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Seismic Analysis & Design of Multistory Building Using Etabs

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***Abstract*—E-tabs are mostly used to analyze concrete& steel structure, low& high rise buildings, skyscrapers& portal frames structure. In this project we had studied structural behavior of multi-story building (G+7) on E-tabs.**

***Index Terms*—E-tabs, SeismicAnalysis, Shearwall, Multistory Building.**

I. Introduction

ETABS issue, for analysis and design for building systems. ETABS features are contain powerful graphical interface coupled with unmatched modeling, analytical, and design procedures, all integrated using a common database. It is quick and very easy for simple structures. Itcan handle the largest and most complex building models. ETABS mainly offers following types of analysis:

(a)Linear

(b)Nonlinear

(c)Pushover Analysis

(d)PΔ Effect Analysis

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

The user must exactly understand the assumptions of the program and must independently verify the results. 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. The Creation of models has never been easy. - The AUTOCAD drawings can be converted directly into ETABS models &can easily analyze and design of building.

E-tabs can Design check of steel and concrete frames, composite beams, composite columns, steel joists, and concrete and masonry shear walls. 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.

II. Aim & objective

AIM OF THE STUDY: Theaim of this project is to analyze & design of multi-story building using E-tabs.
OBJECTIVES:The main objectives of the project are:

- The objective of this project is to check& design of the seismic response of multi-storied building using Etabs.
- Another object is to analysis of forces, bending moment, stress, strain &deformation or deflection for a complex structural system.
- To make the building earthquake resistant against seismic effect.
- To analysis story drift, displacement, shear, story stiffness model period & frequency on different floor.

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III. REVIEW OF LITERATURE

3.1LITERATURE

- **MR. ABHAYGULERIA [1]** has done the work on this paper. Etabs is commonly used to analyze: skyscrapers, parking garages, steel & concrete structures, low and high rise buildings, and portal frame structures. The case study in this paper mainly emphasizes on structural behavior of multi-storey building for different plan configurations like rectangular, c, l and I-shape. Modeling of 15- story R.c.c. framed building is done on the Etabs software for analysis. Post analysis of the structure, maximum shear forces, bending moments, and maximum storey displacement are computed and then compared for all the analyzed cases.

- **MR.RAGHUNANDAN M H &MRS. SUMA DEVI [2]** has done the work on this paper. In this study they used e-tabs nonlinear software for simulation of adjacent multi-storeyed Rc frame buildings of 15-story and 10-story, the provisions that may reduce the effects of pounding like the separation distance, addition of shear walls, lateral bracings and variation in storey height of the buildings have been considered for analysis. And the responses by considering both fixed base and base-isolated conditions are arrived.

- **PROF. KISHORE CHANDRA BISWAL& PROF A VASHA [3]** have done the work on it. Now a day's buildings with floating column is a typical feature in construction in urban India. This study light on the importance of 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 page and time duration factor constant. The time history of floor displacement, drift, base shear, and overturning moment is computed for both the frames with and without floating column by using Etabs.

IV. DESIGN & ANALYSIS

4.1 LAYOUT OF STRUCTURE:

4.1.1 FRAME STRUCTURE:

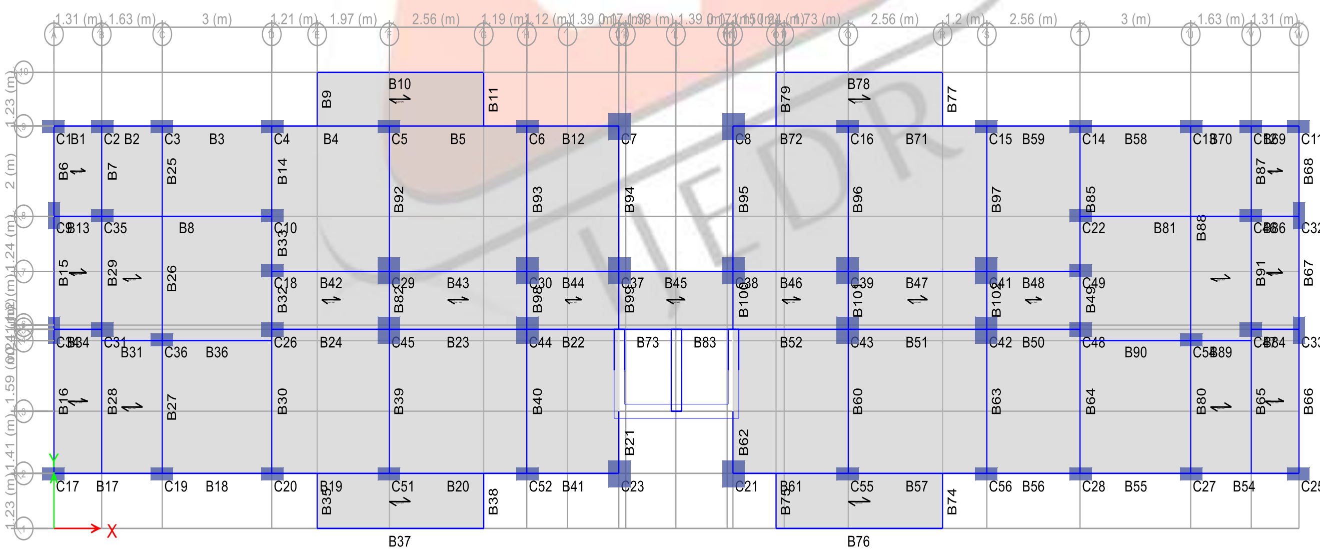

Figure1Plan

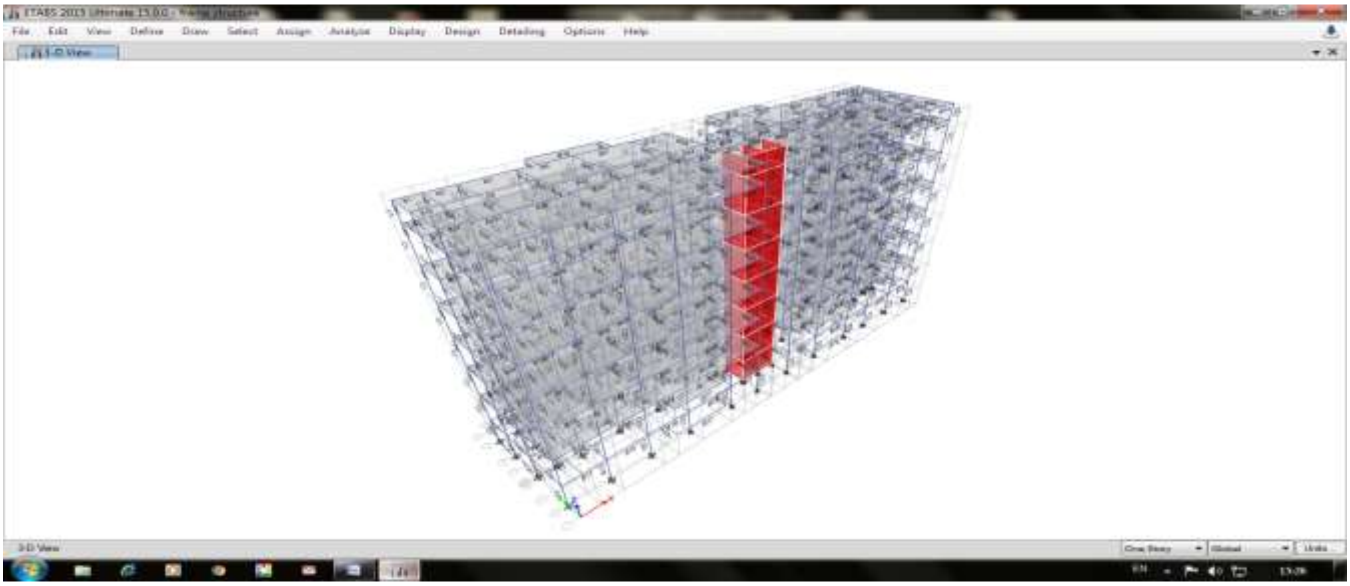

Figure2 3D View

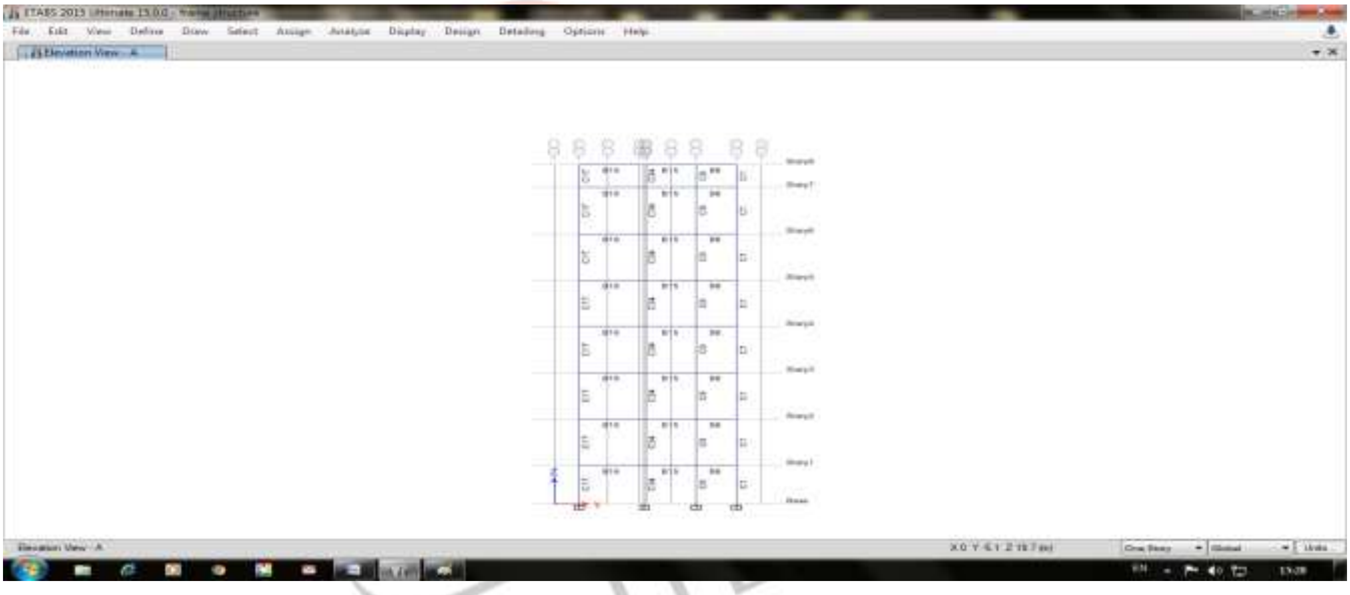

Figure3 Elevation

4.1.2. SHEAR WALL STRUCTURE:

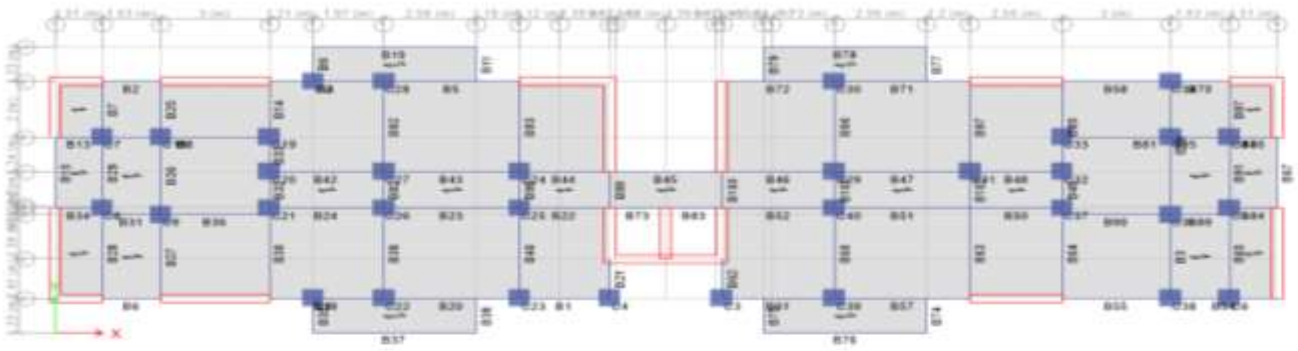

Figure4 Plan

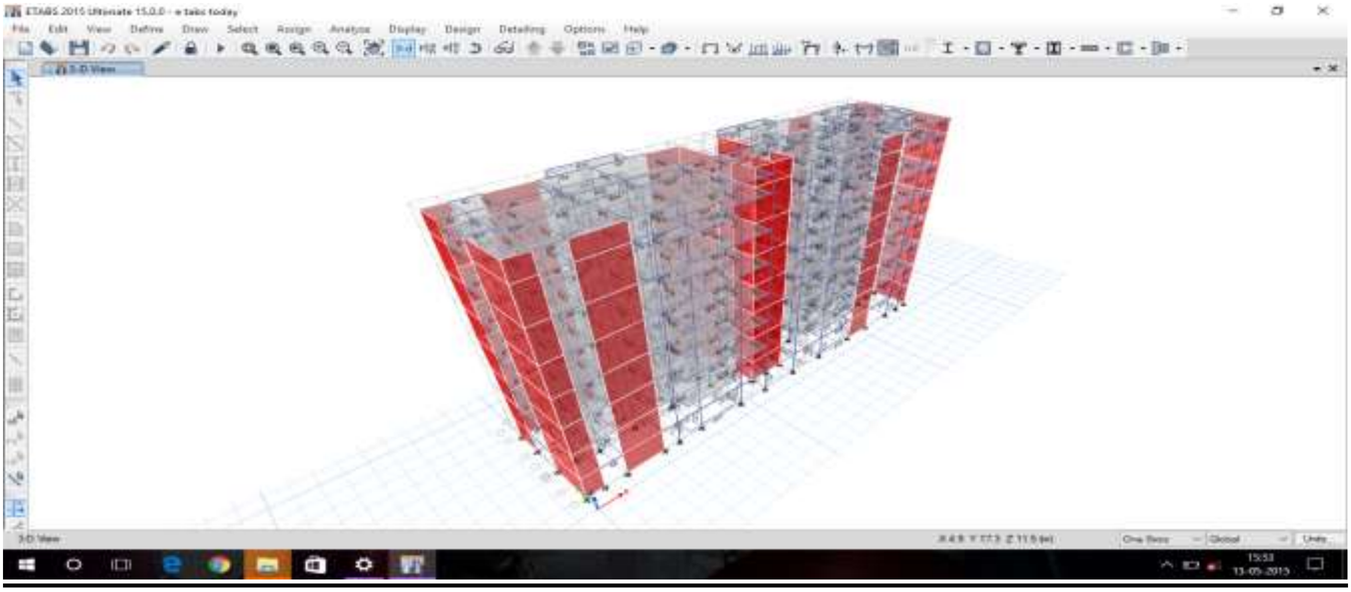

Figure43D View

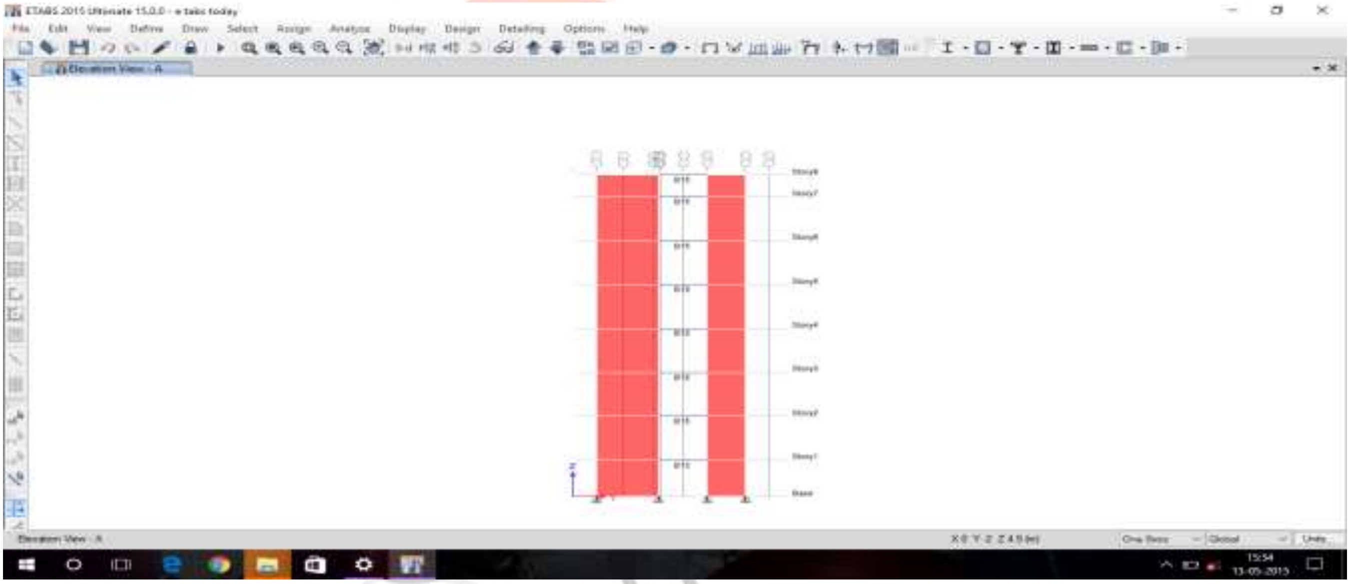

Figure5 Elevation

4.2GENERAL DATA:

4.2.1. FRAME STRUCTURE DATA:

Table 1General dimension of frame structure

SR NO.	PARTICULAR	DIMENSION
1	Length of building	33.87(M)
2	Width of building	10.87(M)
3	Height of building	22(M)
4	Typical story height	3(M)

5	Top story height	1.5(M)
6	Bottom story height	2.5(M)
7	Live load on floor	3 KN/M^2
8	Wall load	2.3KN/M
9	Live load on roof	1.5 KN/M^2
10	Floor finishing	1KN/M^2
11	Water proofing load	1 KN/M^2
12	Density of concrete	25 KN/M^2
13	Density of wall	10 KN/M^2
14	Grade of concrete	M25 KN/M^3
15	Grade of steel	HYSD500
16	Thickness of slab	0.15(M)
17	Zone 3	Z.F.= 0.16

Table2 Dimension of structural member residential building (beam)

SR.NO	ELEMENTS	PROPERTY(M)
1	Main beam	0.4 X 0.5

Table 3 Dimension of structural member residential building (column)

SR.NO	ELEMENTS	PROPERTY(M)
1	Main Column	0.3 X 0.6
2	Secondary column1	0.3X0.4
3	Secondary column2	0.6X0.6

Table 4 Dimension of slab

SR.NO	ELEMENTS	PROPERTY(M)
1	Slab 1way	0.15
2	Slab2way	0.15

4.2.2. SHEAR WALL STRUCTURE DATA:

Table 5 General dimension of shear structure

SR NO.	PARTICULAR	DIMENSION
1	Length of building	33.87(M)

2	Width of building	10.87(M)
3	Height of building	22(M)
4	Typical story height	3(M)
5	Top story height	1.5(M)
6	Bottom story height	2.5(M)
7	Live load on floor	3 KN/M^2
8	Wall load	2.3KN/M
9	Live load on roof	1.5 KN/M^2
10	Floor finishing	$1KN/M^2$
11	Water proofing load	1 KN/M^2
12	Density of concrete	25 KN/M^3
13	Density of wall	10 KN/M^3
14	Grade of concrete	M25
15	Grade of steel	HYSD500
16	Thickness of slab	0.15(M)
17	Thickness of shear wall	0.3 (M)
18	Zone 3	Z.F.= 0.16

Table 6Dimension of shear structural member residential building (beam)

SR.NO	ELEMENTS	PROPERTY(M)
1	Main beam	0.5 X 0.6

Table 7Dimension of shear structural member residential building (column)

SR.NO	ELEMENTS	PROPERTY(M)
1	Main Column	0.6 X 0.6

Table 8Dimension of slab

SR.NO	ELEMENTS	PROPERTY(M)
1	Slab 1way	0.15
2	Slab2way	0.15

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4.4 RUN ANALYSIS:
4.4.1. FRAME STRUCTURE:

- For run analysis go to analyzerunanalysis →

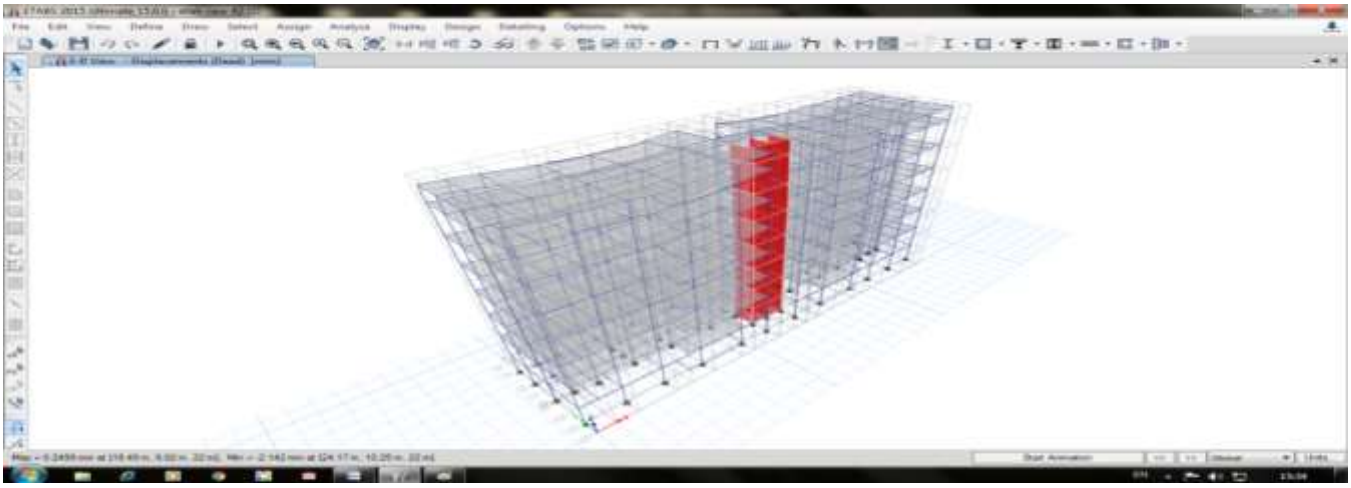

Figure7 Displacement due to shaking

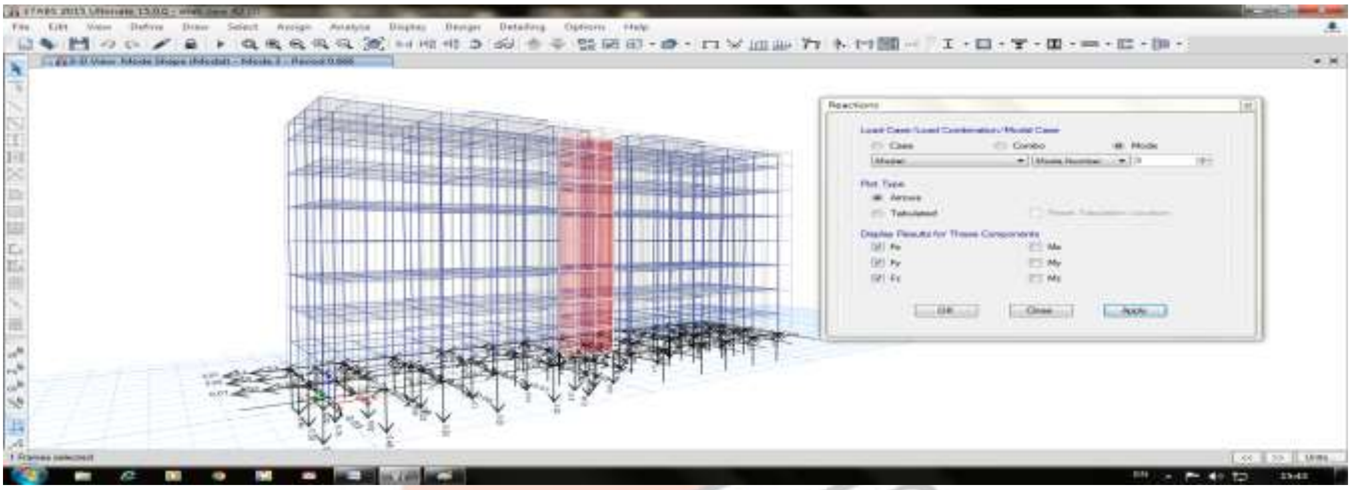

Figure 8 Support reaction

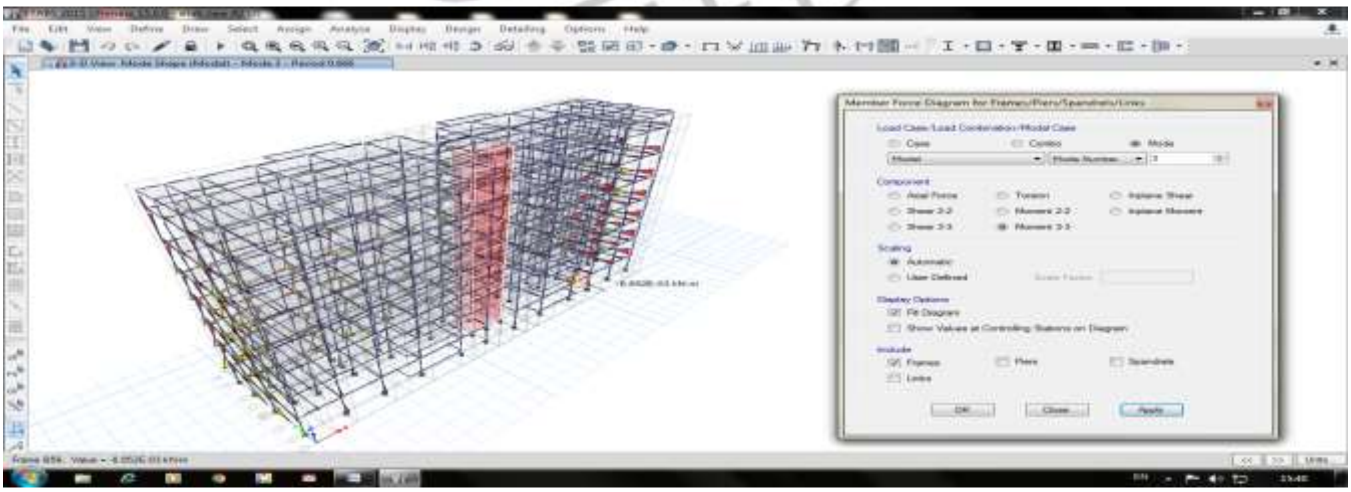

Figure 9 Member force dia. for frames

4.4.2. SHEAR STRUCTURE:

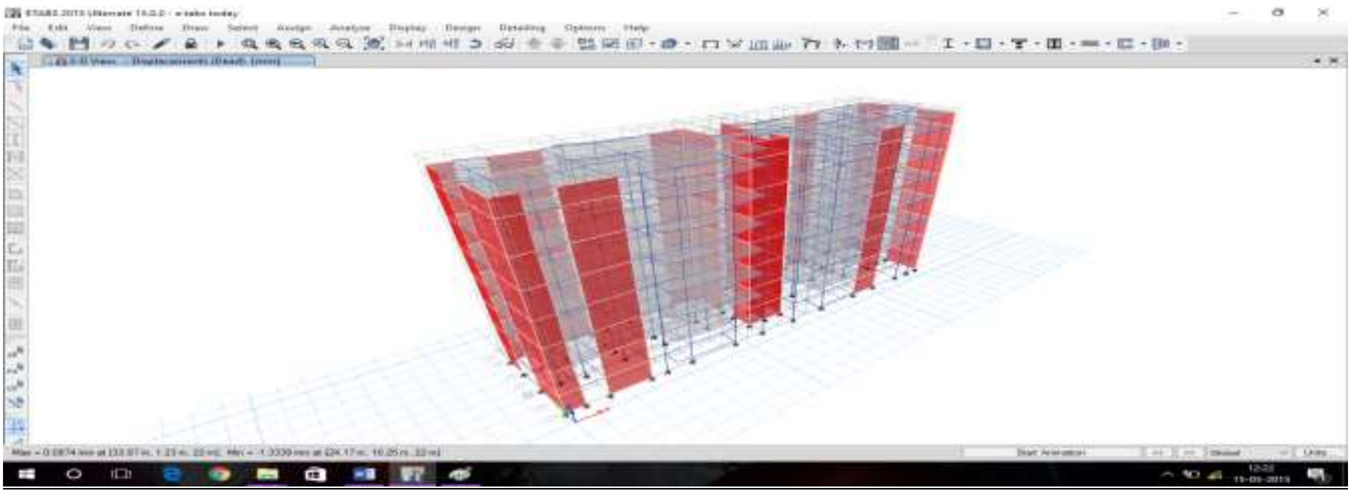

Figure 10Displacement due to shaking

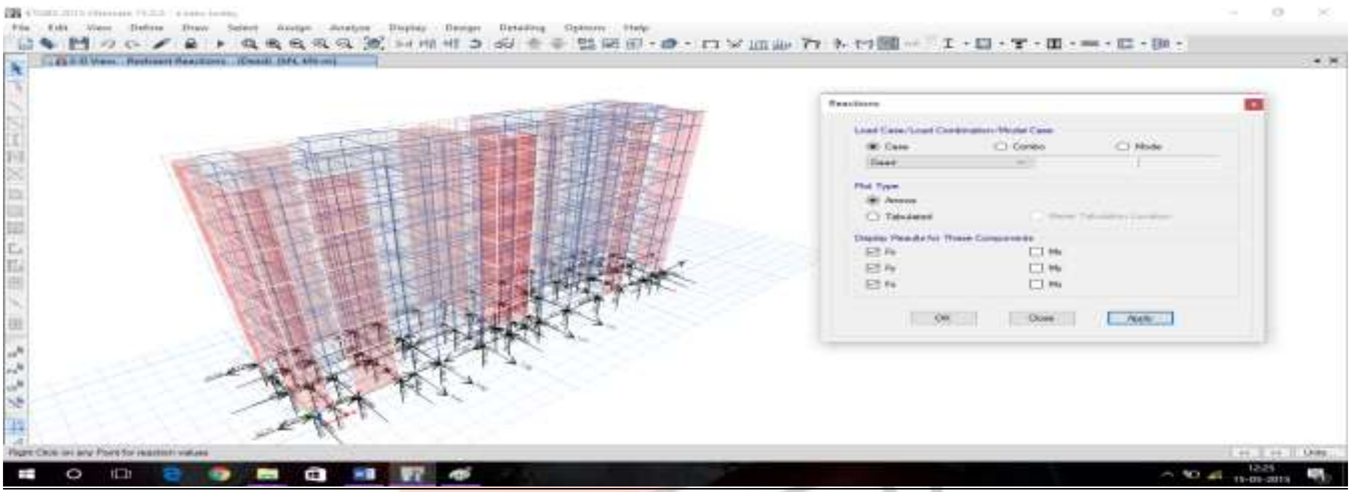

Figure 11 Support reaction

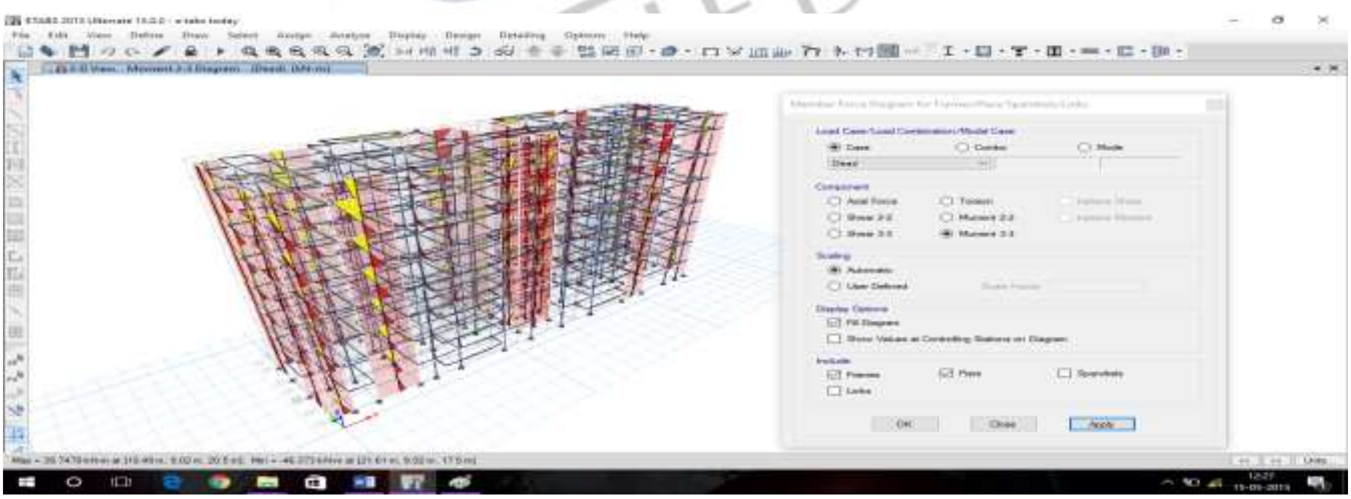

Figure 12 Member force diagram

V. RESULT

5.1 ANALYSISRESULTS OF FRAME STRUCTURE

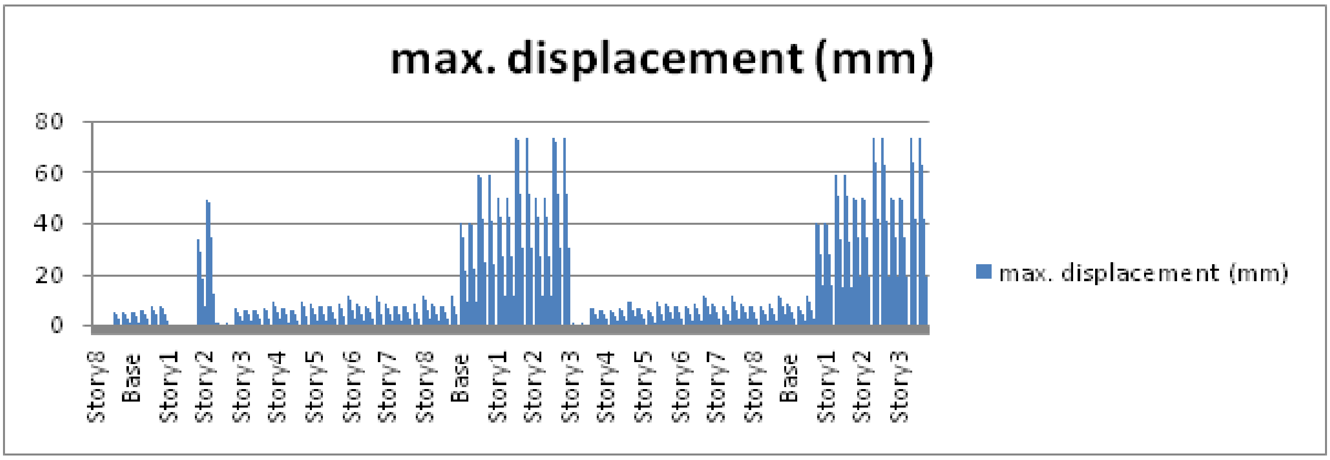

Figure 13Maximum displacement

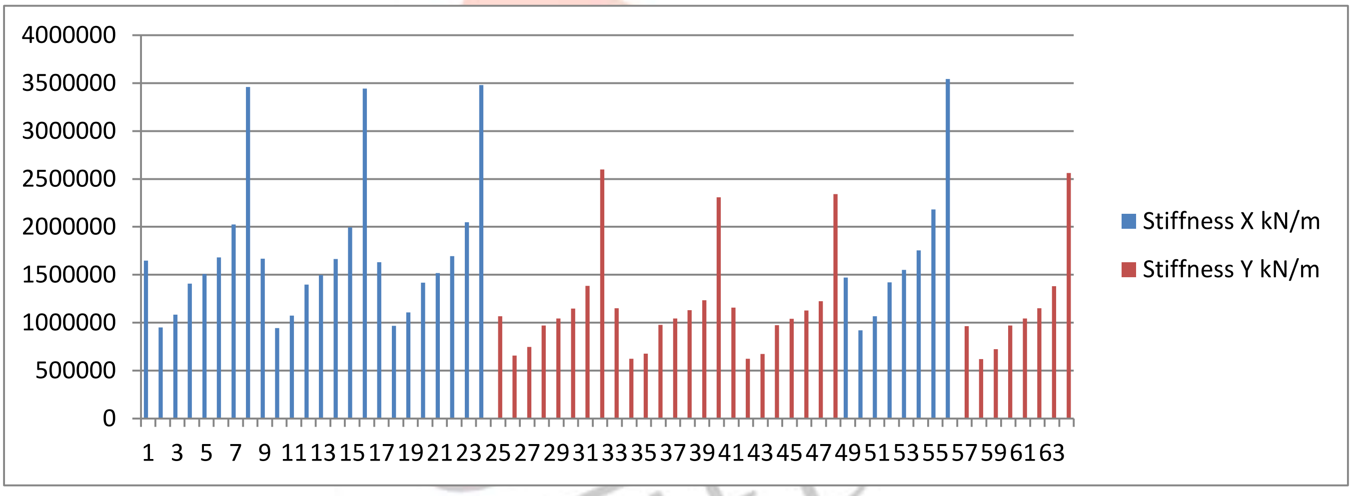

Figure 14Maximum story stiffness

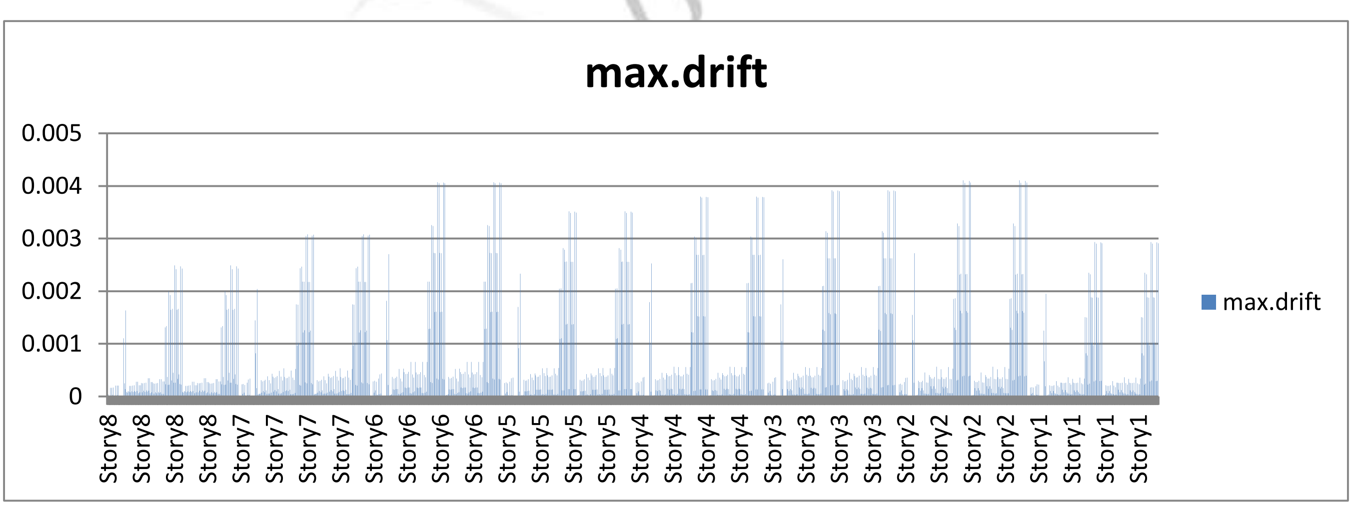

Figure 15Maximum drift

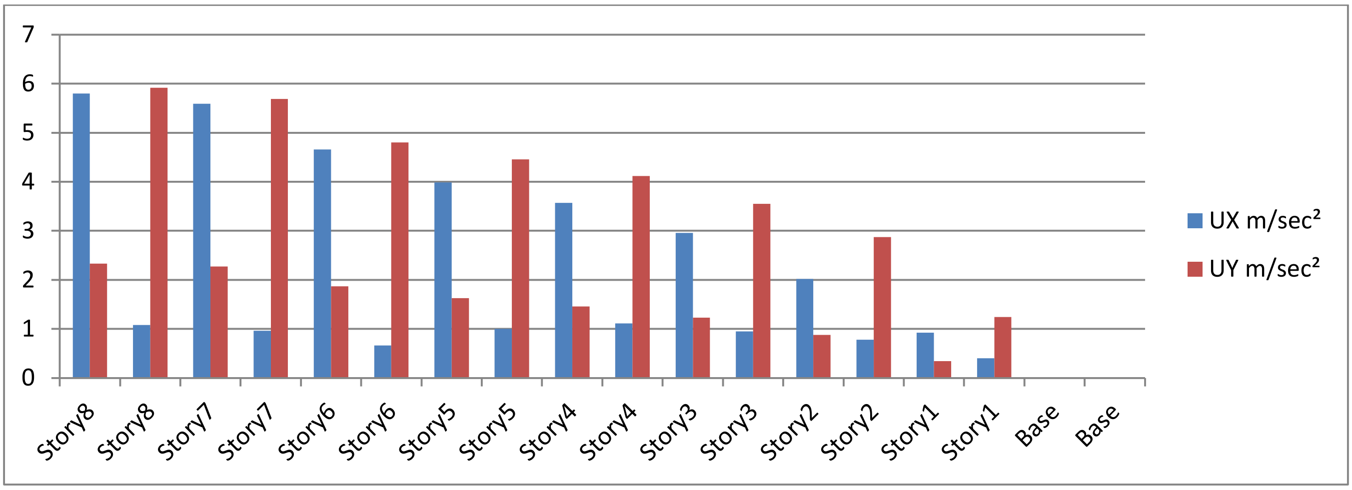

Figure 16Story acceleration

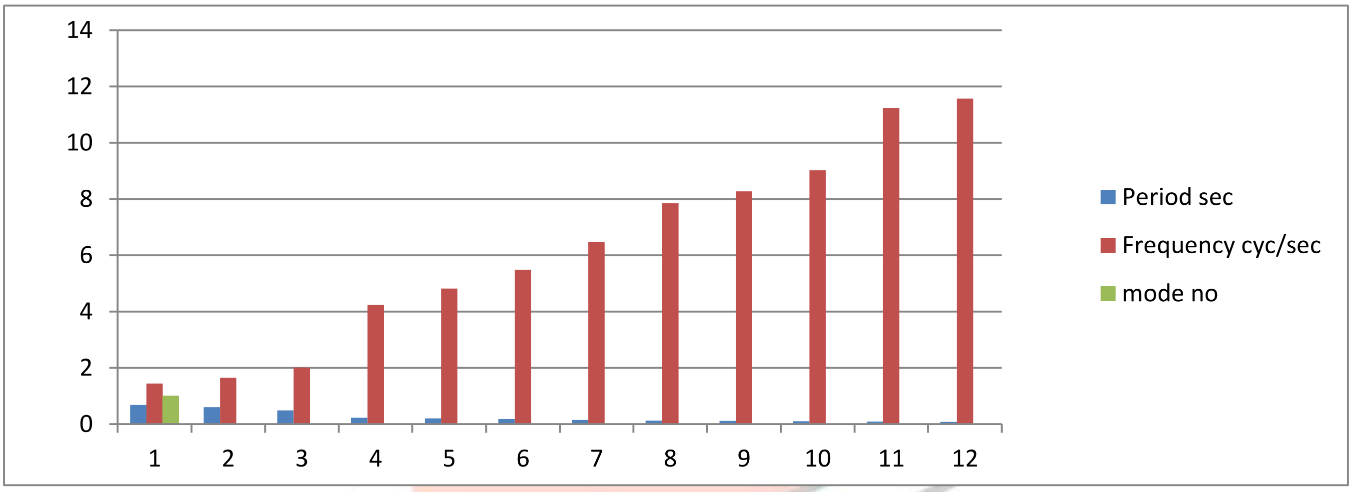

Figure 17Model period & frequency

5.2ANALYSISRESULTS OF SHEAR STRUCTURE

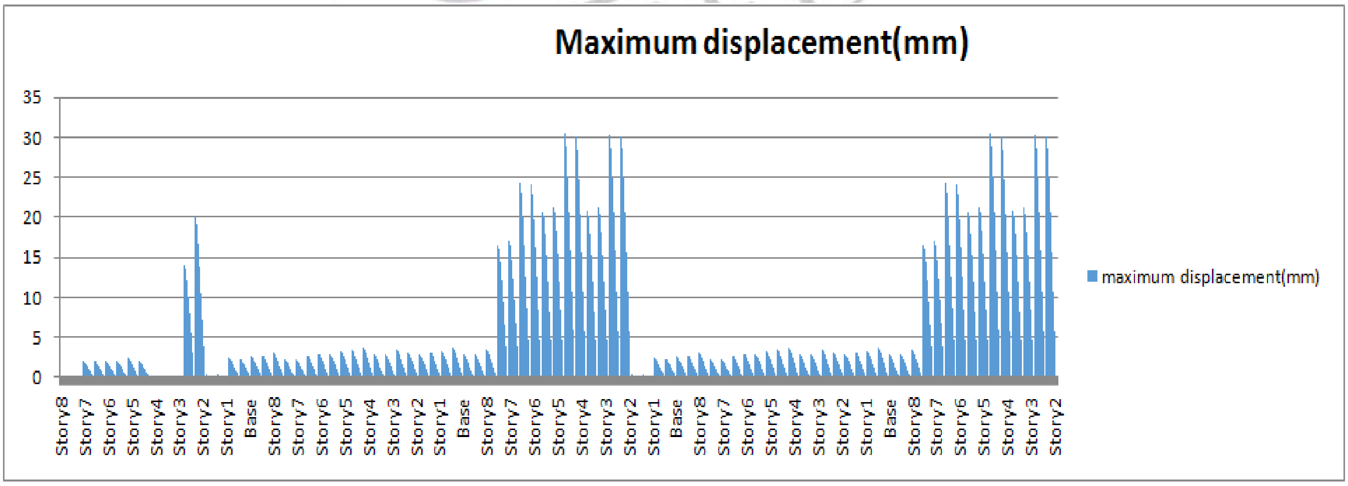

Figure 18 Maximum displacement

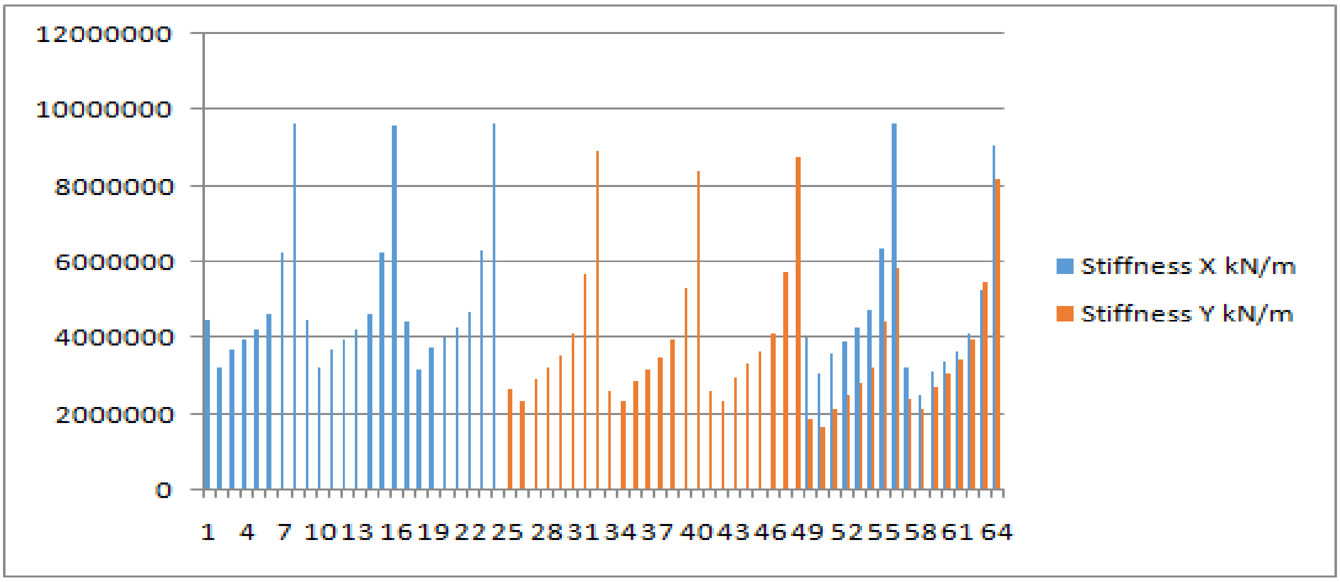

Figure 19 Maximum story stiffness

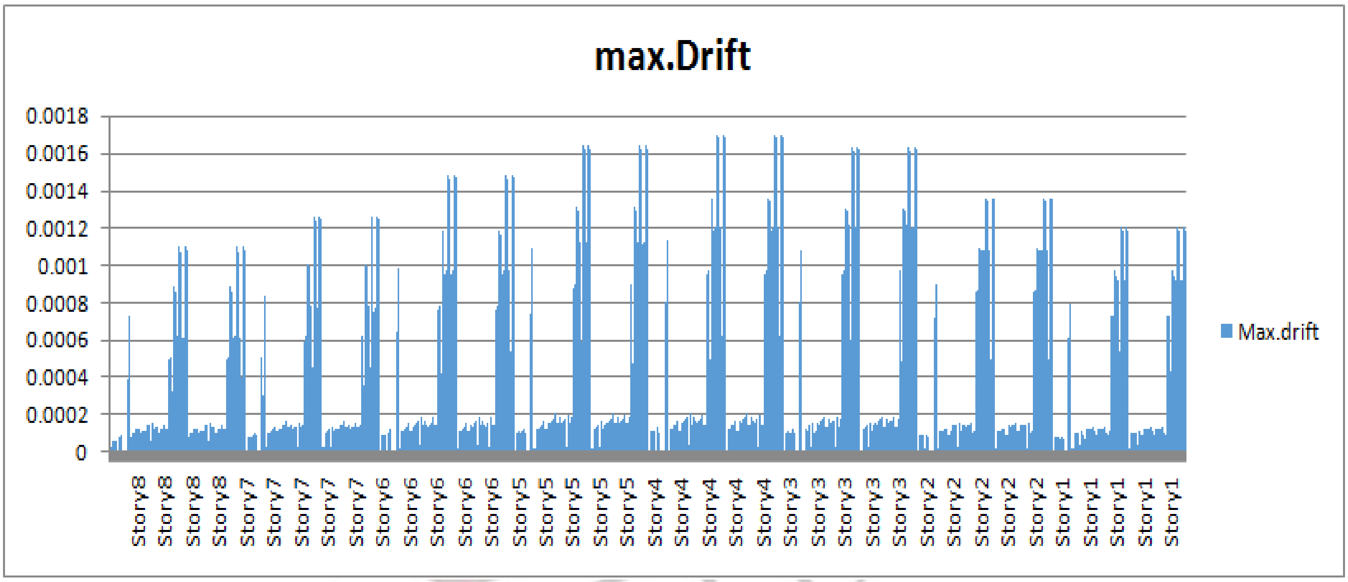

Figure 20 Story drift

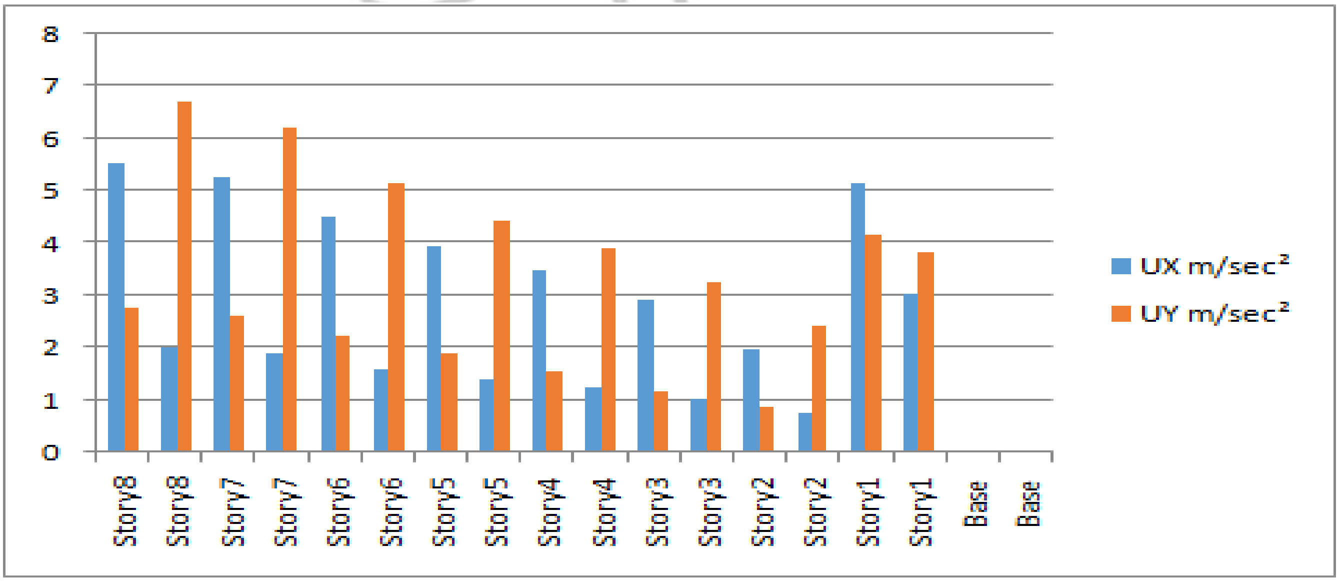

Figure 21Story acceleration

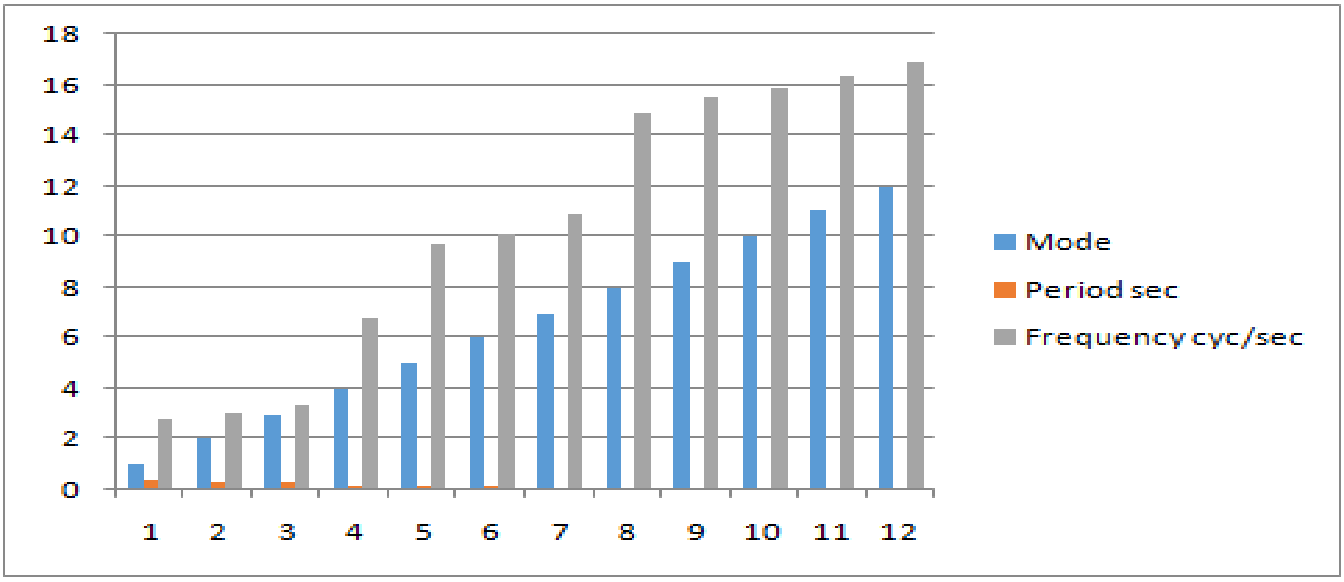

Figure 22 Model period & frequency

V. CONCLUSION

- The displacement is decreased in shear wall structure as compared to frame structure
- The story stiffness is more in shear structure than the frame structure.
- The story drift is decreased in shear wall structure than the frame structure.
- The modal period and frequency is less in frame structure & more in shear wall structure.
- The story acceleration is more in shear structure than the frame structure.
- From this analysis and design we can conclude that the performance of shear structure is batter then the frame structure.
- The cost of the frame structure may be less than the shear structure
- The shear structure is suitable in earthquake prone area due to its higher stiffness & less displacement.

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