

## **COMPARATIVE STUDY OF FLAT SLAB AND CONVENTIONAL SLAB USING ETABS IN 3 SEISMIC ZONES OF INDIA**

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***ABSTRACT-*** In the present days construction activities the employment of flat slab is kind of common which reinforce the load reduction, speed up construction, and economical. Equally from the start conventional slab has lace in providing option like additional stiffness, higher load carrying capability, safe and economical additionally. Because the advancement era began apply of flat block becomes quite common. Within the present thesis work a G+10 business high-rise building having flat slab and conventional slab has been analyzed for the parameters like construction displacement, base shear, construction drift, period of time and construction forces. The performance of the structure and the behavior of the structure is studied in three seismic zones of India i.e zone III, zone IV and zone V.

**Keywords:** Shear wall, Displacement, Drift, Equivalent static method (EQ), Response Spectrum Method (RS).

### **1. INTRODUCTION**

#### **1.1 GENERAL**

The earthquake or seismic vibration is a natural phenomena that happens once the 2 blocks of earth suddenly slip past each other. And the land where they slip from each other are termed as fault plane. The situation below the earths surface wherever the earthquake starts is named as hypocenter, and also the location directly on top of it on the surface of the earth s named the geographical point. Typically associate earthquake has foreshocks. After the large earthquake a chain of smaller quake takes place within that particular region. Scientist cannot tell about that associate earthquake may be a earth tremor till the larger earthquake happens. The most important, main earthquake is named as main shock.

#### **SOME OF THE PICTURES SHOWING FLAT SLAB& CONVENTIONAL SLAB:**



**2.OBJECTIVES:**

- To Investigate the performance of flat building and conventional building subjected to numerous masses and condition and completely different seismic zones.
- To study the behavior of each structure for the parameters like structure displacement, storey drift, base shear, time period , structure forces.
- To study the impact of shear wall within the models so as to resist the lateral masses.
- To study the equivalent static technique and response spectrum technique.

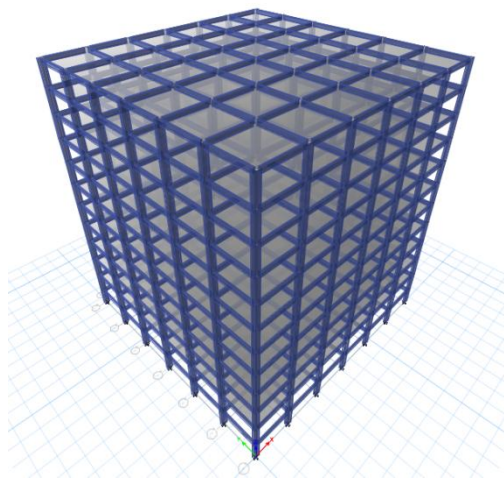
**3. MODELING OF BUILDING & ANALYSIS METHODS**

- 3 Dimensional modeling for analysis using ETABS 2015.
- The building is analysed by Equivalent static analysis and Response spectrum analysis.

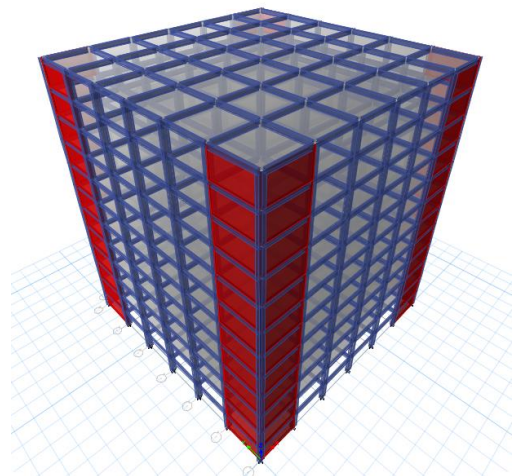
Grade of concrete	M30
Density of Concrete	25 kN/m <sup>3</sup>
Grade of steel reinforcement	Fe415
Live load	3.5 kN/m <sup>2</sup>
Floor Finish	1 KN/m <sup>2</sup>
Wall load	12 KN/m
Seismic zone factor	0.16, 0.24, 0.36
Response reduction factor	5
Impact factor	1

Type of Building	Commercial building
Storey height	3.5 m
Number of bay's in X	6
Number of bay's in Y	6
Type of Soil	Type II (Medium type)
Earthquake zone	III, IV, V

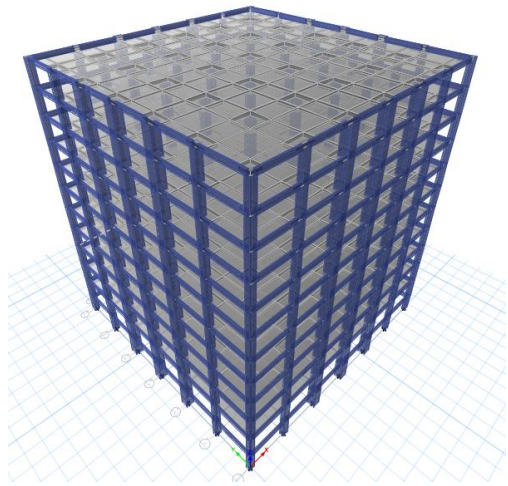
**Geometrical Properties Of Structure**



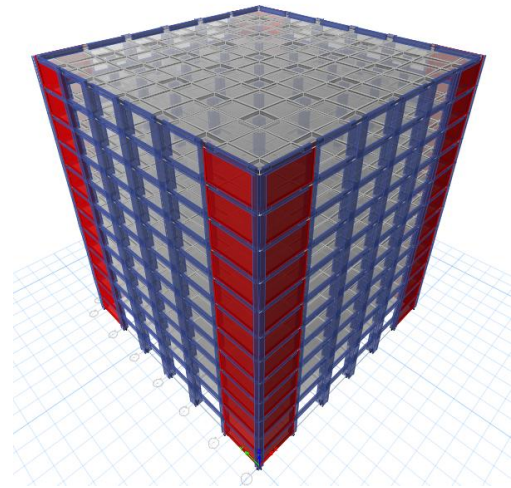
Conventional frame without shear wall



Conventional frame with shear wall



Flat slab without shear wall



Flat slab with shear wall

<u>MODEL NO</u>	<u>Description</u>
1	Flat slab and Conventional slab frame with seismic zone III
2	Flat slab and Conventional slab frame with seismic zone IV
3	Flat slab and Conventional slab frame with seismic zone V
4	Flat slab and Conventional slab frame with Shear wall at corner with seismic zone III
5	Flat slab and Conventional slab frame with Shear wall at corner with seismic zone IV
6	Flat slab and Conventional slab frame with Shear wall at corner with seismic zone V

#### **4. ANALYSIS OF THE BUILDING**

The analysis of Flat slab and Conventional slab structure have been carried out by using software called as ETABS, Before analyzing the building all the structural elements need to be identified like loads, load combinations, size of the members, material properties etc. And once the analysis of the structure is done we can get the results like Storey displacement, Storey forces, Bending moments and axial forces to compare both the slabs i.e Flat slab and Conventional slab And IS:1893-2002 code is used to calculate the seismic design forces, which is usually depends on the mass of the building and seismic coefficient of the structure and it also depends on in which zone the structure is situated..

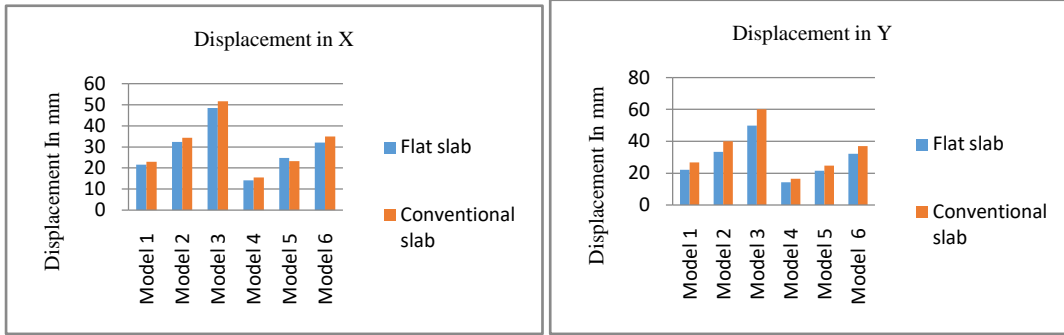
- 1) Equivalent static method
- 2) Response Spectrum Method

#### **5.RESULTS & DISCUSSIONS**

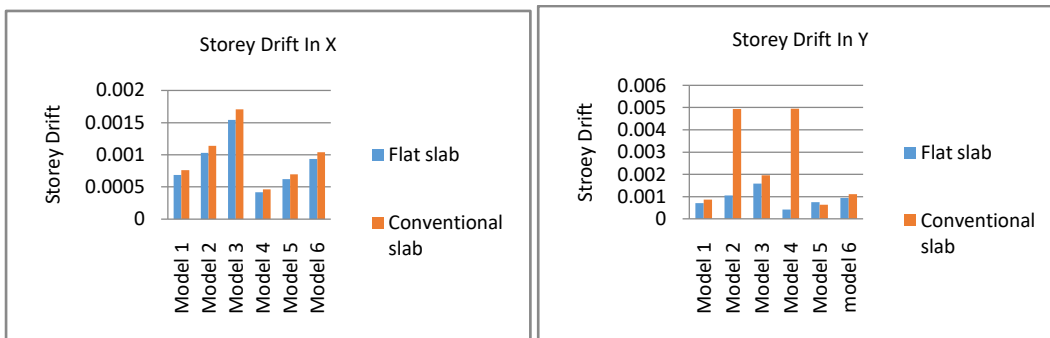
This section shows the results on seismic performance of high rise flat slab RC structure subjected to lateral loadfor varied lateral load systems. The results are given inside the kind of storey displacement, storey drift, time period and base shear with respect to varied LLRS.

1) **Equivalent Static Method**

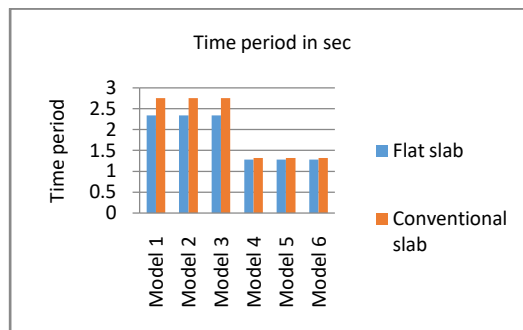
➤ **Storey Displacement**



➤ **Storey Drift**

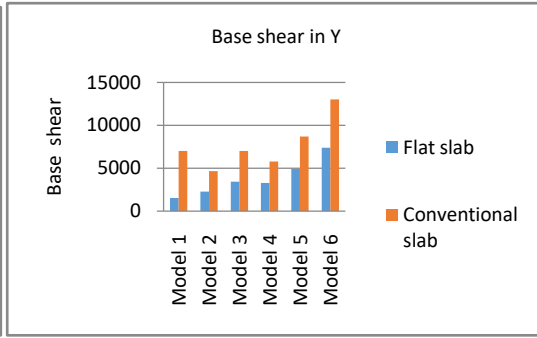
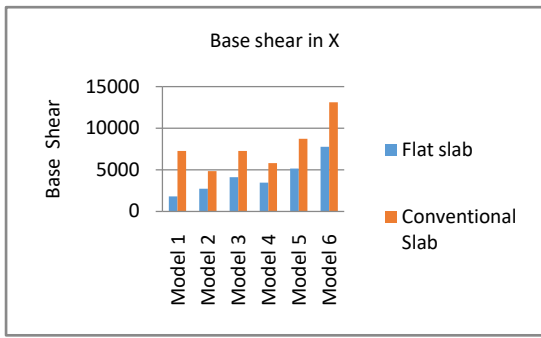


➤ **Time period:**

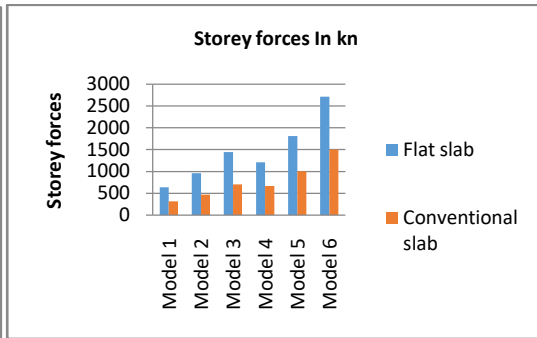
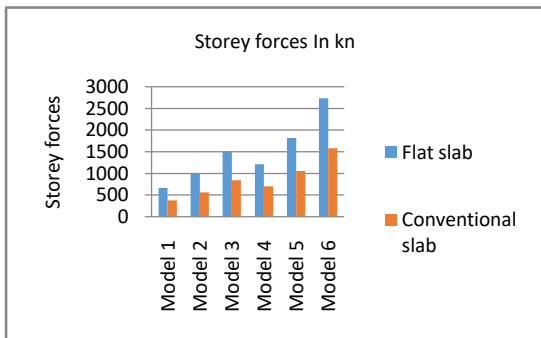


➤ **Base Shear:**

	Flat Slab		Conventional slab	
	EQ X	EQ Y	EQ X	EQ Y
<b>Model 1</b>	1823.7534	1529.466	7274.8722	7012.2154
<b>Model 2</b>	2735.6301	2294.1991	4849.9148	4674.8103
<b>Model 3</b>	4103.4451	3441.2986	7274.8722	7012.2154
<b>Model 4</b>	3448.4706	3279.9526	5826.5696	5793.33
<b>Model 5</b>	5172.7059	4919.9289	8739.8544	8689.9951
<b>Model 6</b>	7759.0588	7379.8934	13109.7816	13034.9926

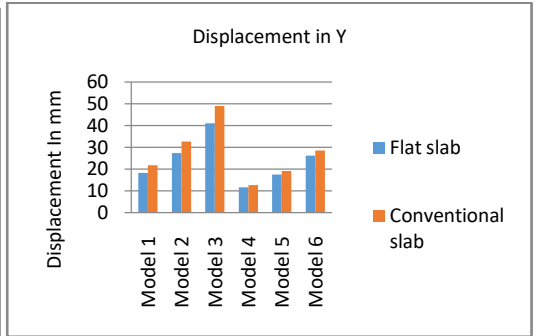
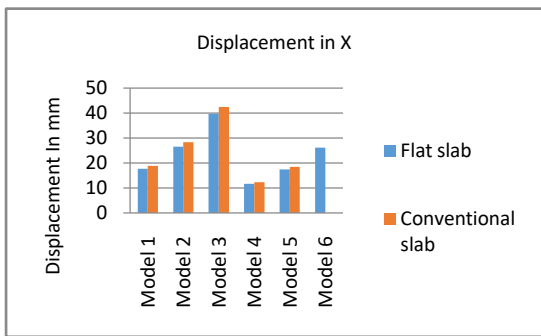


➤ **Storey forces**

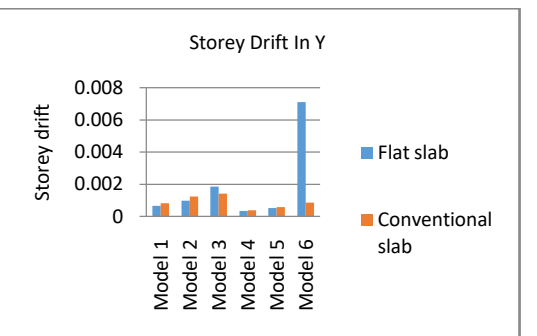
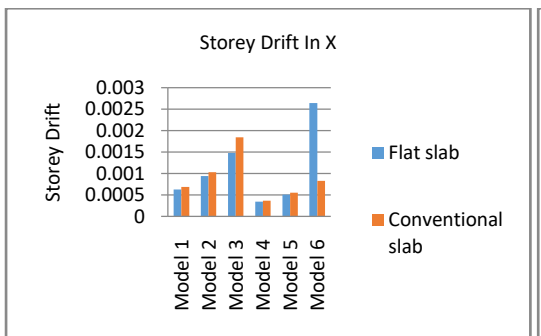


2) **Response spectrum Method**

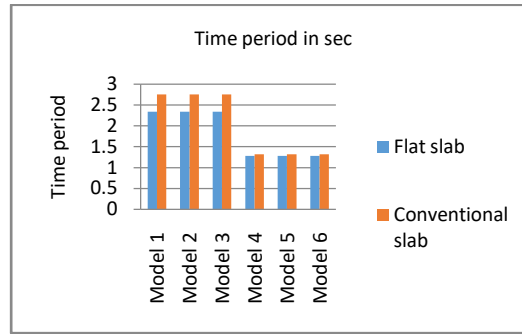
➤ **Storey Displacement**



➤ **Storey Drift**

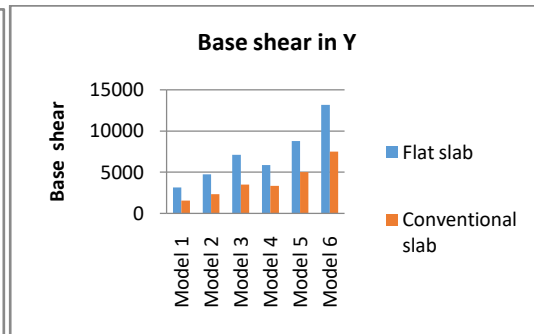
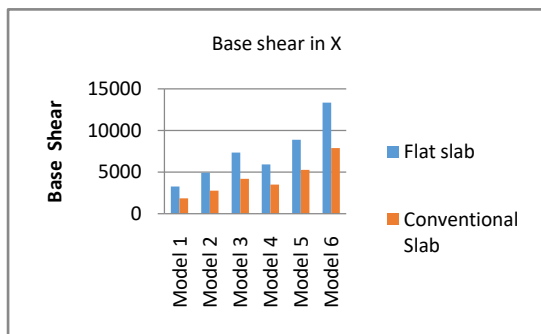


➤ Time period:

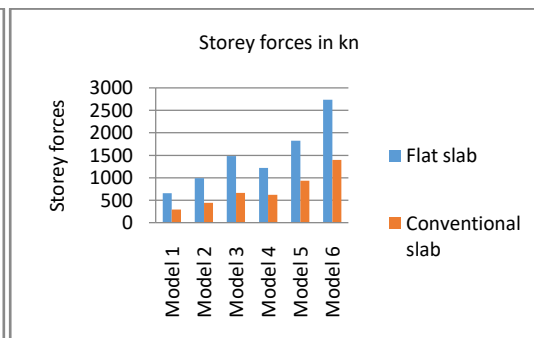
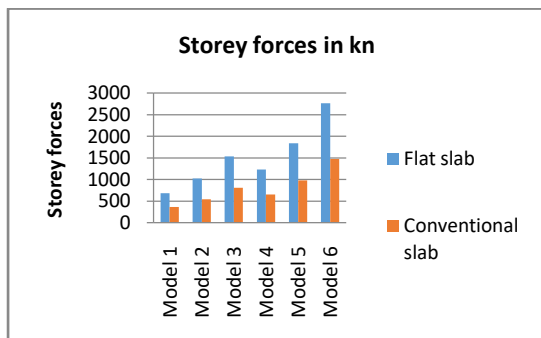


➤ Base Shear:

	Flat Slab		Conventional slab	
	EQ X	EQ Y	EQ X	EQ Y
<b>Model 1</b>	3271.2447	3152.8895	1857.5433	1547.0227
<b>Model 2</b>	4906.867	4729.3342	2786.3149	2320.5341
<b>Model 3</b>	7360.3005	7094.0013	4179.4724	3480.8011
<b>Model 4</b>	5930.484	5858.8087	3505.5044	3330.0533
<b>Model 5</b>	8895.726	8788.2131	5258.2566	4995.08
<b>Model 6</b>	13343.589	13182.3196	7887.3849	7492.62



➤ Storey forces



## **6. CONCLUSIONS**

- According to the above result its found that in the Equivalent Static Method the Storey Forces of Flat slab structure is 8.3% higher than th Conventional Slab And Whean we apply SW at corners the percentage decreases from 8.3% to 2.2% in zones III,IV,V.
- In Case of R S Method the Storey forces of regular RC slab is 12% lesser than flab slab and when SW is provided then the conventional slab is 6.3% lower than the flat block in zone III,IV,V.
- According to the Results in case of Equivalent Static Method the Base Shear of the flab slab is 8% more than the conventional slab in respective zones III,IV,V. And when the shear wall is provided at the corners it will reduced to 2.2% from 8%.
- In case of RS Method the flat slab is 8.3% more than the conventional slab in zones III,IV,V and with shear wall it will reduced to 2.6%.
- The storey displacement in case of EQ method is higher for conventional slab in X direction by 0.87mm,1.31mm,1.98mm for zone III,IV,V. and in Y direction it is higher by 2.78mm,4.52mm,6.79mm,
- The storey displacement in case of Response Spectrum method is higher for RC slab in X direction by 0.7,1.14,1.68mm and in Y direction it is higher by 2.52,3.81 5,5.69mm for respective zones III,IV and V.
- The displacement of storey is higher for conventional slab when the SW is provided at corners for the zone III,IV,V is respectively in X direction is 0.25mm,0.32mm,0.60mm and in Y direction the conventional slab is higher by 0.55mm,0.83mm , 1.27mm,
- In case of RS Method the displacement when SW is provided in corners in X direction the flab slab disp is higher by 0.03mm, 0.11mm, 0.06mm and in Y direction the conventional slab disp is higher by 0.11mm, 0.14mm, 0.23mm, for zone III,IV and V respectively.

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