



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 1, January 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Analysis of High Rise Structure (G+20) with Different Types of Bracings under the Effect of Wind and Earthquake using ETABS

Syed Ashraf Hussaini¹, Syed Jawid Hussain²

P.G. Student, Department of Civil Engineering, K.B.N College of Engineering, Gulbarga, Karnataka, India ¹

Professor, Department of Civil Engineering, K.B.N College of Engineering, Gulbarga, Karnataka, India ²

ABSTRACT: Presently a day, Bracings in steel structure are ordinarily utilized on the grounds that it can withstand parallel loads because of quake, wind, and so forth. It is outstanding amongst other technique for sidelong burden opposing frameworks. This framework gave to limit the horizontal diversion of structure.

This paper is for distinguishing the impact of various kinds of bracings at corners of the structure, and study the conduct of the G+20 structure under wind loading and seismic loading. The structure is analysis in Etabs 2015 and thinks about the boundaries, base shear, time period, story displacement and story drift.

I. INTRODUCTION

Wind is the progression of gases for a huge scope. On the outside of the earth, wind comprises of the mass development of air. In meteorology, winds are regularly alluded to as per their quality, and the course from which the breeze is blowing. Short explosions of fast wind are named blasts. As the breeze surge towards a structure, the subsequent power seeking after on the heights is known as the 'wind load'. The structure's basic plan must expend wind powers cautiously and precisely and migration them to the base in structure to sidestep auxiliary fall flat. While examining tall structures by utilizing wind designing, wind discovered to be the amazing burden and is for the most part a flat power. The auxiliary frameworks that expend wind loads bear to be part to those for dead loads and other gravity loads create inside to the structure.

As the wind blows against a building, the resulting force acting on the elevations is called the 'wind load'. The building's structural design must absorb wind forces safely and efficiently and transfer them to the foundations in order to avoid structural collapse.

When analysing tall buildings using wind engineering, wind is normally discovered to be the dominant load and is fundamentally a horizontal force. The structural systems that absorb wind loads tend to be discrete to those for dead loads and other gravity loads generated inside to the building.

II. OBJECTIVES

- To perform analysis on G+20 story building & determine the activities of RC framed multistory building under the effect of seismic load and wind load.
- Analyzing the behavior of structure by adding different type of bracings in RC structure.
- Analyzing the conduct of structure under seismic and wind stacking.
- Analyzing the structure in Etabs 2015, and recognize the boundaries like story removal, story float, base shear and time span.
- Analyzing the conduct of the structure with and without including bracings.
 - Analyzing the structure using x – bracings, v – bracings, invert v – bracings, ecent forward – bracings and ecent backward – bracings.

III. ANALYTICAL MODELING

3.1 GENERAL DESCRIPTION OF MODELS

Model 1: Regular Model G+20 Storey, in this model infill masonry is considered & Etabs have performed analyses.



Model 2: Regular Model G+20 Storey building, an adding X – bracings at corners, and performed by Etabs.

Model 3: Regular Model G+20 Storey building, an adding V – bracings at corners, and performed by Etabs.

Model 4: Regular Model G+20 Storey building, an adding Invert V – bracings at corners, and performed by Etabs.

Model 5: Regular Model G+20 Storey building, an adding Eccen forward bracings at corners, and performed by Etabs.

Model 6: Regular Model G+20 Storey building, an adding Eccen backward bracings at corners, and performed by Etabs.

3.2 DESIGN DATA

Type of structure	RCC Frame structure
Building analysis	G+20
Grade of concrete for column beam and slab	M30
Steel	Fe250
Size of external columns	300×750mm
Size of internal columns	300×1000mm
Size of beam	300×600mm
Slab thickness	150mm
Bracing size	ISHB350
Response reduction factor	3
Importance factor	1
Self weight of wall	14KN/m ³
Live load	3KN/m ²
Floor finishes	1.5KN/m ²
Height of the building	67.2m
Parapet	1.21m
Wall thickness	0.3m
Story height	3m
Bottom height	2.5m
Wind velocity	33m/s
Seismic Zone	2
Zone factor (z)	0.1
Type of structure	RCC Frame structure
Building analysis	G+20
Grade of concrete for column beam and slab	M30
Steel	Fe250
Size of external columns	300×750mm
Size of internal columns	300×1000mm
Size of beam	300×600mm
Slab thickness	150mm
Bracing size	ISHB350
Response reduction factor	3
Importance factor	1
Self weight of wall	14KN/m ³
Live load	3KN/m ²
Floor finishes	1.5KN/m ²
Height of the building	67.2m
Parapet	1.21m
Wall thickness	0.3m
Story height	3m
Bottom height	2.5m
Wind velocity	33m/s
Seismic Zone	2
Zone factor (z)	0.1



SEISMIC AND WIND PARAMETERS

Seismic Coefficients IS : 1893-2000		Wind Coefficients IS : 875-1987	
Seismic Zone Factor	0.16	Wind Speed (V _b)	33m/s
Soil Type	II	Terrain Category	III
Importance Factor (I)	1	Structure Class	C
Response Reduction (R)	5	Risk Coefficient k ₁ Factor	1
		Topography k ₃ factor	1
		Windward Coefficient	1.01
		Leeward Coefficient	1

MATERIAL PROPERTY

Property	Concrete	Steel
Young's Modulus, E (kN/mm ²)	217.18	205
Poisson's ratio (μ)	0.2	0.3
Density, ρ (Kg/m ³)	2549.291	7833.413

3.3 CALCULATION OF LOADING:

3.3.1 SEISMIC LOADING:

This calculation presents the automatically generated lateral seismic loads according to Indian code IS: 1893 – 2002, as calculated by Etabs.

Seismic zone factor, Z = 0.1

Response reduction factor, R = 3

Importance factor, I = 1

Site type, zone = 2

Seismic response:

Spectral response spectrum, Sa/g

$$\frac{S_a}{g} = \frac{1.36}{T}$$

$$\frac{S_a}{g} = 0.681$$

Equivalent lateral force:

Seismic co-efficient, A_h

$$A = \frac{Z I S_a}{2Rg}$$

3.4 DYNAMIC EFFECT AND WIND LOADING:

From, IS: 875 (part – 3) – 1987

Adaptable thin structures and basic components will be initiated to learn the significance of wind incited motions or excitations along and over the course of wind.

$$a = \frac{H}{W}(x - axis) \quad b = \frac{H}{l}(y - axis)$$

Were,

H = 66m, w = 25m, l = 25m, h = 67.2m.

$$a = \frac{66}{25} = 2.640$$

$$b = \frac{66}{25} = 2.640$$

Both 'a' and 'b' values are less than 5. (From IS – 875, part – 3, 1987. P – 3, 7.1(a))

Hence, Dynamic analysis is not required.

External pressure coefficients (C_p):-

(From IS – 875, part – 3, page – 14, table – 4)

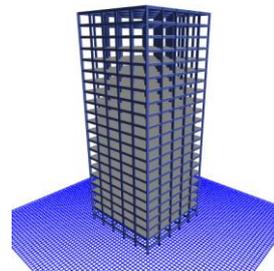
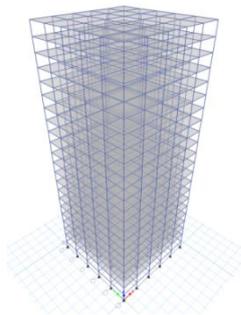
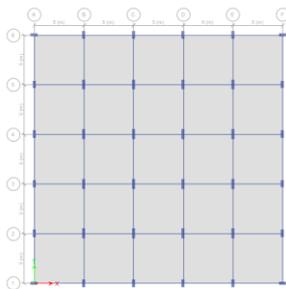
$$\frac{h}{w} = \frac{67.2}{25} = 2.688$$

$$\frac{l}{w} = \frac{25}{25} = 1.000$$

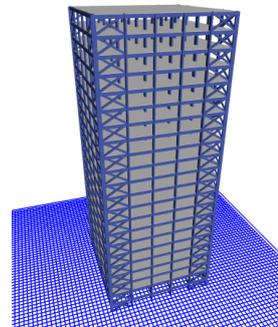
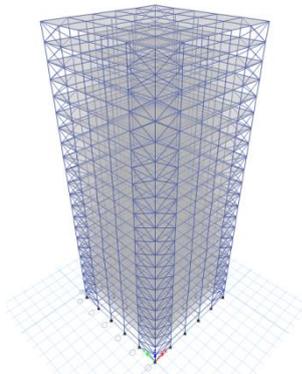
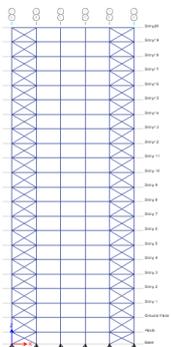
Windward and leeward:

A	+0.8
B	-0.25
C	+0.8
D	-0.25

MODEL 1: REGULAR MODEL G+20STOREY

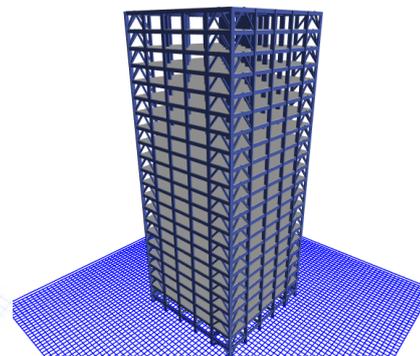
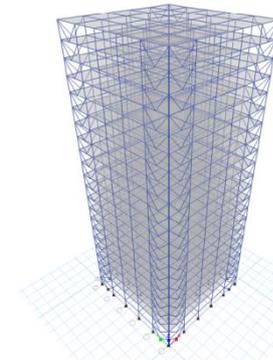


BRACINGS AT CORNER



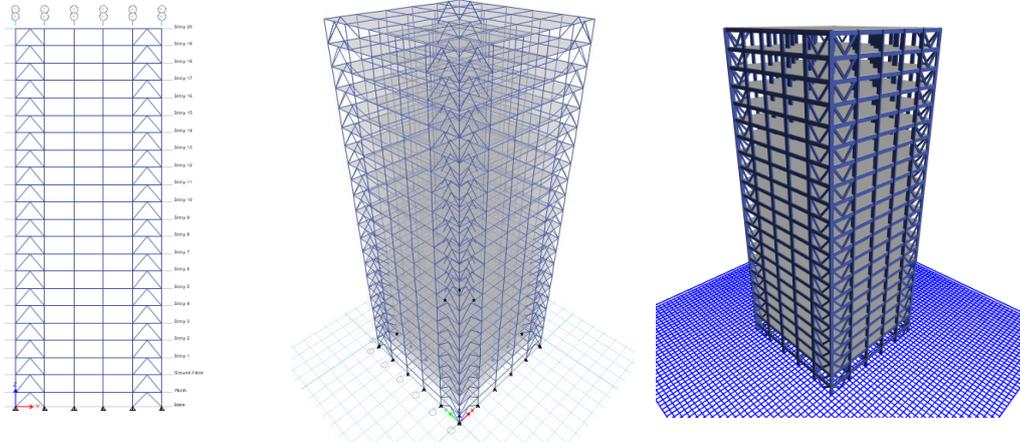
MODEL 2: MODEL WITH X

MODEL 3: MODEL WITH V – BRACINGS

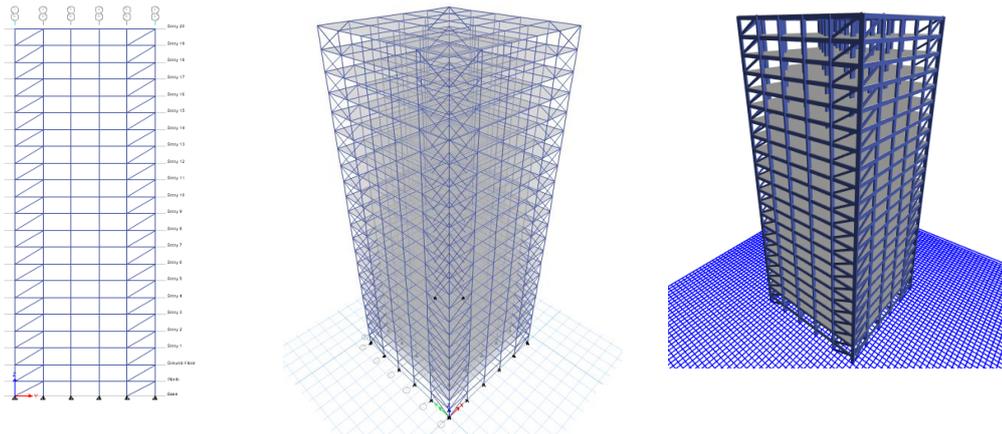




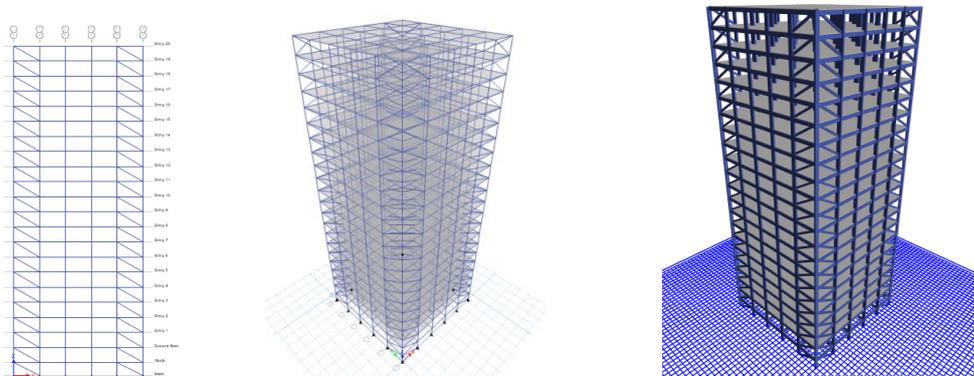
MODEL 4 : MODEL WITH INVERT V – BRACING



MODEL 5: MODEL WITH ECCENT FORWARD BRACING



MODEL 6 : MODEL WITH ECCENT BACKWARD BRACING





IV EXAMINATION RESULTS AND CONVERSATIONS

4.1 INTRODUCTION:

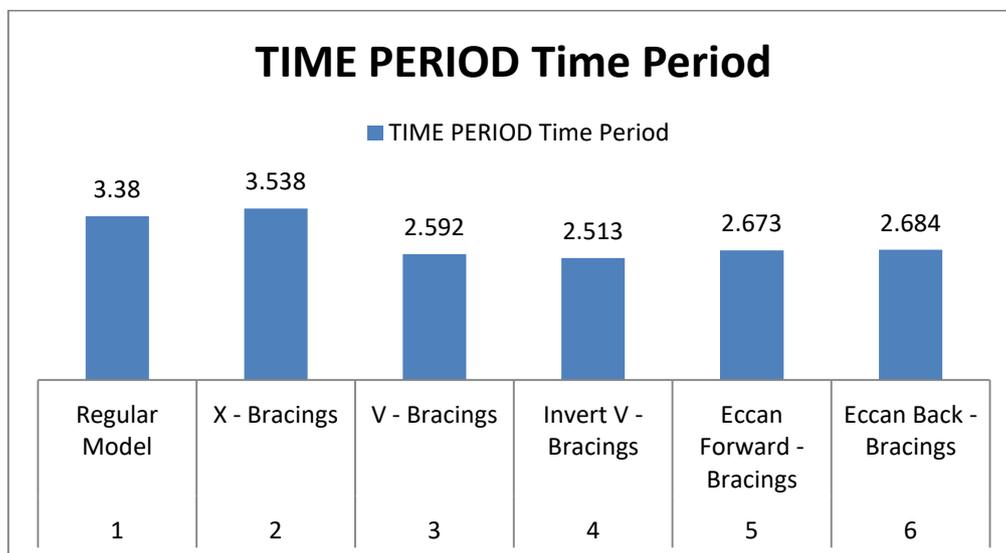
In the assessment, diverse detail like, story uprooting, story float, base shear and Time span have been study and distinction has been made.

4.2 TIME PERIOD:

It is a free vibration structure which is not been dammed or not comparable by changing the various analysis method, the time period differ have noted that regular model 1 has the top time period (or does not) to externally due to external support.

TABLE 4.1: TIME PERIOD CALACULATIONS

TIME PERIOD		
SL.NO	Model	Time Period
1	Regular Model	3.38
2	X - Bracings	3.538
3	V - Bracings	2.592
4	Invert V - Bracings	2.513
5	Eccant Forward - Bracings	2.673
6	Eccant Back - Bracings	2.684



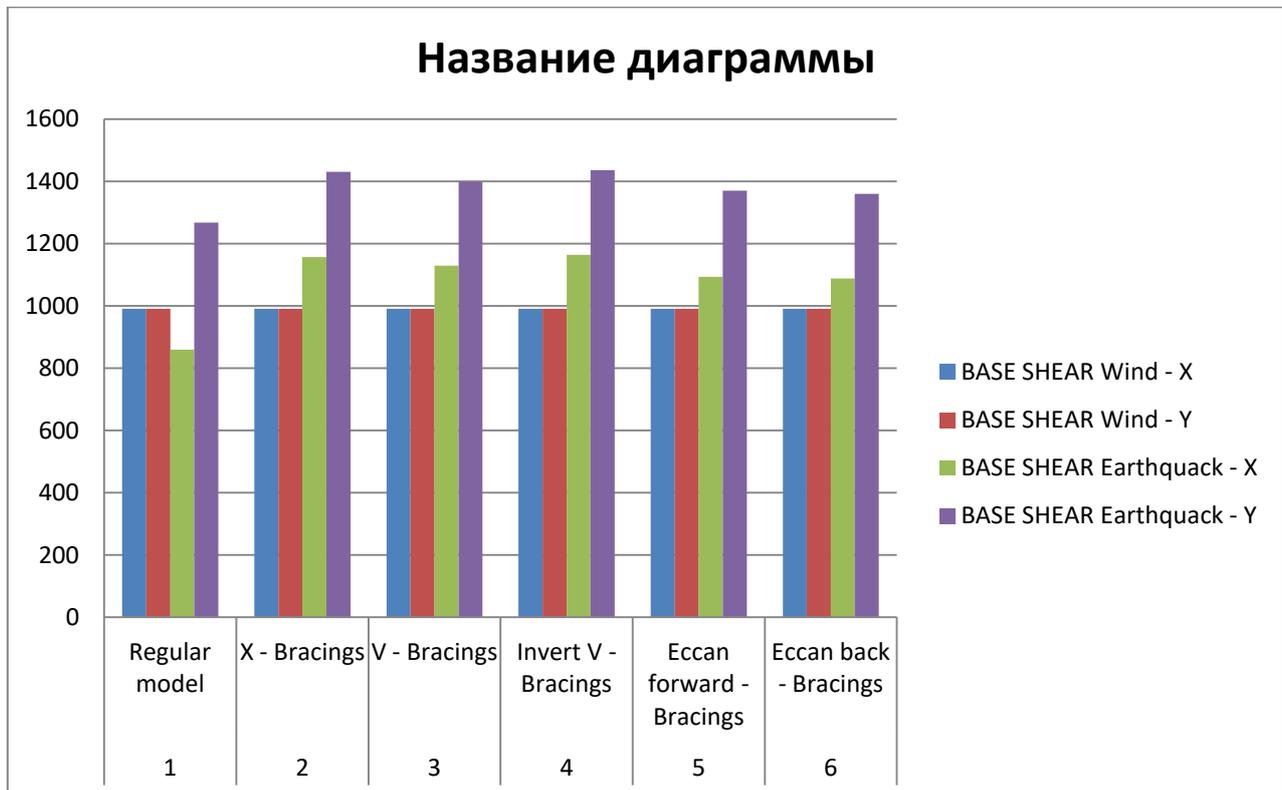
4.3 DESIGN BASE SHEAR

Base Shear is simply the readjustment of the most counted on lateral forces which takes place due to ground shaking at the base of the structure, the below table values was found by inspection done in Etabs 2015. The base shear for several models, the base shear is calculate on the site condition on which structure stands and same as to soil strata, which helps to study, for the load bearings of load.



TABLE 4.2: BASE SHEAR CALCULATION

BASE SHEAR (kN)					
SL.NO	MODEL	Wind - X	Wind - Y	Earthquake - X	Earthquake - Y
1	Regular model	990.75	990.75	859.56	1267
2	X - Bracings	990.75	990.75	1157	1431
3	V - Bracings	990.75	990.75	1129	1399
4	Invert V - Bracings	990.75	990.75	1164	1436
5	Eccan forward - Bracings	990.75	990.75	1093	1370
6	Eccan back - Bracings	990.75	990.75	1088	1360



4.4 STORY DISPLACEMENT

Story displacement, distributing of story in lateral position which refer to origin, it is a complete replacement of the store with refer to the different displacement values for the different models have been noted and mentioned below. It has-been noted that by doing inspection by using Etabs 2015 application of different examination procedures. It is observed that the movement under 2 different models as model contains various features like CW, SW AND SS

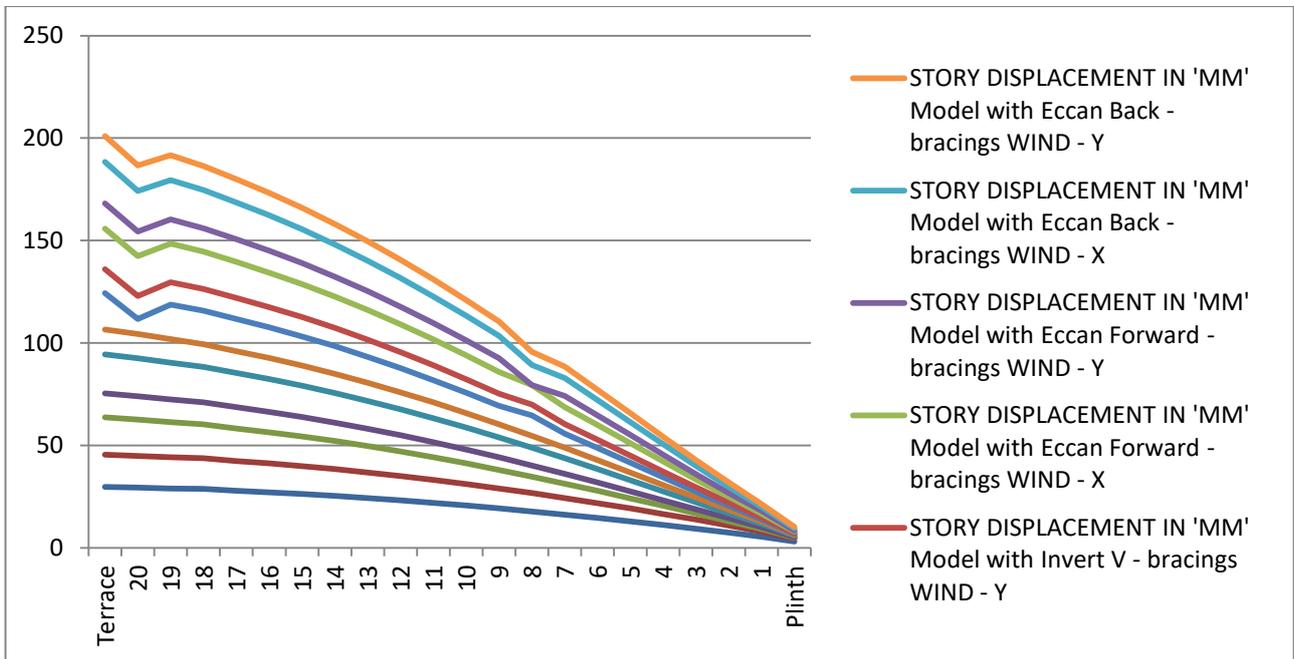


Fig. 4.3 : Wind Load Story Displacement in ‘MM’

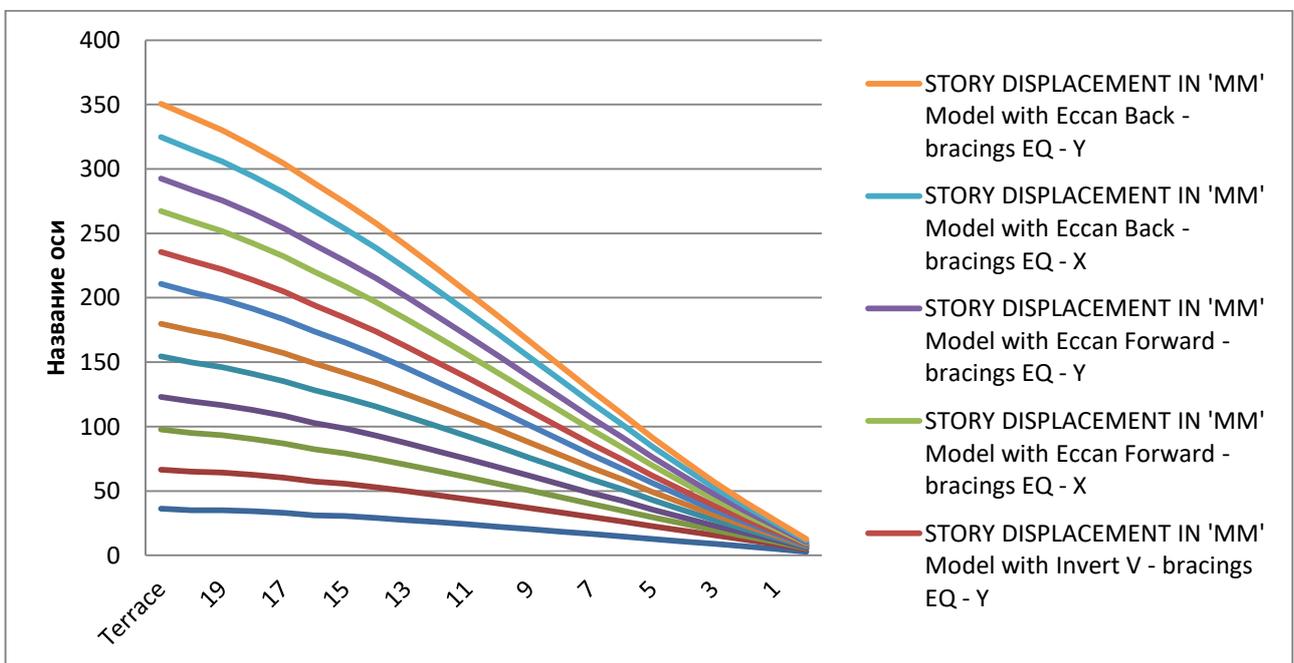


Fig. 4.4 : Earthquake Load Story Displacement in ‘MM’

V. SUMMARY AND CONCLUSION

5.1 SUMMARY

As the subject expresses that the impact of seismic and wind stacking on the structure by including diverse sort of bracings in the structure, an examination have been done to comprehend the different boundaries like base shear, time span, story uprooting, story float. The examination has been acting in Etabs 2015 programming.



5.2 CONCLUSION

- The building height increases displacement of the building increases.
- The story drift depend on height and lateral loading act on building.
- The structure with X – bracing and V – bracing provide better resistant to seismic and wind loading.
- The maximum time period is obtained in X – bracing, and the minimum time period is obtained in invert V bracing.
- Base shear is directly depending upon the condition of soil, the Maximum base shear obtained in invert V bracing.
- The model providing with invert V – bracing is better resisting to lateral loads and twisting moment of structure.

5.3 SCOPE OF FURTHER STUDIES

- Further studies can be carrying out by adopting alternate bracings both X and Y – direction.
- Further studies can be carrying out by adding shear walls with bracings.
- Further studies can be carrying out by adding dampers or base isolators to with stand in seismic load or twisting moment of the structure.

REFERENCES

- 1) Mohammed Hyderuddin Md Mubassir Imran Syed Mohsin, Retrofitting of Reinforced Concrete Frames using Steel Bracing, IJSRD - International Journal for Scientific Research & Development| Vol. 4, Issue 08, 2016 | ISSN (online): 2321-0613.
- 2) Dakshayani S, Chaithra N, Ruchir A J, Comparison of Seismic Performance of RC Flat Slab with and without Drop Panel for Steel Bracing, IJRST –International Journal for Innovative Research in Science & Technology| Volume 3 | Issue 04 | September 2016 ISSN (online): 2349-6010.
- 3) Sagar T. kawale, Prof. D.H. Tupe, Dr. G.R. Gandhe, Seismic Analysis of Steel Frame Building using Bracing in ETAB Software, International Research Journal of Engineering and Technology (IRJET), Volume: 06 Issue: 12 | Dec 2019 www.irjet.net.
- 4) Sachin Metre, Shivanand C ghule, Ravi kiran, COMPARATIVE STUDY OF DIFFERENT TYPES OF BRACING SYSTEMS BY PLACING AT DIFFERENT LOCATIONS, International Research Journal of Engineering and Technology (IRJET) Volume: 04 Issue: 08 | Aug -2017 www.irjet.net.
- 5) Priyanka.T, Shilpa.V.B, SEISMIC ANALYSIS OF UNSYMMETRICAL BUILDING WITH DIFFERENT BRACING SYSTEMS, IJRET: International Journal of Research in Engineering and Technology, Volume: 05 Issue: 06 | Jun-2016, Available @ <http://ijret.esatjournals.org>.
- 6) M. Mohana Ram, Comparisons of the Different Bracing Systemwith Lateral and Transverse Loading on 2D Steel Frame, International Journal of Engineering Research & Technology (IJERT), Vol. 5 Issue 04, April-2016.



INNO SPACE
SJIF Scientific Journal Impact Factor

**Impact Factor:
7.512**

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details