Solid State Technology
Volume: 63 Issue: 2s
Publication Year: 2020

Analysis Of Multi Storeyed Building Under Gravitational And Time Varying Loading Conditions

Naamani Gopinath[1], Mr. K. Vamshi Krishna[2]

[1] M. Tech Student, Malla Reddy Engineering College (Autonomous), Maisammaguda, Medchal(M), Malkajgiri(D), Hyderabad 500100

[2]Assistant Professor, Malla Reddy Engineering College (Autonomous), Maisammaguda, Medchal(M), Malkajgiri(D), Hyderabad 500100

Abstract-Examination of structures for static loads is a standard undertaking these days in view of accessibility of specific projects which can be utilized for the investigation. Then again, dynamic investigation is a tedious cycle and requires extra info identified with mass of the structure, and a comprehension of basic elements for understanding of systematic outcomes. Reinforced cement (RC) outline structures are most regular kind of developments in urban India, which are exposed to a few sorts of powers during their lifetime, for example, static powers because of dead and live loads, wind and dynamic loads because of the breeze and quake. In this study a private of G+7 multi-story building is read for earth quake loads utilizing ETABS. Accepting that material property is linear,under static and dynamic burdens investigation is performed. These non-straight investigation are done by considering serious seismic zones III and V and the conduct is evaluated by taking kind II soil condition. Distinctive reaction like story removals, story drifts,storey shears and story firmness are plotted to contemplate the conduct of the structure.

Keywords: Multi-storey building, static loads, dynamic loads, ETABS, storey displacements, storey drifts and storey shears.

I. INTRODUCTION

Nowadays seismic tremors has gotten successive in the nature because of a few reasons, here we don't examine about the reasons of quake rather our subject is the way to with stand the seismic tremor loads on the structures or structures. This turns into the significant measures for us, as the tremors are getting very basic to us planning the structure or dissecting the structures by and large customary arrangement utilizing the static loads, for example, live burden, dead burden and so forth., we can't plan a more secure structure particularly on account of high raised structure it is on the grounds that in high raised structure there will be wind pressure on the structure at more prominent greatness which changes time to time contingent on the force, speed and bearing of wind i.e., dynamic in nature comparably to

earth shake stacks to withstand these kind of burdens, static strategies are insufficient and consequently we go for dynamic examination and we model the necessary structure utilizing ETABS programming and investigate the structure in the ETABS utilizing the reaction spectra technique.

II. BUILDING MODLING DETAILS

Building of 7 storey's with plan area 24 mx 24 m is analyzed in ETABS V16.2.1.0 package to determine dynamic control of the those buildings. Wind and earthquake parameters for analysis are taken and dynamic analysis is performed as per IS: 1893-2002 code. Analysis is performed to find storey displacement; storey drift and storey shear for the structure. General description of the Building is tabulated in tables below

Table 1: DETAILS OF THE BUILDING

S. No	**Details of the building**	
i)	Structure	OMRF
ii)	Number of stories	G+7
iii)	Type of building	Regular and Symmetrical in plan
iv)	Height of the building	21 m
v)	Support	Fixed
vi)	Seismic zones	III and V

Table 2: MATERIAL PROPERTIES

S. No	**Material properties**	
i)	Grade of concrete	M30
ii)	Grade of steel	Fe415
iii)	Density of reinforced concrete	25 kN/m^3

iv)	Young's modulus of M30 concrete, E_c	27386.13 kN/m^2
v)	Poissions ration, μ_c	0.2
vi)	Young's modulus steel, E_s	2 x 10^8 kN/m^2

Table 3: TYPES OF LOADS CONSIDERED FOR MODELING

S. No	**Type of Loads & their intensities**	
i)	Floor finish	1.5 kN/m^2
ii)	Live load on floors	5 kN/m^2
iii)	External wall load on beams	11.5 kN/m^2
iv)	Internal wall load on beams	5.27 kN/ m^2

Table 4: SEISMIC PROPERTIES

S. No	**Seismic Properties**	
i)	Zones III and V	0.16 and 0.36
ii)	Importance factor (I)	1
iii)	Response reduction factor (R)	5%
iv)	Soil type	II
v)	Damping ratio	0.05
vi)	Wind Speed - Zone III	39 m/sec

vii)	Wind coefficients	
	Terrain category	2
	Risk coefficient	1
	Topography	1

Table 5: MEMBER PROPERTIES

S. No	Member Properties	No. of stories	Grade	Section sizes (mm)
i)	Column	ALL	M30	900 x 900
ii)	Beam	ALL	M30	600 x 450
iii)	Slab	ALL	M 30	175

In the present study, 7 storied reinforced concrete structures is considered. The modeled structure is situated in earthquake zone III and V of India having medium stiff soil is considered. Plan and 3D view of the structures is shown in Figure 1.

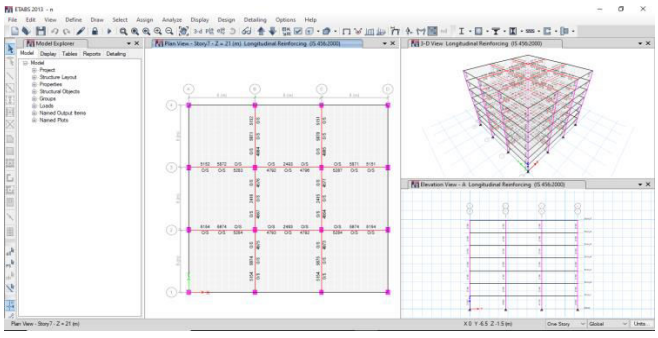

Figure 1: Model developed in ETABS Software

III. RESULTS AND ANALYSIS

A. *Story Displacement*

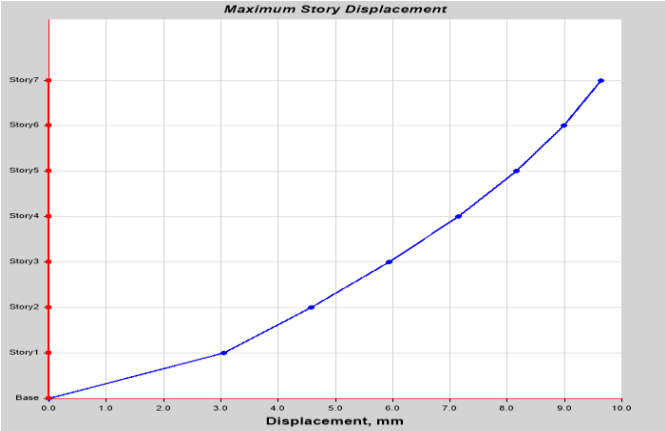

Figure 2: Story displacements of the structure in zone III for EQ X

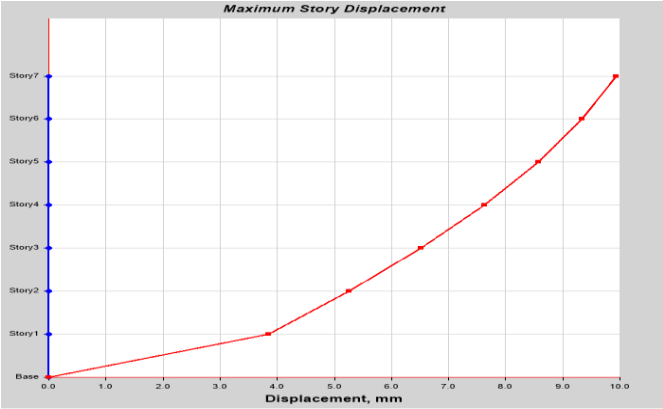

Figure 3: Story displacements of the structure in zone III for EQ Y

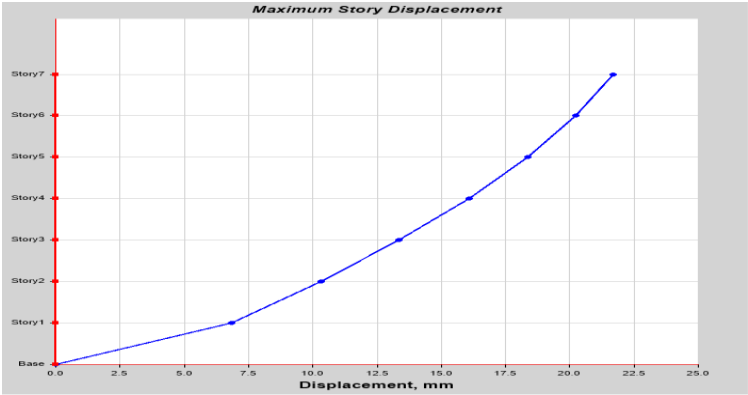

Figure 4: Story displacements of the structure in zone V for EQ X

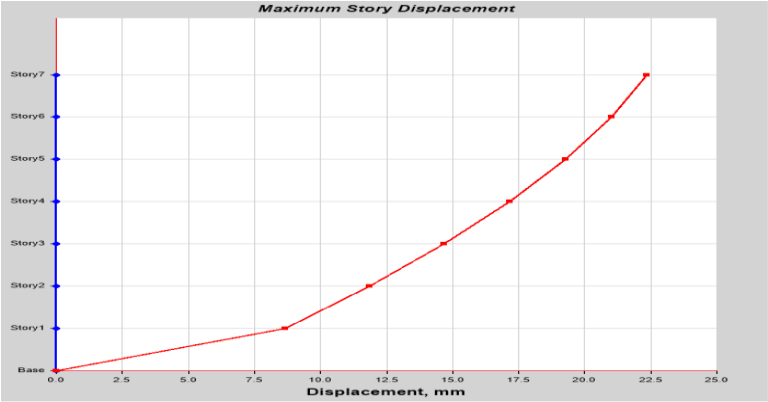

Figure 5: Story displacements of the structure in zone V for EQ Y

B. Story drifts

Table 6: STORY DRIFT IN ZONE III

Story	Elevation m	Location	For EQ X		For EQ Y	
			X-Dir	Y-Dir	X-Dir	Y-Dir
Story7	21	Top	0.000213	3.917E-08	3.619E-08	0.000197
Story6	18	Top	0.000276	1.386E-07	1.28E-07	0.000255
Story5	15	Top	0.000342	1.046E-07	9.643E-08	0.000316
Story4	12	Top	0.0004	1.035E-07	9.827E-08	0.00037
Story3	9	Top	0.000454	8.686E-08	8.396E-08	0.000419
Story2	6	Top	0.000514	4.327E-07	4.244E-07	0.000475
Story1	3	Top	0.001015	3.774E-07	3.673E-07	0.001282
Base	0	Top	0	0	0	0

Table 7: STORY DRIFT IN ZONE V

Story	Elevation m	Location	For EQ X		For EQ Y	
			X-Dir	Y-Dir	X-Dir	Y-Dir
Story7	21	Top	0.00048	8.814E-08	8.144E-08	0.000443

Story6	18	Top	0.000621	3.119E-07	2.879E-07	0.000574
Story5	15	Top	0.000769	2.354E-07	2.17E-07	0.00071
Story4	12	Top	0.0009	2.328E-07	2.211E-07	0.000832
Story3	9	Top	0.001021	1.954E-07	1.889E-07	0.000943
Story2	6	Top	0.001156	0.000001	0.000001	0.001069
Story1	3	Top	0.002285	0.000001	0.000001	0.002884
Base	0	Top	0	0	0	0

C. Story shear

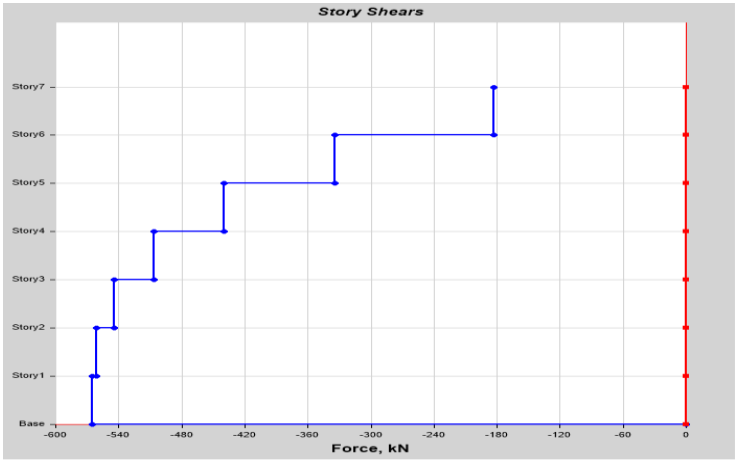

Figure 6: Story shears of the structure in zone III for EQ X

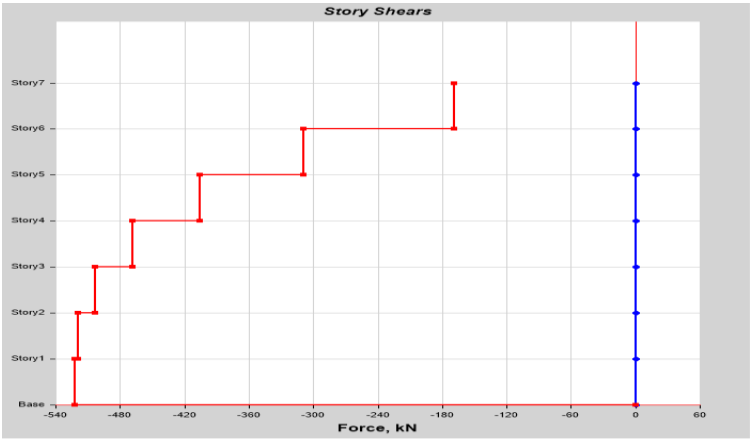

Figure 7: Story shears of the structure in zone III for EQ Y

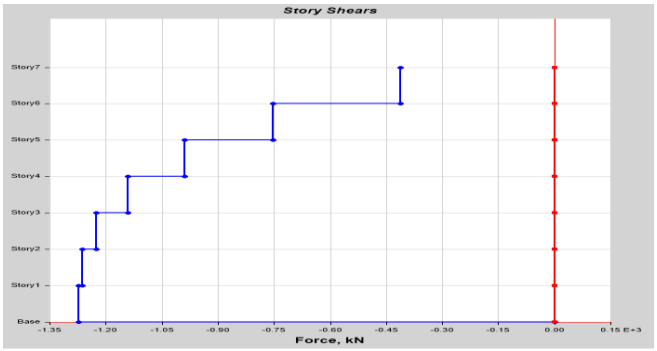

Figure 8: Story shears of the structure in zone V for EQ X

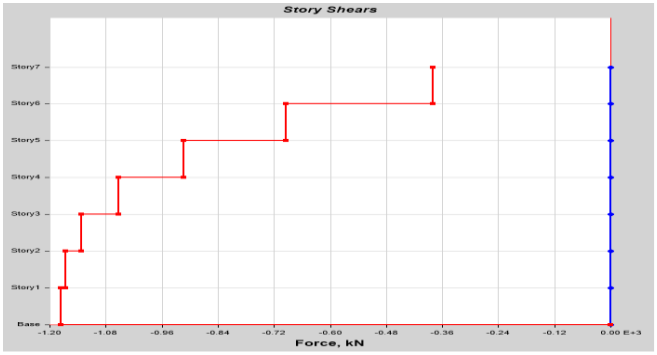

Figure 9: Story shears of the structure in zone V for EQ Y

D. Story Stiffness

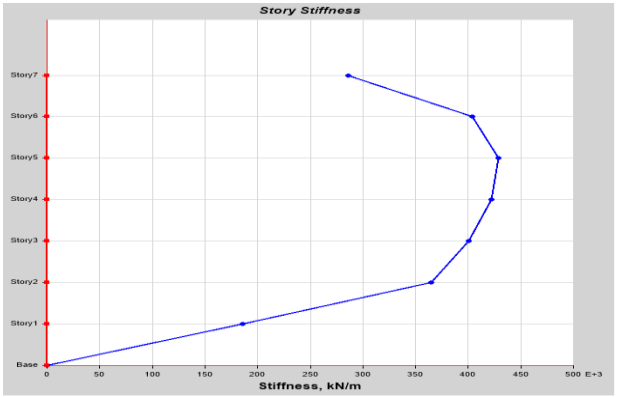

Figure 10: Story stiffness values of the structure in zone III for EQ X

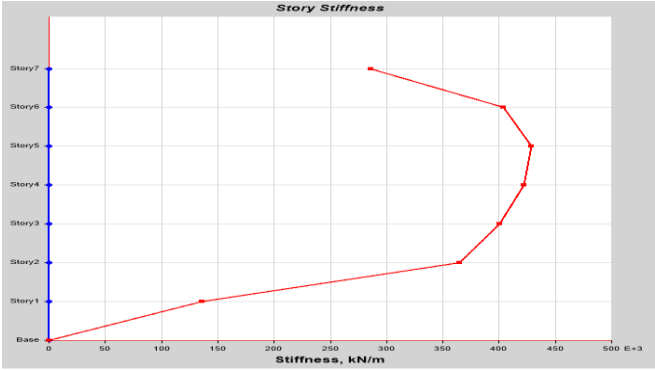

Figure 11: Story stiffness values of the structure in zone III for EQ Y

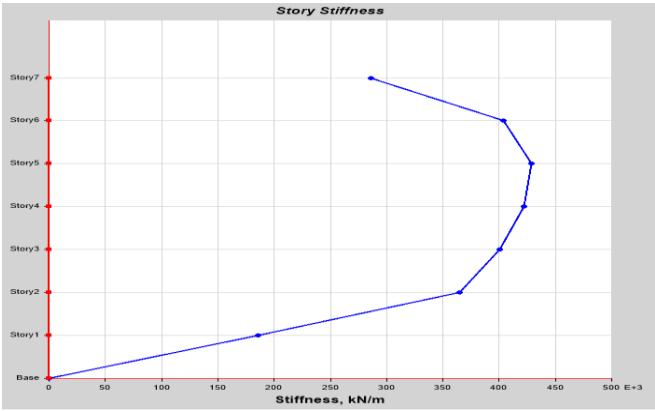

Figure 12: Story stiffness values of the structure in zone V for EQ X

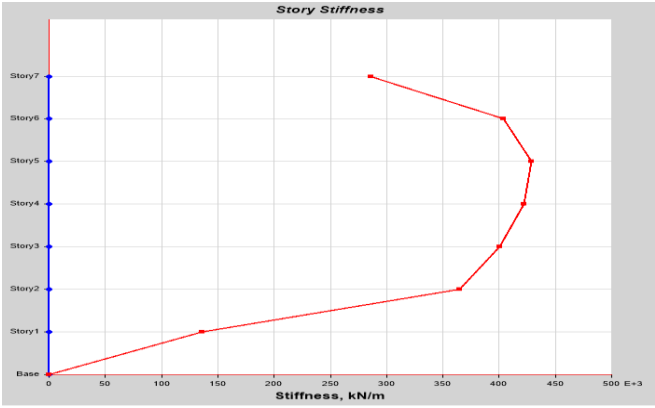

Figure 13: Story stiffness values of the structure in zone V for EQ Y

E. Lateral Loads

Table 8: COMPARISON OF LATERAL LOADS IN ZONE III

Story	Elevation m	Location	For EQ X		For EQ Y	
			X-Dir kN	Y-Dir kN	X-Dir kN	Y-Dir kN

Story7	21	Top	182.756	0	0	168.8592
Story6	18	Top	151.4593	0	0	139.9423
Story5	15	Top	105.1801	0	0	97.1822
Story4	12	Top	67.3152	0	0	62.1966
Story3	9	Top	37.8648	0	0	34.9856
Story2	6	Top	16.8288	0	0	15.5491
Story1	3	Top	3.9486	0	0	3.6483
Base	0	Top	0	0	0	0

Table 9: COMPARISON OF LATERAL LOADS IN ZONE V

Story	**Elevation m**	**Location**	**For EQ X**		**For EQ Y**	
			X-Dir kN	**Y-Dir kN**	**X-Dir kN**	**Y-Dir kN**
Story7	21	Top	411.201	0	0	379.9333
Story6	18	Top	340.7834	0	0	314.8702
Story5	15	Top	236.6551	0	0	218.6599
Story4	12	Top	151.4593	0	0	139.9423
Story3	9	Top	85.1958	0	0	78.7176
Story2	6	Top	37.8648	0	0	34.9856
Story1	3	Top	8.8843	0	0	8.2087
Base	0	Top	0	0	0	0

IV CONCLSIONS

- Displacement in Y-course increments regarding X-heading. Most extreme uprooting in X-heading is 9.633 mm and Y-course is 9.932mm is happened at 7thstorey in zone III. In zone V greatest relocation in X-bearing is 21.673 mm and Y-course is 22.346 mm is happened at seventh story.
- As no.of stories expands uprooting in Y-heading increments as for removal in X-course.
- Story floats in Y-heading increments as for X-bearing. Most extreme float in X-course is 1.015 x103and Y-bearing is 1.282 x 103 in zone III. In zone V most extreme float in X-bearing is 2.285 x 103 and Y-heading is 2.884 x 103.
- If quake load isn't considered for the investigation there will be opportunities for toppling this is one of the motivation to plan a structure to oppose both static and dynamic burdens.
- There is wonderful decline in story shears power as stories expanded. The story shears of structure increments as zone is expanding. Story shears in X-course are more than in Y-heading.
- Base responses are more in zone V than zone III for the structure under various burdens.
- Stiffness qualities are same in the two zones and the structure is stiffer in both the zones.
- Lateral burdens in X-course are more than in Y-bearing and as the zone builds parallel burden impact increments.

REFERENCES

[1]. Kirtan T and Jayaramappa N, "Similar investigation of multi-story RC outline with shear divider and hexagrid framework", Indian Journal of Research, Volume: 06, Issue: 01, January 2017, pp. 814-817, ISSN 2250-1991.

[2]. Jayesh Venkolath and Rahul Krishnan K, "Ideal diagrid edge of tall structures exposed to parallel burdens", International Research Journal of Engineering and Technology (IRJET), Volume: 03 Issue: 09, September 2016, (pp. 841-846).

[3]. Abhinav V, Sreenatha Reddy, Vasudeva Naidu and Madan Mohan, "Seismic examination of multi-story RC working with shear divider utilizing STAAD.Pro", International Journal of Innovative Technology and Research (IJITR), Volume: 4, Issue: 5, August 2016, pp. 3776-3779, ISSN 2320 – 5547.

[4]. Nandeesh K C and Geetha K, " Comparative investigation of hyperbolic roundabout diagrid steel structure restored at center with shear divider and steel supported edges", International Journal of examination in Engineering and innovation (IJRET), Volume: 05, Issue: 07, July 2016, pp. 317-323, eISSN: 2319-1163, p-ISSN: 2321-7308.

[5]. Md. Samdani Azad and Syed Hazni Abd Gani, "Similar investigation of seismic examination of multi-story structures with shear dividers and supporting frameworks", International Journal of Advanced Structures and Geotechnical Engineering (IJASGE), Volume: 05, Issue: 03, July 2016 pp. 72-77, ISSN 2319-5347.

[6]. Harshita Tripathi and Sarita Singla, "Diagrid auxiliary framework for RC encircled multi-story building", International Journal of Scientific and Engineering Research (IJSER), Volume: 7, Issue: 6, June 2016, pp. 356-362, ISSN 2229-5518.

[7]. Priyanka Soni, Purushottam Lal Tamarkar and Vikky Kumhar, "Auxiliary investigation of multi-story working of various shear dividers area and statures", International Journal of Engineering Trends and Technology (IJETT), Volume: 32, February 2016.

[8]. Shubham R Kasat, Sanket R Patil, Akshay S Raut and Shrikant R Bhuskade, "Relative investigation of multi-story working under the activity of shear divider utilizing ETAB programming", International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), 2016.

[9]. Alkuntel C V, Dhimate M V, Mahajan M B, Shevale S Y, Shinde S K and Raskar A, "Seismic examination of multi-story building having infill divider, shear divider and propping", Imperial Journal of Interdisciplinary Research (IJIR), Volume: 02, Issue: 06, 2016, pp. 1522-1524, ISSN: 2454-1362.

[10]. Saket Yadav and Vivek Garg, "Bit of leeway of steel diagrid working over traditional structure," International Journal of Civil and Structural Engineering Research (ISSN), Volume: 03, Issue: 01, September 2015, pp. 394-406.