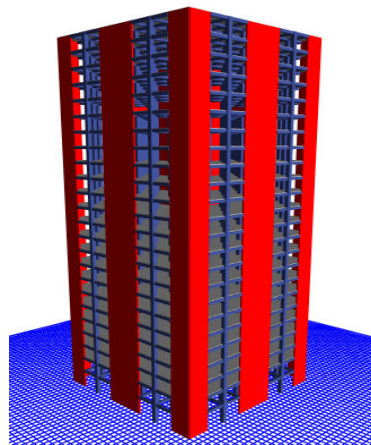
Floating column at 9th, 10th, 16th, 17th floor

MODEL-9 FLOATING COLUMN AT GF, 1ST, 2ND, 3RD FLOOR



Floating column at GF, 1st, 2nd, 3rd floor

MODEL-10 FLOATING COLUMN AT 6TH, 12TH, 18TH FLOOR



Floating column at 6th, 12th, 18th floor



GENERAL PARAMETERS

SR NO.	PARTICULAR	DIMENSION
1	Length of building	32(m)
2	Width of building	32 (m)
3	Height of building (G+23)	75 (m)
4	Bottom story height	4.5 (m)
5	Typical storey height	3 (m)
5	Live load on floor	2 KN / m ²
6	Floor finishing	1 KN / m ²
7	Thickness of slab	0.15 (m)
8	Zone -3	0.16
9	Beam	400*600 (mm)
10	Column	600*600 (mm)
11	Shear Wall Thickness	300 (mm)
12	Soil Type	Medium

Load Combination

- 1.5 (DL + EQX)
- 1.5 (DL + EQY)
- 1.2 (DL + LL+ EQX)
- 0.9 DL + 1.5 EQX

Where,

DL = Dead Load

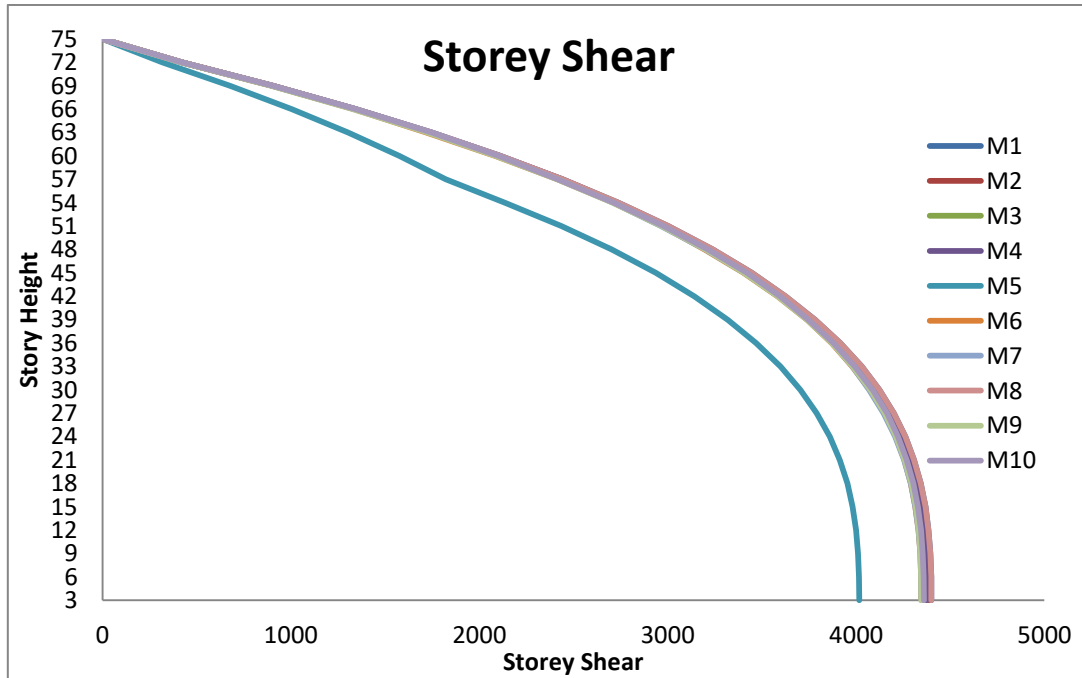
EQX = Earthquake Load on X-Axis

EQY = Earthquake Load on Y-Axis

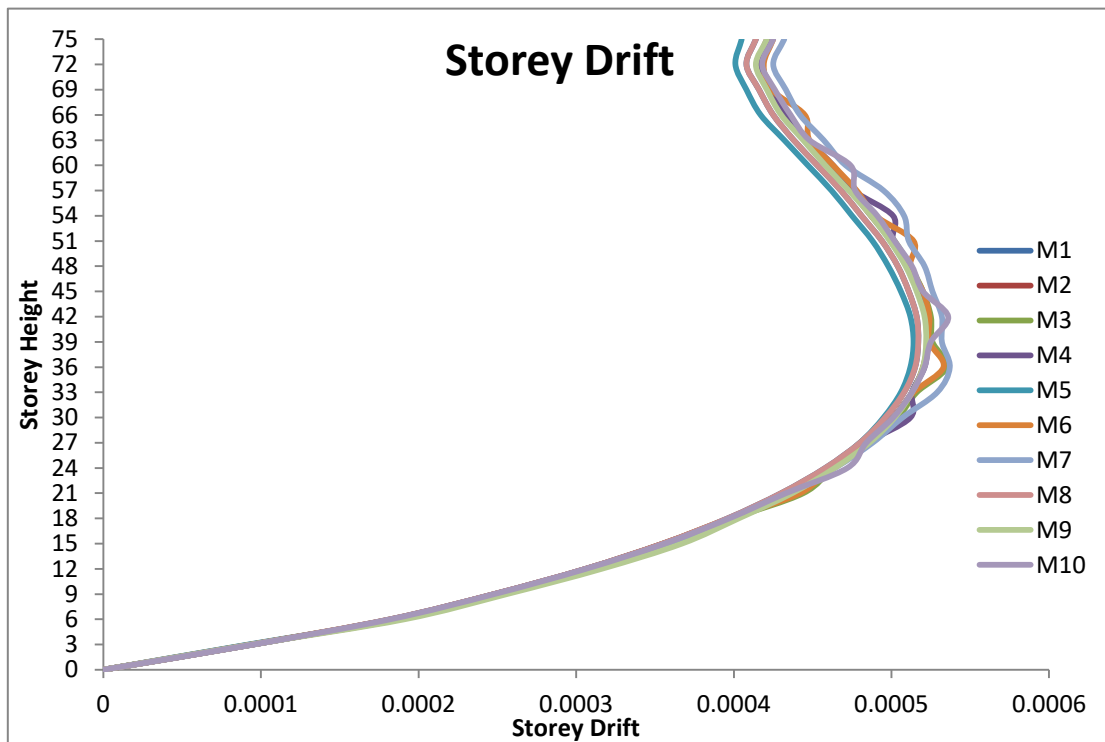
LL = Live Load

IV. RESULT

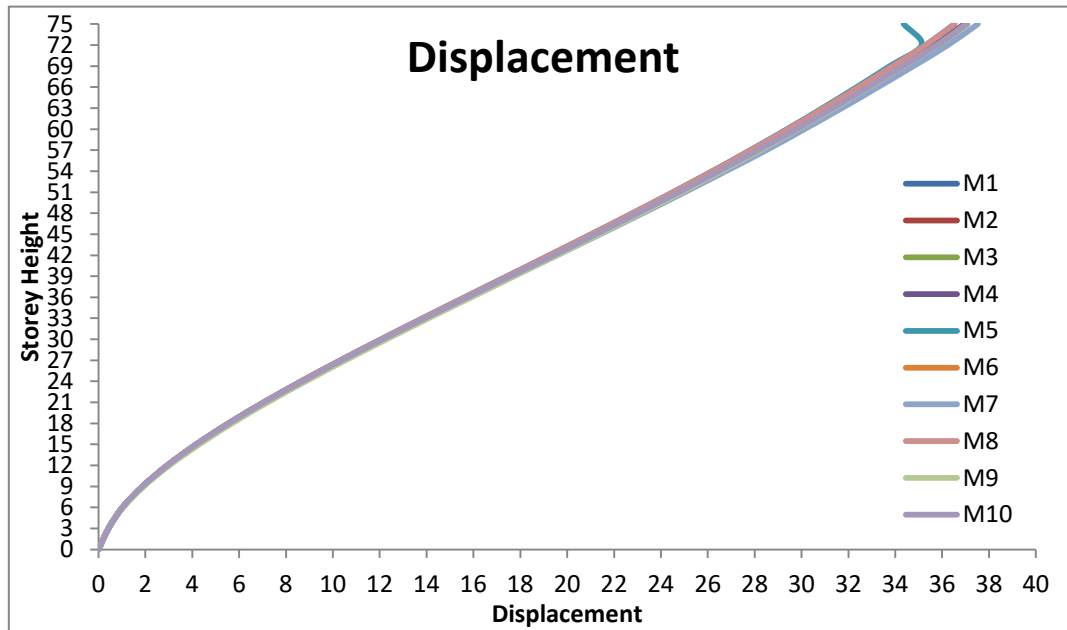
STOREY SHEAR



STOREY DRIFT



DISPLACEMENT



V. CONCLUSION

G+23 Building without and with different positions of floating column analysed in ETABS.

From above results for Base Shear:Model 1 has a value of base shear compare to 0.30% Model-2, 0.59% Model 3, 0.60% Model-4, 8.69% Model-5,1.21% Model-6, 1.21% Model-7, 0.00% Model-8, 1.21% Model-9 and 0.91% Model-10.The base shear of without floating column had higher values, but the difference between the values was comparatively less.

From above results for Storey Drift:The storey where floating columns were provided showed more lateral displacement between adjacent stories than non-floating columns. The stories where floating columns were not provided showed same storey drift.

From above results for Displacement:Model 1 has value of displacement compare to -1.17% Model-2, -1.51% Model 3, -1.20% Model-4, 5.94% Model-5, -1.41% Model-6, -2.73% Model-7, 0.00% Model-8, -1.41% Model-9 and -1.41% Model-10.There are more displacements of members in floating column buildings in seismic zones.The lateral displacement i.e., storey drift of floating column building is eventually more but does not affect stability of structure.

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