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ANALYSIS OF G+20 RC BUILDING IN DIFFERENT ZONES USING ETABS

[1] Savan Kumar, [2] Galanna Karningol
[1]PG Student, [2] Assistant Professor
[1] Department of Structural Engineering
[1] Sharnbasva University, Kalaburagi, India

Abstract: The response of a building to an earthquake is vibration. The two horizontal & vertical directions may be used to decompose an earthquake's power (z). The structure shakes and vibrates in all 3 axis as a result of this motion, with the horizontal being the major direction of shaking. Into study of structural concrete, particularly multi-storeyed structures, it is critical to take into account the impacts on lateral stresses caused by wind and earthquakes. The primary goal of earthquake resistance analysis is to ensure that structures can withstand even small quakes without suffering damage. However, minor non-structural damage may be able to withstand severe earthquakes without collapse of main structure. Post-elastic deformation of components is critical to preventing collapse in the event of a big earthquake. When a critical component of the structural system fails, redundancy allows internal forces to be redistributed. It is likely that the lateral force is reallocated to another system when the original one fails or yields, in order to avoid further failure. With the use of Response spectrum analysis, we're trying to learn more about behavior of a multi-story R.C. structure with an irregular layout.

Reinforced concrete (RC) multi-story commercial structure with zones II, III, IV, and V is the focus of this research.

ETabs from FEM program is used to carry out analysis. There are twenty storeys in building model in the study, each having a height of 3 meters. For ease of comparison, the amount of bays & width of every bay in 2 horizontal directions are maintained constant throughout all 4 models. It is possible to take a range of possibilities of SEISMIC ZONE FACTOR and see how they affect the results.

Index terms: **ETABS, Response Spectrum Analysis, Equivalent static approach, ETABS, Seismic zone, Storey drift.**

I. INTRODUCTION

Wind and earthquakes both have the potential to induce dynamic movement in structures. However, wind-force and earthquake-effect design must be unique from one another. It is a fundamental tenet of structural design to load a structure by applying pressure to its exposed surface area, and this is exactly what happens in wind design. A displacement-type loading is used in tremor designing; wherein structure is vulnerable with randomised movement of ground so in foundation, causing inertial forces inside building to produce stresses. If we look at the building's load-deformation curve, we can see that the demand on the structure is divided into two types of loading: displacement due to earthquake shaking and force-type loading (the vertical axis). The average wind velocity upon that structure is more than zero, but the oscillation component is much less. Because of this, the stress field of a structure subjected to wind forces may see tiny oscillations, however stresses will only reverse if a wind direction changes, which only happens over a long period of time. In contrast, during an earthquake, the ground moves cyclically around structure's center of gravity. To put it another way, during an earthquake, the tensions in structure are subjected to several full reversals.

II. OBJECTIVES OF STUDY

Following goals are focus of this research:

1. How to do a building's seismic examination.
2. To examine how a structure responds to seismic and wind stresses.
3. Comparing the ETABS software findings for different buildings in zones II, III, IV, & V.
4. It does have 20 floors with 3m story heights all the way up the building model.
5. Bay lengths & bay widths in 2 horizontal dimensions were maintained consistent within every model of convenience's sake while analyzing 5 models
6. Impacts of various variations of zone factor were seen in the findings.
7. Various wind speeds are analyzed & their impacts upon that construction of building are shown in findings.

SCOPE OF STUDY

RC Building Models' seismic behavior has been studied to see whether there have been any modifications as a result of project:

- Elevation and seismic loads are considered in the construction of RC-framed structures.
- Researchers used Response Spectrum Analysis and the equivalent static approach in conjunction with symmetric bare framework structure models to conduct their research in various areas of the city.
- Seismic zone factor effects in distinct Zone II zones are highlighted in research;
- Zones IV & V are taken into account when evaluating a building's seismic performance.
- The research focuses on the impact of the seismic zone factor upon that seismic response of G+20 structures.
- ETABS 9.7 nonlinear program is used to model, analyze, and develop all of the model's key components.

III. LITERATURE REVIEW

Jag Mohan Humar etal (2013):

Equivalent static load technique for determining seismic design loads. It is from these NBCC 2005 requirements that the appropriate base shear & lateral displacement modifications are derived. Based on the findings of this article, the following conclusions have been drawn::

1. 1. The base shear modification variable Mv & overturning moment slenderness J both are depending upon that parameters of laterally forces resistant system.. Flexural wall systems have biggest Mv factor, whereas moment-resisting frames have least. However, for flexural wall, J is smallest, whereas for moment-resisting frame, J is biggest.
2. Parameters Mv & J are likewise affected by first mode time Ta. As a result, Mv grows as Ta rises, but J decreases as Ta rises.
3. Factors response spectra's form has significant impact on Mv & J. The UHS with in eastern areas of Canada decreases at a faster rate with lengthening time than in the western regions. As a result, in ast, greater mode contributing is more prevalent, resulting in greater Mv values & lower J values.

Conrad PAULSON et al (2004): There are significant differences between seismic vs winds designing base shear forces in the eastern & Midwestern U.S Even in comparatively modest seismic activity design hazard of Chicago, seismic design pressures may be considerable for low-rise buildings. Its designed base shear may be controlled by seismic or wind depending on the soil type at the site. Seismic requirements may override lateral strength proportioning for low-rise structures in Chicago and New York City soil. For low-rise structures on rock, wind design frequently dictates the strength proportioning, especially in places with considerable wind exposure.
Increasing seismic loads upon that lateral loading network might not have had a substantial impact on its economics on a practical basis. Even in Chicago, where seismic design may need double the strength of wind for certain lower-rising buildings, such forces have a minor magnitude in absolute terms. This means that a structure's cost might not have been significantly affected by an additional cost for seismic strength standards, when the whole cost of a building is compared.
Besides the aberration connected with inclusion of soil factors in ASCE 7-95, that appears to having been resolved with the latest editions of ASCE 7, there seems to be no general rise in seismic designing amplitudes with newer versions of ASCE 7. In Atlanta & NYC, latest version of ASCE 7 actually yields lesser design accelerations than prior editions.

AzlanAdnan, SuhanaSuradi et.al(2008): Reinforced concrete structures are subjected to both earthquake and wind stresses.

IV. METHODLOGY

SEISMIC ANALYSIS ACCORDING TO CODE

The response of a building to an earthquake is vibration. The 3 independently parallel orientations of an earthquake's force may be summarized as the following: (z). The structure shakes and vibrates across all 3 axis as a result of this motion, with horizontal being major direction of shaking. Every construction is intended to handle gravity loads, which is force of mass divided by gravitational acceleration. Most buildings are well-protected against vertical shaking because to the intrinsic safety factor employed in the design standards. Structures with enormous spans, especially those requiring structural stability analysis at the design or overall level, should also take vertical acceleration into account. No matter how serious an issue may be, IS 1893 (part-1) suggests that either a full dynamic analysis, or a pseudo static analysis, be performed. Modal analysis utilizing the response spectrum approach & equivalent lateral force technique is recommended in all seismic zones for buildings with a height of less than 40 m.

WIND ANALYSIS

Basic wind speed (Vb) for every location must be taken from IS 875-1987(3) and adjusted for getting designing wind load at any height (Vz) for a selected construction.

Vz=Vb k1k2 k3

Here, Vz = designing wind velocity for height z in m/s,
Vb = Basic wind velocity m/s,
k1 = possibility factor
k2 = terrain unevenness &height factor
k3 = topography factor.

India's basic wind speed chart for zones picked from the code, and applied for 10m height over average ground level. In order to get designed wind load for any elevation above mean ground level, following equation must be used:

$P_z=0.6V_z^2$

Here, Pz = wind pressure into N/m2 at height z
Vz = designing wind velocity into m/s at height z

V. MODELING AND ANALYSIS

COMPUTER PROGRAMMING

Reinforced concrete structures with earthquake and wind stresses have been analyzed using a computer software that incorporates the 2002 amendments to IS-1893 PART-1 2002. Based on the design's lateral stresses, the computer determines base shear which can withstand them. It also determines the building's mass and stiffness centers. Moments, lateral shear forces, and extra shear forces owing to torsion are also computed for each vertical member resisting lateral load on each level. The application visually depicts all of findings to make them easily understandable.

STRUCTURE DETAILS

The twenty-story structural model in research has a constant floor size of 3 meters. The amount of bays as well as bay-width in 2 horizontal orientations are maintained consistent at every model for ease of comparison. The consequences of different ZONE FACTOR values are analyzed & shown in findings. Here are some other insights:

PARAMETERES	ZONE II	ZONE III	ZONE IV	ZONE V
SESMIC ZONE FACTOR	0.10	0.16	0.24	0.36
BASIC WIND SPEED	33 m/s	39 m/s	46m/s	50 m/s
RESPONSE REDUCTION FACTOR	5	5	5	5
IMPORTANCE FACTOR	1	1	1	1
SOIL CONDITITON	MEDIUM	MEDIUM	MEDIUM	MEDIUM
SLAB THICKNESS	0.150 m	0.150 m	0.150 m	0.150 m
BEAM SIZE	0.30x0.45m	0.30x0.45m	0.30x0.45m	0.30x0.45m
COLUMN SIZE	0.75m x 0.75m	0.75m x 0.75m	0.75m x 0.75m	0.75m x 0.75m
LIVE LOAD	2 KN/m^2	2 KN/m^2	2 KN/m^2	2 KN/m^2
DEAD LOAD	3.75 KN/m^2	3.75 KN/m^2	3.75 KN/m^2	3.75 KN/m^2
FLOOR FINISH	1.1 KN/m2	1.1 KN/m2	1.1 KN/m2	1.1 KN/m2
MATERIAL PROPERTIES	M_{30}	M_{30}	M_{30}	M_{30}

LOADING:

Larger structural stresses and higher relevance of wind loading are the main differences between loading upon tall structures and loading on low-rise buildings. For purposes of this structural study and design, 3 different kinds of loads were taken into account. Gravity loads, that include dead & live loads, wind & earthquake loads, are among them.

GRAVITY LOADS:

Gravity loads that are propelled laterally with framed structure during an earthquake are known as dead loads. Gravitational loads which don't even accelerate lateral at same frequency like structural frame during an earthquake are characterized as "live loads" (or "moving loads").

LATERAL LOADS:

In design of structures, there's many loads that are virtually usually applied horizontally, and they must be taken into account. This kind of load is known as lateral load. Wind force & seismic loads are two examples of essential lateral loads on buildings.

WIND LOAD:

With each additional floor above ground, the wind's power on the structure increases substantially. For buildings with a typical proportion and a maximum height of roughly 10 storeys, wind load has little effect upon design. At higher elevations, however, wind stress necessitates a larger structural element, resulting in an incremental cost premium.

EARTHQUAKE LOAD:

These inertial loads of a building's mass that are generated by a seismic disturbance are known as earthquake loads. Land slide, subsidence, active faulting underneath base, or liquefaction of local sub - grade as a consequence of vibration may also cause significant earthquakes. There is a direct correlation between strength of earthquakes as well as frequency with which they occur. Severe earthquakes are very uncommon, but moderate and small earthquakes occur on a regular basis.

LOAD COMBINATIONS:

Because of this, it is necessary to integrate the different loads in accordance with design regulations. These below load combos are created in lack of such guidelines. The most detrimental impact on the building & corresponding structural part may be chosen. Into loading amalgamations, simultaneous incidence of maximal seismic, wind, & impact loading levels should also be noted.

PLANNING & 3D BUILDING MODEL

PLANNING:

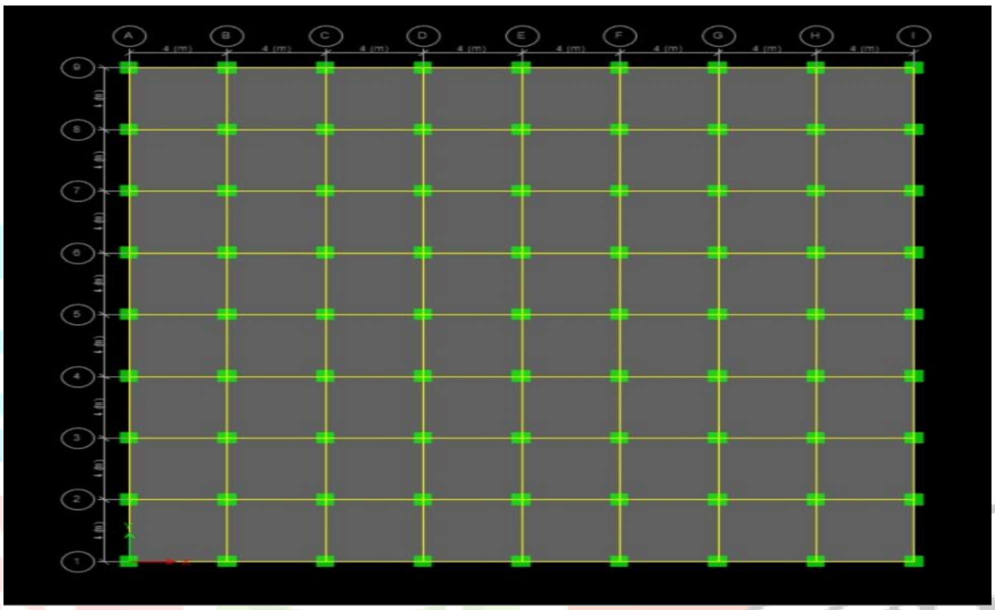

Fig 1: Bare frame model into 2Dview.

3D MODEL:

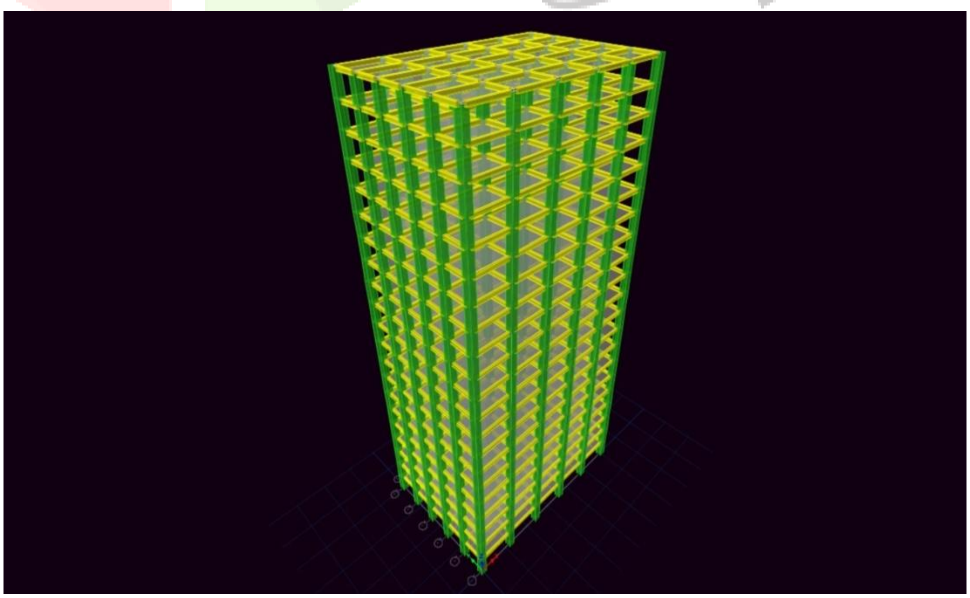

Fig 2: Bare frame model in 3Dview.

VI. RESULTS AND DISCUSSION

BASE SHEAR : Base shear refers to greatest anticipated lateral strain exerted on a building's foundation as a result of seismic ground motion. This floor is especially vulnerable to earthquake damage. The shear force responsible for the building's collapse was the load that was applied to it over the point of fracture. The weakest part of a structure is usually the foundation, making it susceptible to damage during an earthquake.

ZONES	BASE SHEAR (KN)
ZONE II	1324.5
ZONE III	2119.2
ZONE IV	3178.8
ZONE V	4768.2

As can be seen in above base shear graph, as seismic zones expand, so does the base shear of the underlying structure. Zone II has a base shear value of 1324.5 KN for a comparable construction, whereas Zone V has a value of 4768.2 KN. If the seismic ZONE shifts from II to V, the base shear will rise by more than 360%.

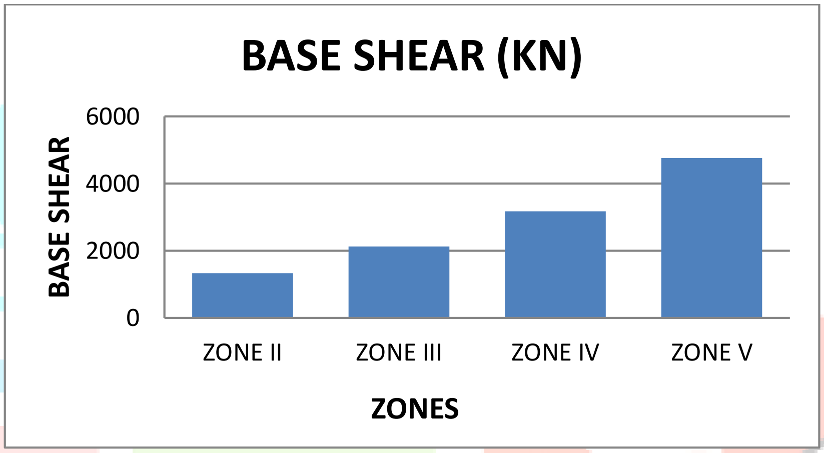

Fig 3: Base shear values difference diverse zones of INDIA

6.1 DISPLACEMENT FOR EARTH QUAKE LOAD

6.1.1 Displacement values for 1.2(DL+LL+EQX)

STOREY	DISPLACEMENT (in m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.001032	0.0013	0.001657	0.002192
2	0.003331	0.004205	0.005369	0.007115
3	0.00622	0.007869	0.010068	0.013366
4	0.009356	0.011866	0.015212	0.020232
5	0.012564	0.015975	0.020524	0.027346
6	0.015753	0.020082	0.025854	0.034512
7	0.018873	0.024123	0.031122	0.041621
8	0.021896	0.028058	0.036276	0.048601
9	0.024801	0.031863	0.041279	0.055403
10	0.027575	0.035515	0.046102	0.061982
11	0.030204	0.038995	0.050716	0.068298
12	0.032677	0.042285	0.055095	0.074311
13	0.03498	0.045364	0.059209	0.079977
14	0.037102	0.048214	0.063029	0.085252
15	0.03903	0.050813	0.066524	0.090091
16	0.04075	0.053142	0.069663	0.094446
17	0.042252	0.05518	0.072417	0.098273
18	0.043526	0.056913	0.074762	0.101536
19	0.044571	0.058335	0.076687	0.104215
20	0.045398	0.05946	0.078208	0.10633

21	**0.04605**	**0.060341**	**0.079397**	**0.107981**

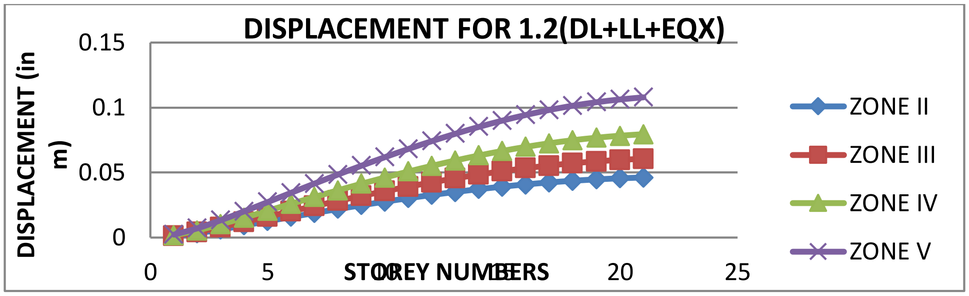

Fig 4: Displacement graph for 1.2(DL+LL+EQX)

Figure 4 shows that when seismic zones expand, displacement of building models also expands. Displacement is extreme at the top and minimal at the bottom. Zone II saw a displacement of 0.04605m, whereas zone V experienced displacement of 0.107981m. As a result, there will be a 230% rise in the distance traveled. It's possible that Zone II may become Zone V.

6.1.2 Displacement values for 1.2(DL+LL+EQY)

STOREY	**DISPLACEMENT (in m)**			
	ZONE II	**ZONE III**	**ZONE IV**	**ZONE V**
1	**0.001017**	**0.001285**	**0.001642**	**0.002177**
2	**0.003278**	**0.004151**	**0.005315**	**0.007061**
3	**0.006116**	**0.007765**	**0.009964**	**0.013261**
4	**0.009196**	**0.011705**	**0.015051**	**0.020071**
5	**0.012344**	**0.015755**	**0.020303**	**0.027125**
6	**0.015471**	**0.0198**	**0.025572**	**0.03423**
7	**0.018528**	**0.023778**	**0.030777**	**0.041276**
8	**0.021487**	**0.02765**	**0.035867**	**0.048193**
9	**0.024329**	**0.031391**	**0.040806**	**0.05493**
10	**0.027038**	**0.034978**	**0.045565**	**0.061445**
11	**0.029603**	**0.038394**	**0.050115**	**0.067697**
12	**0.032011**	**0.041619**	**0.054429**	**0.073645**
13	**0.034249**	**0.044633**	**0.058479**	**0.079246**
14	**0.036306**	**0.047418**	**0.062233**	**0.084456**
15	**0.038169**	**0.049952**	**0.065663**	**0.089229**
16	**0.039824**	**0.052215**	**0.068736**	**0.093519**
17	**0.04126**	**0.054188**	**0.071425**	**0.097281**
18	**0.042468**	**0.055855**	**0.073704**	**0.100478**
19	**0.043447**	**0.057211**	**0.075563**	**0.103091**
20	**0.044208**	**0.05827**	**0.077018**	**0.10514**
21	**0.044794**	**0.059085**	**0.078141**	**0.106725**

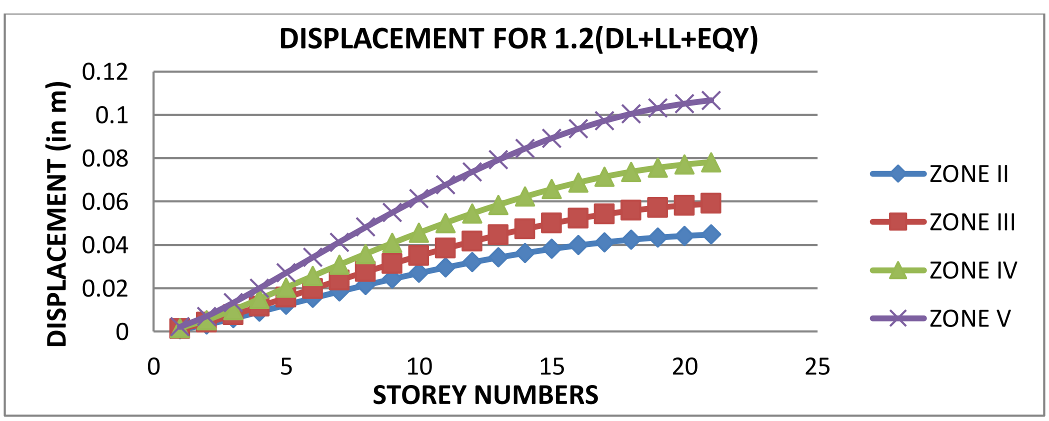

Fig 5: Displacement graph for 1.2(DL+LL+EQY)

As can be seen in the preceding displacement graph (fig. 5), as the seismic zones rise, so does displacement of the building model. Displacement is extreme at the top and minimal at the bottom. Zone II saw a displacement of 0.044794 m, whereas zone V experienced a displacement of 0.106725 m. As a result, the amount of space being displaced will grow by a factor of 230. It's possible that Zone II may become Zone V.

6.1.3 Displacement values for 0.9(DL+LL+EQX)

STOREY	DISPLACEMENT (in m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000774	0.000975	0.001243	0.001644
2	0.002499	0.003153	0.004027	0.005336
3	0.004665	0.005902	0.007551	0.010024
4	0.007017	0.008899	0.011409	0.015174
5	0.009423	0.011982	0.015393	0.020509
6	0.011815	0.015062	0.019391	0.025884
7	0.014155	0.018092	0.023341	0.031216
8	0.016422	0.021044	0.027207	0.036451
9	0.018601	0.023897	0.030959	0.041552
10	0.020681	0.026636	0.034576	0.046486
11	0.022653	0.029246	0.038037	0.051224
12	0.024507	0.031713	0.041321	0.055733
13	0.026235	0.034023	0.044407	0.059983
14	0.027827	0.03616	0.047272	0.063939
15	0.029272	0.03811	0.049893	0.067568
16	0.030563	0.039856	0.052248	0.070834
17	0.031689	0.041385	0.054313	0.073705
18	0.032645	0.042685	0.056072	0.076152
19	0.033428	0.043751	0.057515	0.078161
20	0.034049	0.044595	0.058656	0.079747
21	0.034537	0.045256	0.059548	0.080985

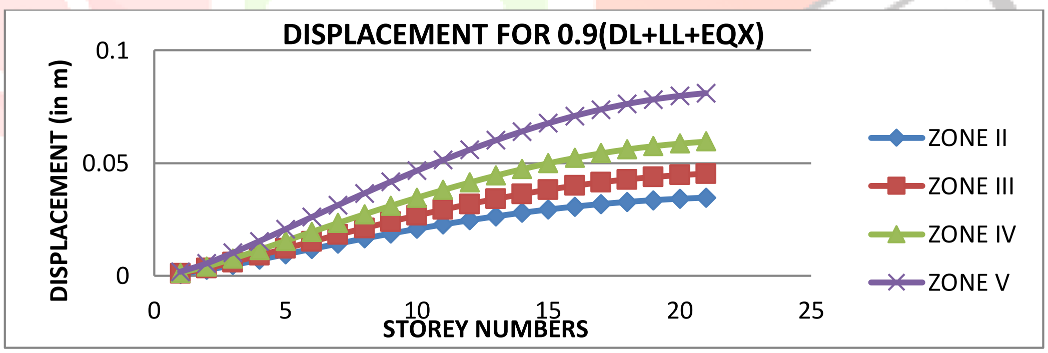

Fig 6: Displacement graph for 0.9(DL+LL+EQX)

As can be seen in the preceding displacement graph (fig. 6), as the seismic zones rise, so does displacement of the building model. Displacement is extreme at the top and minimal at the bottom. Both zones experience displacement, with zone II experiencing 0.034537 m and zone V experiencing 0.080985 m. This results in a 230% increase in displacement. It's possible that Zone II may become Zone V.

6.1.4 Displacement values for 0.9(DL+LL+EQY)

STOREY	DISPLACEMENT (in m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000763	0.000964	0.001231	0.001633
2	0.002458	0.003113	0.003986	0.005296
3	0.004587	0.005824	0.007473	0.009946
4	0.006897	0.008779	0.011289	0.015053
5	0.009258	0.011816	0.015227	0.020344
6	0.011603	0.01485	0.019179	0.025673
7	0.013896	0.017833	0.023083	0.030957
8	0.016115	0.020738	0.0269	0.036145
9	0.018246	0.023543	0.030605	0.041198
10	0.020279	0.026234	0.034174	0.046084
11	0.022202	0.028795	0.037586	0.050773
12	0.024008	0.031214	0.040822	0.055234
13	0.025687	0.033475	0.043859	0.059435
14	0.02723	0.035563	0.046675	0.063342
15	0.028626	0.037464	0.049247	0.066922
16	0.029868	0.039161	0.051552	0.070139
17	0.030945	0.040641	0.053569	0.072961
18	0.031851	0.041891	0.055278	0.075358
19	0.032585	0.042908	0.056672	0.077318
20	0.033156	0.043702	0.057763	0.078855
21	0.033595	0.044314	0.058606	0.080043

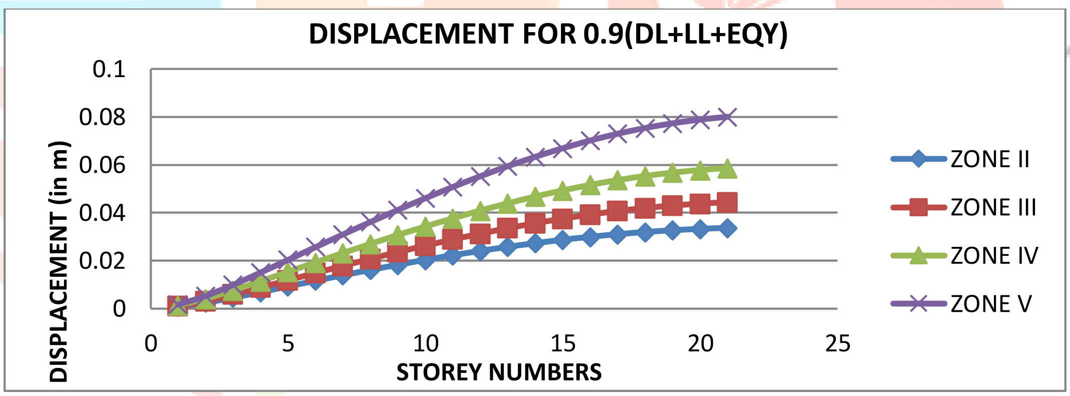

Fig 7: Displacement graph for 0.9(DL+LL+EQY)

We can see that the displacement of the building model rises as the number of seismic zones rises (fig. 7). There is significant movement at the top and little movement at the bottom. The zone II displacement is 0.033595 m, while the zone V displacement is 0.080043 m. In other words, the increase in displacement is 230%. Change from Zone II to Zone V.

6.2 DISPLACEMENT FOR WIND LOAD

6.2.1 Displacement values for 1.2(DL+LL+WX)

STOREY	DISPLACEMENT (in m)			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.001244	0.001505	0.001864	0.00204
2	0.003985	0.004822	0.005974	0.00654
3	0.007387	0.00894	0.011079	0.012129
4	0.011025	0.013346	0.016543	0.018115
5	0.014684	0.01778	0.022045	0.024145
6	0.018254	0.022108	0.027416	0.030034
7	0.021676	0.026258	0.03257	0.035688
8	0.024919	0.030193	0.037458	0.041051
9	0.027967	0.033891	0.042052	0.046093
10	0.030807	0.037339	0.046335	0.050796
11	0.033433	0.040526	0.050296	0.055144
12	0.035841	0.043448	0.053926	0.05913
13	0.038026	0.0461	0.05722	0.062746
14	0.039987	0.048478	0.060173	0.065988
15	0.041722	0.05058	0.062781	0.06885
16	0.043229	0.052405	0.065043	0.071332
17	0.04451	0.053953	0.06696	0.073434
18	0.045569	0.05523	0.068537	0.075163
19	0.046416	0.056248	0.06979	0.076534
20	0.047073	0.057034	0.070753	0.077587
21	0.047585	0.057643	0.071497	0.078398

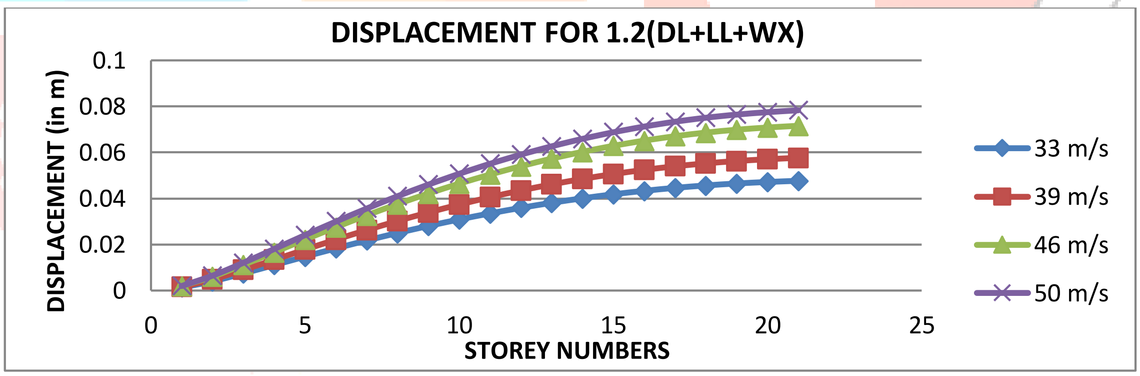

Fig 8: Displacement graph for 0.9(DL+LL+WX)

Figure 8 shows that displacement is greatest at the roof and smallest at the foundation. At a wind speed of 33 meters per second, there is a displacement of 0.047585 meters, and at a wind speed of 50 meters per second, the displacement is 0.078398 meters. An rise in displacement of 165% follows.

6.2.2 Displacing values for 1.2(DL+LL+WY)

STOREY	DISPLACEMENT (in m)			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.001228	0.001489	0.001849	0.002025
2	0.003932	0.004768	0.005921	0.006486
3	0.007283	0.008835	0.010974	0.012025
4	0.010864	0.013185	0.016382	0.017954
5	0.014463	0.01756	0.021824	0.023924
6	0.017971	0.021826	0.027134	0.029752
7	0.021331	0.025913	0.032225	0.035343
8	0.024511	0.029785	0.037049	0.040643
9	0.027494	0.033419	0.04158	0.045621
10	0.03027	0.036802	0.045799	0.050259
11	0.032832	0.039925	0.049695	0.054543
12	0.035175	0.042782	0.05326	0.058464
13	0.037296	0.045369	0.056489	0.062015
14	0.039191	0.047682	0.059377	0.065192
15	0.04086	0.049719	0.06192	0.067989
16	0.042302	0.051478	0.064116	0.070405
17	0.043518	0.052961	0.065967	0.072442
18	0.044511	0.054172	0.067478	0.074104
19	0.045292	0.055124	0.068666	0.07541
20	0.045883	0.055844	0.069563	0.076397
21	0.046329	0.056387	0.070241	0.077142

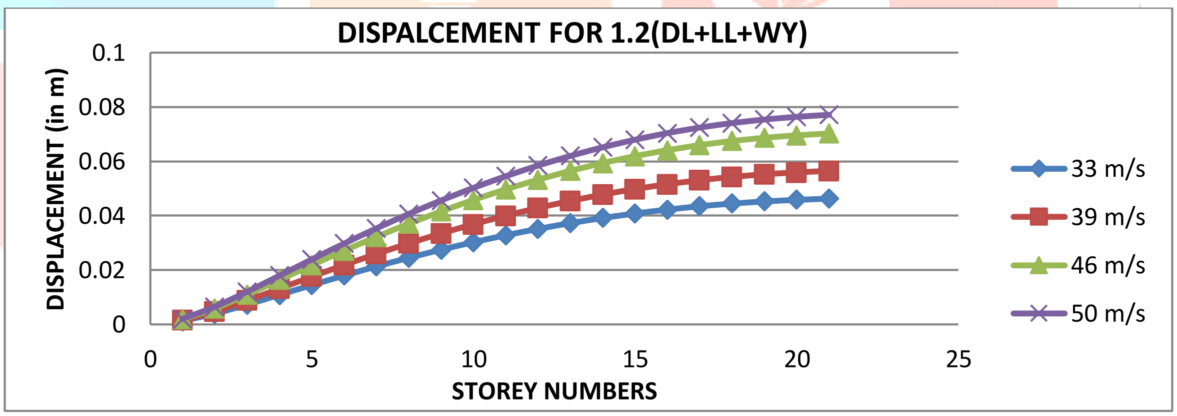

Fig 9 : Displacement graph for 1.2(DL+LL+WY)

It can be seen in the figure 9 that displacement is extreme at the top and negligible at the bottom. The difference between the displacement at 33 m/s and 50 m/s winds is 0.046329 m, and at 50 m/s it is 0.77142 m. An rise in displacement of 165% follows. Between 33 and 50 meters per second of wind.

6.2.3 Displacing values for 0.9(DL+LL+WX)

STOREY	DISPLACEMENT (in m)			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.000933	0.001128	0.001398	0.00153
2	0.002989	0.003617	0.004481	0.004905
3	0.00554	0.006705	0.008309	0.009097
4	0.008269	0.010009	0.012407	0.013586
5	0.011013	0.013335	0.016533	0.018108
6	0.01369	0.016581	0.020562	0.022526
7	0.016257	0.019694	0.024427	0.026766
8	0.018689	0.022645	0.028093	0.030788
9	0.020975	0.025419	0.031539	0.03457
10	0.023105	0.028004	0.034751	0.038097
11	0.025075	0.030395	0.037722	0.041358
12	0.026881	0.032586	0.040445	0.044347
13	0.02852	0.034575	0.042915	0.04706
14	0.02999	0.036359	0.04513	0.049491
15	0.031291	0.037935	0.047086	0.051638
16	0.032422	0.039304	0.048782	0.053499
17	0.033383	0.040465	0.05022	0.055076
18	0.034177	0.041423	0.051403	0.056372
19	0.034812	0.042186	0.052342	0.057401
20	0.035305	0.042775	0.053065	0.05819
21	0.035689	0.043232	0.053622	0.058798

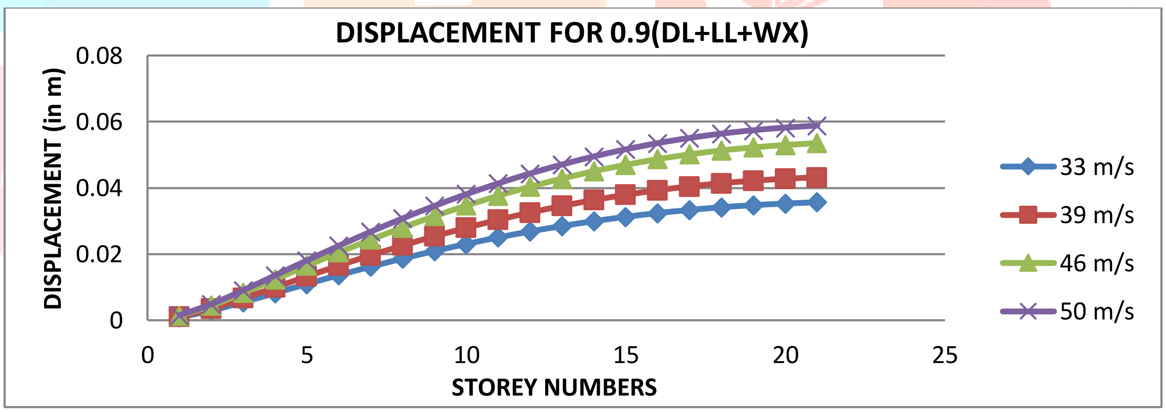

Fig 10: Displacement graph for 0.9(DL+LL+WX)

It can be seen from Fig. 10 that displacement is extreme towards the top and negligible near the bottom. Wind speed of 33 m/s causes a displacement of 0.035689 m, whereas wind speed of 50 m/s causes a displacement of 0.058798 m. Because of this, the amount of displacement will rise by 200%. Between 33 and 50 meters per second of wind.

6.2.4 Displacing values for 0.9(DL+LL+WY)

STOREY	DISPLACEMENT (in m)			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.000933	0.001117	0.001386	0.001519
2	0.002989	0.003576	0.00444	0.004865
3	0.00554	0.006627	0.008231	0.009019
4	0.008269	0.009889	0.012287	0.013466
5	0.011013	0.01317	0.016368	0.017943
6	0.01369	0.016369	0.02035	0.022314
7	0.016257	0.019435	0.024169	0.026507
8	0.018689	0.022339	0.027787	0.030482
9	0.020975	0.025064	0.031185	0.034216
10	0.023105	0.027602	0.034349	0.037694
11	0.025075	0.029944	0.037271	0.040907
12	0.026881	0.032087	0.039945	0.043848
13	0.02852	0.034027	0.042367	0.046511
14	0.02999	0.035762	0.044533	0.048894
15	0.031291	0.037289	0.04644	0.050992
16	0.032422	0.038609	0.048087	0.052804
17	0.033383	0.039721	0.049475	0.054331
18	0.034177	0.040629	0.050609	0.055578
19	0.034812	0.041343	0.051499	0.056558
20	0.035305	0.041883	0.052172	0.057298
21	0.035689	0.04229	0.05268	0.057856

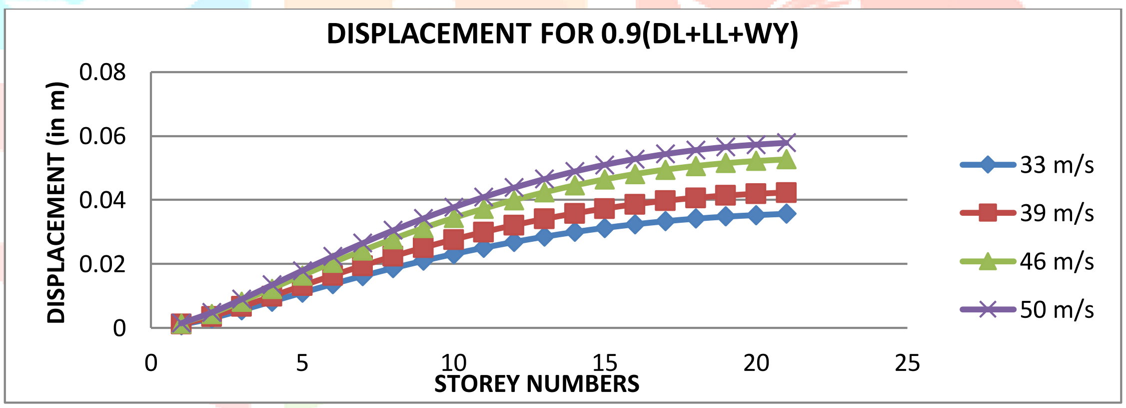

Fig 11: Displacement graph for 0.9(DL+LL+WX)

It is evident that displacement is extreme at the top and minimal at the foundation (fig. 11). Displacement is 0.035689 m with a wind speed of 33 m/s and 0.00.05785 m at a wind speed of 50 m/s. An rise in displacement of 165% follows.

6.3 STOREY DRIFT FOR EARTHQUAKE LOAD

6.3.1 Storey drift value for 1.2(DL+LL+EQX)

STOREY	STOREY DRIFT			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000344	0.000433	0.000552	0.000731
2	0.000766	0.000968	0.001237	0.001641
3	0.000963	0.001222	0.001566	0.002084
4	0.001045	0.001332	0.001715	0.002289
5	0.001069	0.00137	0.00177	0.0023899
6	0.001063	0.001369	0.001777	0.002389
7	0.00104	0.001347	0.001756	0.002369
8	0.001007	0.001312	0.001718	0.002327
9	0.000968	0.001268	0.001668	0.002267
10	0.000925	0.001217	0.001608	0.002193
11	0.000876	0.00116	0.001538	0.002105
12	0.000824	0.001097	0.00146	0.002004
13	0.000768	0.001027	0.001371	0.001889
14	0.000707	0.00095	0.001273	0.001758
15	0.000643	0.000866	0.001165	0.001613
16	0.000573	0.000776	0.001046	0.001452
17	0.000501	0.000679	0.000918	0.001276
18	0.000425	0.000578	0.000782	0.001088
19	0.000348	0.000474	0.000642	0.000893
20	0.000276	0.000375	0.000507	0.000705
21	0.000217	0.000294	0.000396	0.00055

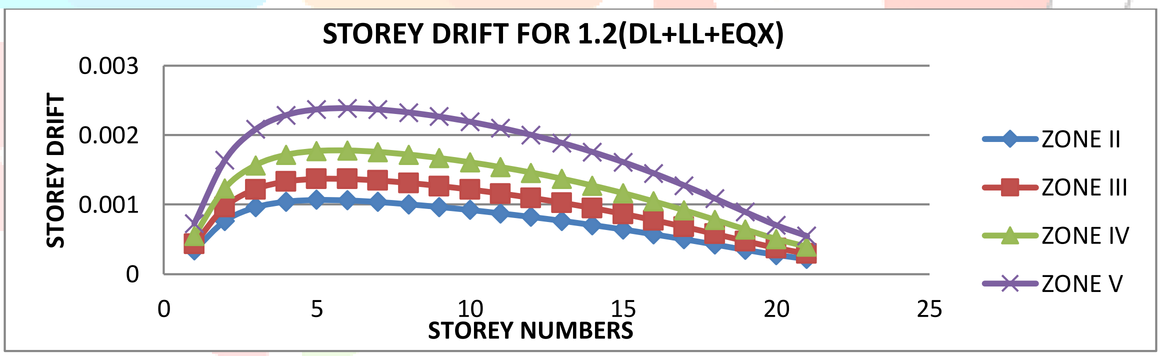

Fig 12: Storey drift graph for 1.2(DL+LL+EQX)

We can see that as the seismic zone factor goes up, so does the amount of storey drift (fig. 12). Also, ZONE V has the most potential for storey drift. Zone II has a storey drift of 0.001069. Zone V has a storey drift of 0.002389.

6.3.2 Storey drift value for 1.2(DL+LL+EQY)

	STOREY DRIFT			
STOREY	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000195	0.000428	0.000547	0.000726
2	0.00043	0.000955	0.001224	0.001628
3	0.000532	0.001205	0.00155	0.002067
4	0.000567	0.001313	0.001696	0.00227
5	0.000569	0.00135	0.001756	0.002368
6	0.000553	0.001348	0.00175	0.002351
7	0.000529	0.001326	0.001735	0.002349
8	0.0005	0.001291	0.001697	0.002306
9	0.000469	0.001247	0.001646	0.002246
10	0.000437	0.001196	0.001586	0.002172
11	0.000404	0.001139	0.001517	0.002084
12	0.00037	0.001075	0.001438	0.001983
13	0.000337	0.001005	0.00135	0.001867
14	0.000303	0.000928	0.001252	0.001737
15	0.000269	0.000845	0.001143	0.001591
16	0.000236	0.000754	0.001025	0.00143
17	0.000202	0.000658	0.000896	0.001254
18	0.00017	0.000556	0.00076	0.001066
19	0.000139	0.000452	0.00062	0.000871
20	0.000111	0.000353	0.000485	0.000683
21	0.000089	0.000272	0.000374	0.000528

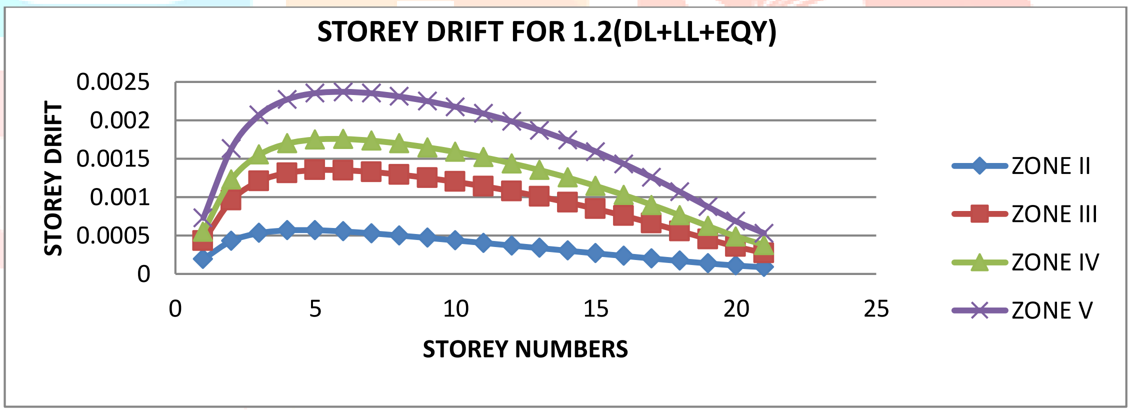

Fig 13: Storey drift graph for 1.2(DL+LL+EQY)

In Fig. 13, we have a graph of storey drift vs seismic zone factor, and it's easy to see that as the seismic zone factor rises, so does the storey drift. Also, ZONE V has the most potential for storey drift. The lateral movement between floors is 0.000569 in zone II and 0.002368 in zone V.

6.3.3 Storey drift value for 0.9(DL+LL+EQX)

STOREY	STOREY DRIFT			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000258	0.000325	0.000414	0.000548
2	0.000575	0.000726	0.000928	0.001231
3	0.000722	0.000916	0.001175	0.001563
4	0.000784	0.000999	0.001286	0.001717
5	0.000802	0.001027	0.001333	0.0017792
6	0.000797	0.001027	0.001328	0.00179
7	0.00078	0.00101	0.001317	0.001777
8	0.000756	0.000984	0.001288	0.001745
9	0.000726	0.000951	0.001251	0.0017
10	0.000693	0.000913	0.001206	0.001645
11	0.000657	0.00087	0.001154	0.001579
12	0.000618	0.000822	0.001095	0.001503
13	0.000576	0.00077	0.001029	0.001417
14	0.000531	0.000712	0.000955	0.001319
15	0.000482	0.00065	0.000874	0.00121
16	0.00043	0.000582	0.000785	0.001089
17	0.000375	0.00051	0.000688	0.000957
18	0.000319	0.000433	0.000586	0.000816
19	0.000261	0.000355	0.000481	0.00067
20	0.000207	0.000281	0.00038	0.000529
21	0.000163	0.00022	0.000297	0.000413

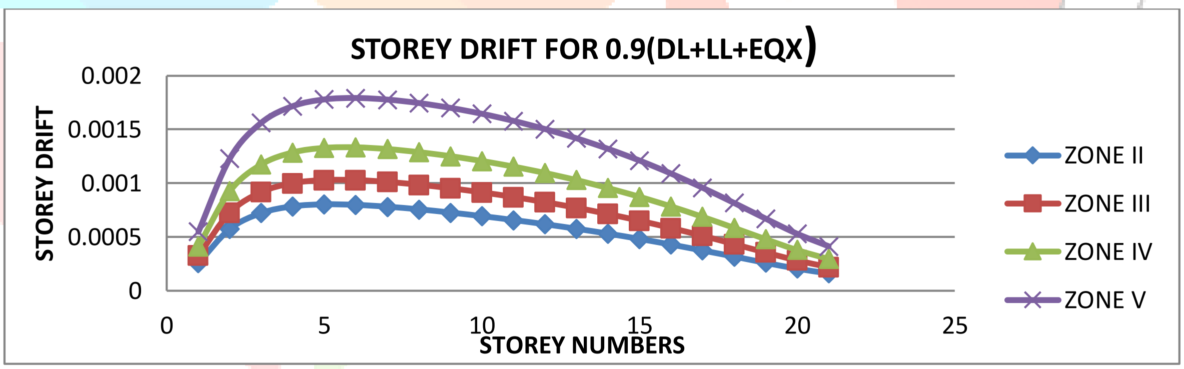

Fig 14: Storey drift graph for 0.9(DL+LL+EQX)

This is evident in Fig. 14, where the storey drift graph shows that as seismic zone factor rises, so does the storey drift. Also, ZONE V has the most potential for storey drift. Zone II has a storey drift of 0.000802, while zone V has a storey drift of 0.001792.

6.3.4 Storey drift value for 0.9(DL+LL+EQY)

STOREY	STOREY DRIFT			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000254	0.000321	0.00041	0.000544
2	0.000565	0.000717	0.000918	0.001221
3	0.00071	0.000904	0.001162	0.00155
4	0.00077	0.000985	0.001272	0.001702
5	0.000787	0.001012	0.001313	0.001764
6	0.000782	0.001011	0.001317	0.001776
7	0.000764	0.000994	0.001301	0.001761
8	0.00074	0.000968	0.001273	0.001729
9	0.00071	0.000935	0.001235	0.001684
10	0.000677	0.000897	0.00119	0.001629
11	0.000641	0.000854	0.001138	0.001563
12	0.000602	0.000806	0.001079	0.001487
13	0.00056	0.000754	0.001012	0.0014
14	0.000514	0.000696	0.000939	0.001303
15	0.000466	0.000633	0.000857	0.001193
16	0.000414	0.000566	0.000768	0.001072
17	0.000359	0.000493	0.000672	0.00094
18	0.000302	0.000417	0.00057	0.000799
19	0.000245	0.000339	0.000465	0.000653
20	0.00019	0.000265	0.000364	0.000512
21	0.000146	0.000204	0.000281	0.000396

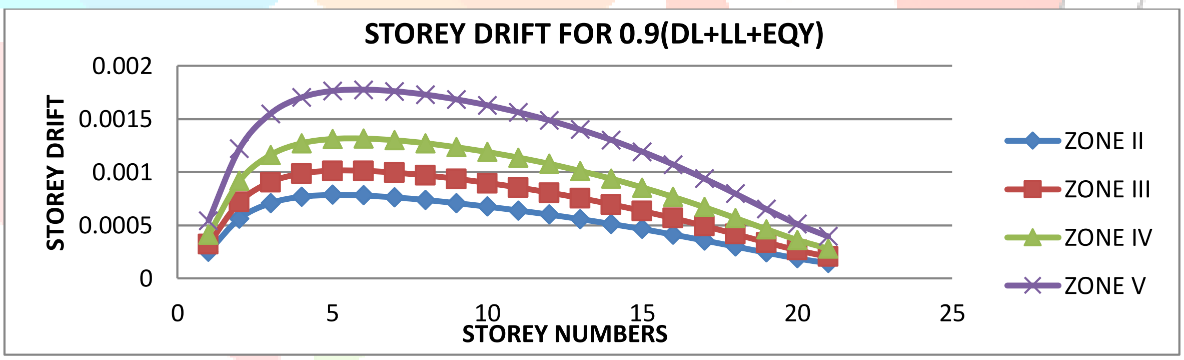

Fig 15: Storey drift graph for 0.9(DL+LL+EQY)

From the above storey drift graph (fig 15) it is clear that, the storey drift increases with the increasing of seismic zone factor. And the maximum storey drift is available at ZONE V. Storey drift at zone II is 0.000787 and storey drift at zone V is 0.001776.

6.4 STOREY DRIFT FOR WIND LOAD

6.4.1 Storey drift value for 1.2(DL+LL+WX)

STOREY	STOREY DRIFT			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.000415	0.000502	0.000621	0.00068
2	0.000914	0.001106	0.00137	0.0015
3	0.001134	0.001373	0.001701	0.001863
4	0.001213	0.001469	0.001821	0.001995
5	0.00122	0.001478	0.001834	0.00201
6	0.00119	0.001443	0.001791	0.001963
7	0.001141	0.001383	0.001718	0.001884
8	0.001081	0.001312	0.001629	0.001788
9	0.001016	0.001233	0.001531	0.001681
10	0.000947	0.001149	0.001428	0.001567
11	0.000875	0.001063	0.00132	0.00145
12	0.000803	0.000974	0.00121	0.001329
13	0.000729	0.000884	0.001098	0.001205
14	0.000654	0.000793	0.000984	0.001081
15	0.000578	0.000701	0.000869	0.000954
16	0.000502	0.000608	0.000754	0.000827
17	0.000427	0.000516	0.000639	0.000701
18	0.000353	0.000426	0.000526	0.000576
19	0.000282	0.000339	0.000418	0.000457
20	0.000219	0.000262	0.000321	0.000351
21	0.000171	0.000203	0.000248	0.00027

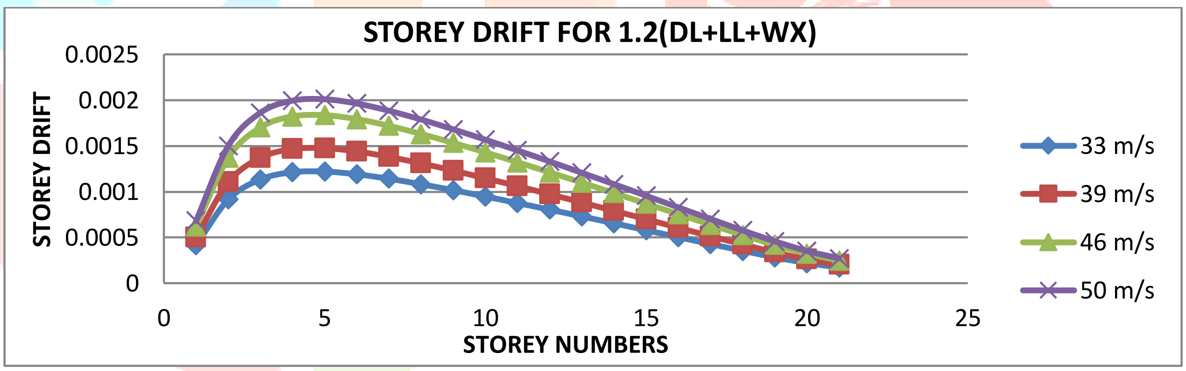

Fig 16: Storey drift graph for 1.2(DL+LL+WX)

From the above storey drift graph (fig 16) it is clear that, the storey drift increases with the increasing of wind pressure. And the maximum storey drift is available at ZONE V. The value of storey drift at wind speed 33 m/s is 0.000119 and at high wind speed 50 m/s is 0.00201.

6.4.2 Storey drift value for 1.2(DL+LL+WY)

STOREY	STOREY DRIFT			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.000195	0.000496	0.000616	0.000675
2	0.00043	0.001093	0.001357	0.001487
3	0.000532	0.001356	0.001685	0.001846
4	0.000567	0.00145	0.001803	0.001976
5	0.000569	0.001458	0.001814	0.00199
6	0.000553	0.001422	0.00177	0.001943
7	0.000529	0.001363	0.001697	0.001864
8	0.0005	0.001291	0.001608	0.001767
9	0.000469	0.001211	0.00151	0.00166
10	0.000437	0.001128	0.001406	0.001546
11	0.000404	0.001041	0.001299	0.001428
12	0.00037	0.000952	0.001189	0.001307
13	0.000337	0.000862	0.001076	0.001184
14	0.000303	0.000771	0.000963	0.001059
15	0.000269	0.000679	0.000848	0.000932
16	0.000236	0.000586	0.000732	0.000805
17	0.000202	0.000494	0.000617	0.000679
18	0.00017	0.000404	0.000504	0.000554
19	0.000139	0.000317	0.000396	0.000435
20	0.000111	0.00024	0.000299	0.000329
21	0.000089	0.000181	0.000226	0.000248

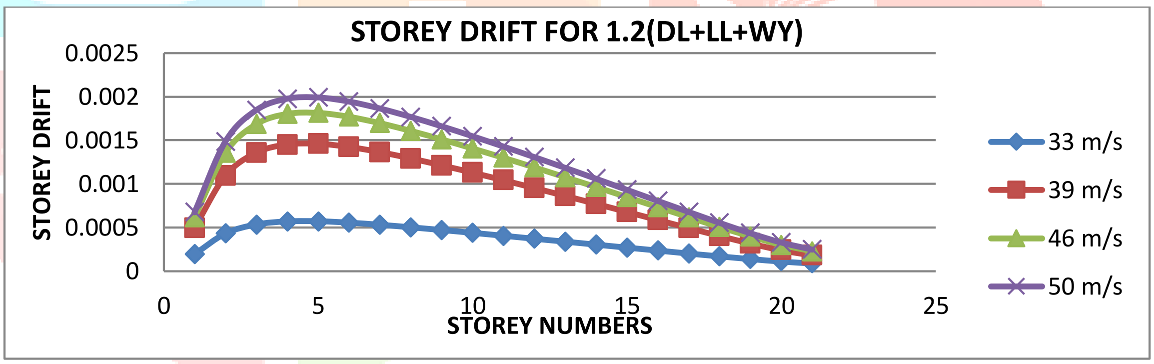

Fig 17: Storey drift graph for 1.2(DL+LL+WY)

From the above storey drift graph (fig 17) it is clear that, the storey drift increases with the increasing of wind pressure. And the maximum storey drift is available at ZONE V. The value of storey drift at wind speed 33 m/s is 0.000119 and at high wind speed 50 m/s is 0.00201.

6.4.3 Storey drift value for 0.9(DL+LL+WX)

STOREY	STOREY DRIFT			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.000311	0.000376	0.000466	0.00051
2	0.000685	0.000829	0.001028	0.001125
3	0.00085	0.001029	0.001276	0.001397
4	0.000909	0.001102	0.001366	0.001496
5	0.000915	0.001109	0.001375	0.001507
6	0.000892	0.001082	0.001343	0.001472
7	0.000856	0.001038	0.001288	0.001413
8	0.000811	0.000984	0.001222	0.001341
9	0.000762	0.000924	0.001149	0.001261
10	0.00071	0.000862	0.001071	0.001176
11	0.000657	0.000797	0.00099	0.001087
12	0.000602	0.00073	0.000908	0.000996
13	0.000546	0.000663	0.000823	0.000904
14	0.00049	0.000595	0.000738	0.00081
15	0.000434	0.000526	0.000652	0.000716
16	0.000377	0.000456	0.000565	0.00062
17	0.00032	0.000387	0.000479	0.000525
18	0.000265	0.000319	0.000394	0.000432
19	0.000212	0.000254	0.000313	0.000343
20	0.000164	0.000196	0.000241	0.000263
21	0.000128	0.000152	0.000186	0.000203

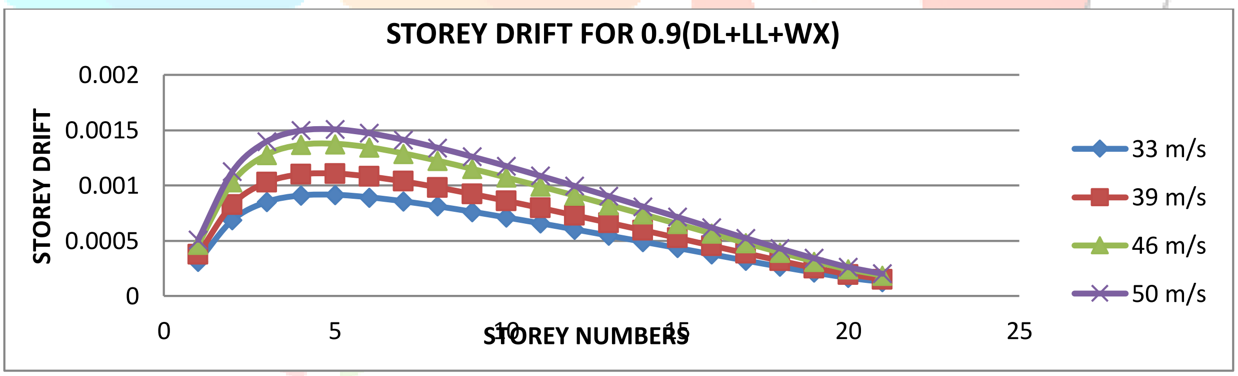

Fig 18: Storey drift graph for 0.9(DL+LL+WX)

From the above storey drift graph (fig 18) it is clear that, the storey drift increases with the increasing of wind pressure. And the maximum storey drift is available at ZONE V. The value of storey drift at wind speed 33 m/s is 0.000915 and at high wind speed 50 m/s is 0.001507.

6.4.4 Storey drift value for 0.9(DL+LL+WY)

STOREY	STOREY DRIFT			
	33 m/s	39 m/s	46 m/s	50 m/s
1	0.000311	0.000372	0.000462	0.000506
2	0.000685	0.00082	0.001018	0.001115
3	0.00085	0.001017	0.001263	0.001385
4	0.000909	0.001087	0.001352	0.001482
5	0.000915	0.001094	0.00136	0.001492
6	0.000892	0.001067	0.001328	0.001457
7	0.000856	0.001022	0.001273	0.001398
8	0.000811	0.000968	0.001206	0.001325
9	0.000762	0.000909	0.001133	0.001245
10	0.00071	0.000846	0.001055	0.001159
11	0.000657	0.000781	0.000974	0.001071
12	0.000602	0.000714	0.000891	0.00098
13	0.000546	0.000647	0.000807	0.000888
14	0.00049	0.000578	0.000722	0.000794
15	0.000434	0.000509	0.000636	0.000699
16	0.000377	0.00044	0.000549	0.000604
17	0.00032	0.000371	0.000463	0.000509
18	0.000265	0.000303	0.000378	0.000416
19	0.000212	0.000238	0.000297	0.000327
20	0.000164	0.00018	0.000224	0.000247
21	0.000128	0.000136	0.000169	0.000186

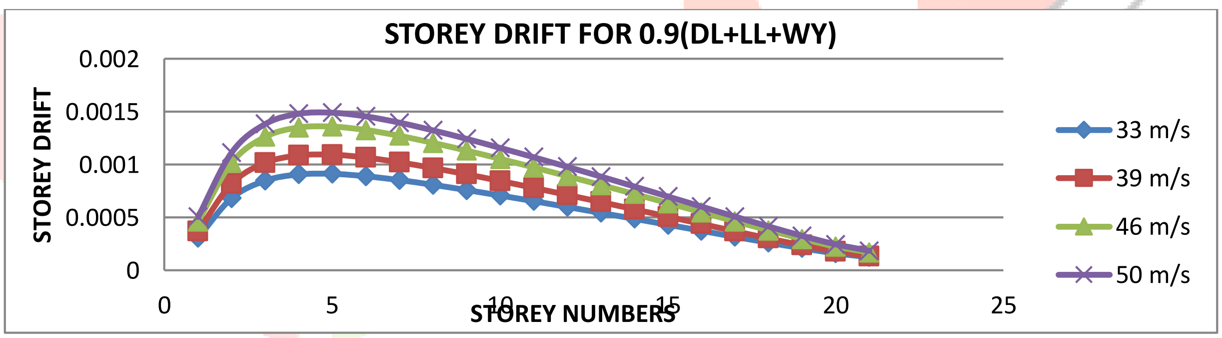

Fig 19: Storey drift graph for 0.9(DL+LL+WY)

From the above storey drift graph (fig 19) it is clear that, the storey drift increases with the increasing of wind pressure. And the maximum storey drift is available at ZONE V. The value of storey drift at wind speed 33 m/s is 0.000915 and at high wind speed 50 m/s is 0.001507.

6.5 STOREY SHEAR FOR EARTHQUAKE LOAD

6.5.1 Storey shear for 1.2(DL+LL+EQX)

STOREY	STOREY SHEAR			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	3630.616	4584.265	5855.798	7763.097
2	3532.928	4486.285	5757.427	7664.141
3	3433.777	4385.963	5655.544	7559.916
4	3332.186	4281.738	5547.806	7446.91
5	3227.181	4172.049	5431.873	7321.61
6	3117.785	4055.335	5305.403	7180.505
7	3003.022	3930.036	5166.054	7020.081
8	2881.918	3794.589	5011.484	6836.826
9	2753.497	3647.434	4839.352	6627.227
10	2616.782	3487.01	4647.316	6387.773
11	2470.798	3311.756	4433.034	6114.951
12	2314.569	3120.11	4194.165	5805.248
13	2147.12	2910.512	3928.368	5455.152
14	1967.475	2681.4	3633.3	5061.151
15	1774.659	2431.214	3306.621	4619.731
16	1567.695	2158.391	2945.987	4127.381
17	1345.608	1861.372	2549.059	3580.588
18	1107.422	1538.595	2113.493	2975.839
19	852.162	1188.499	1636.949	2309.623
20	578.8519	809.5231	1117.085	1578.427
21	286.5161	400.1057	551.5586	778.7379

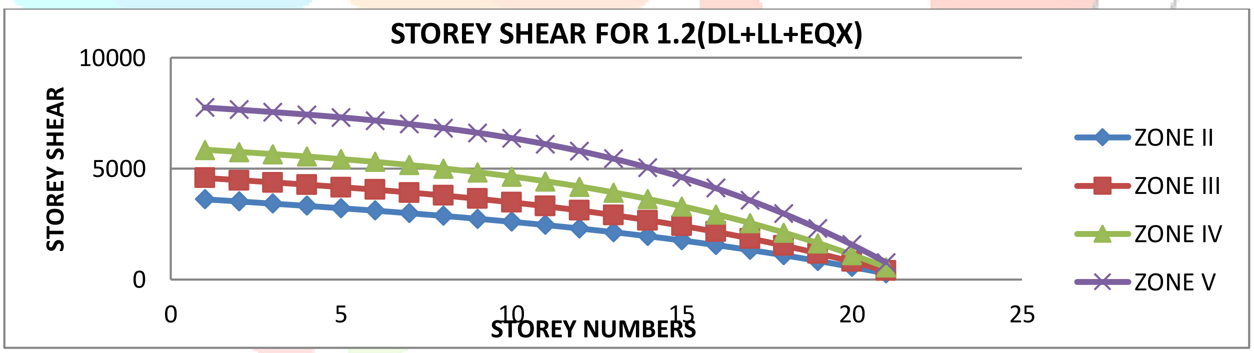

Fig 20: Storey shear graph for 1.2(DL+LL+EQX)

From above storey shear graph it is clear that, the Storey Shear is decreased as height of the building increased and reduced at top floor in all the models. The storey shear is max at the base. And the storey. shear for the model in ZONE II is 286.5161 KN and ZONE V is 778.73KN.

6.5.2 Storey shear for 1.2(DL+LL+EQY)

STOREY	STOREY SHEAR			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	3630.616	4584.265	5855.798	7763.097
2	3532.928	4486.285	5757.427	7664.141
3	3433.777	4385.963	5655.544	7559.916
4	3332.186	4281.738	5547.806	7446.91
5	3227.181	4172.049	5431.873	7321.61
6	3117.785	4055.335	5305.403	7180.505
7	3003.022	3930.036	5166.054	7020.081
8	2881.918	3794.589	5011.484	6836.826
9	2753.497	3647.434	4839.352	6627.227
10	2616.782	3487.01	4647.316	6387.773
11	2470.798	3311.756	4433.034	6114.951
12	2314.569	3120.11	4194.165	5805.248
13	2147.12	2910.512	3928.368	5455.152
14	1967.475	2681.4	3633.3	5061.151
15	1774.659	2431.214	3306.621	4619.731
16	1567.695	2158.391	2945.987	4127.381
17	1345.608	1861.372	2549.059	3580.588
18	1107.422	1538.595	2113.493	2975.839
19	852.162	1188.499	1636.949	2309.623
20	578.8519	809.5231	1117.085	1578.427
21	286.5161	400.1057	551.5586	778.7379

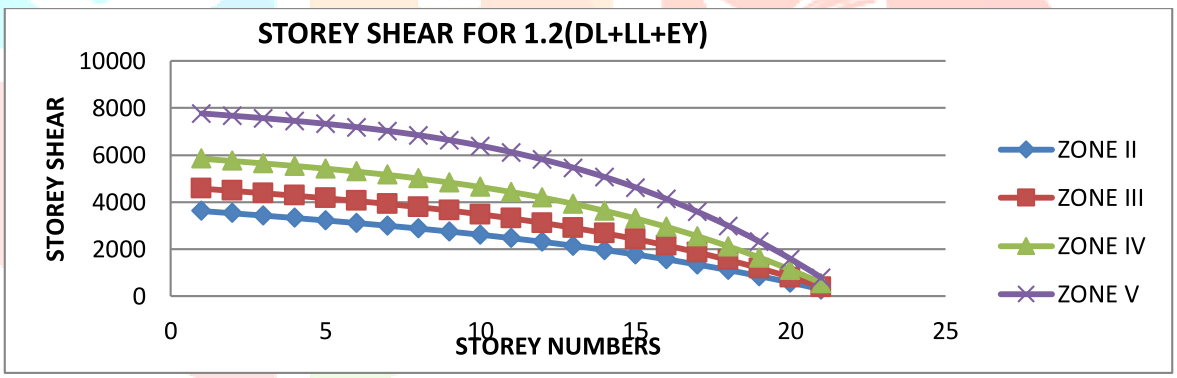

Fig 21: Storey shear graph for 1.2(DL+LL+EQY)

From the above storey shear graph (fig 21) it is clear that, the Storey Shear is decreased as height of the building increased and reduced at top floor in all the building models. The storey shear is maximum at the base. And the storey. shear value for the model in ZONE II is 286.5161 KN and ZONE V is 778.7379 KN.

6.5.3 Storey shear for 0.9(DL+LL+EQX)

STOREY	STOREY SHEAR			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	2722.962	3438.199	4391.848	5822.323
2	2649.696	3364.714	4318.07	5748.105
3	2575.332	3289.472	4241.658	5669.937
4	2499.14	3211.303	4160.855	5585.182
5	2420.385	3129.037	4073.905	5491.208
6	2338.338	3041.502	3979.052	5385.378
7	2252.267	2947.527	3874.54	5265.06
8	2161.439	2845.942	3758.613	5127.619
9	2065.122	2735.576	3629.514	4970.421
10	1962.586	2615.258	3485.487	4790.83
11	1853.098	2483.817	3324.776	4586.213
12	1735.927	2340.083	3145.624	4353.936
13	1610.34	2182.884	2946.276	4091.364
14	1475.606	2011.05	2724.975	3795.863
15	1330.994	1823.41	2479.965	3464.798
16	1175.771	1618.794	2209.49	3095.536
17	1009.206	1396.029	1911.794	2685.441
18	830.5665	1153.947	1585.12	2231.88
19	639.1215	891.3744	1227.712	1732.218
20	434.1389	607.1423	837.8135	1183.82
21	214.8871	300.0793	413.669	584.0534

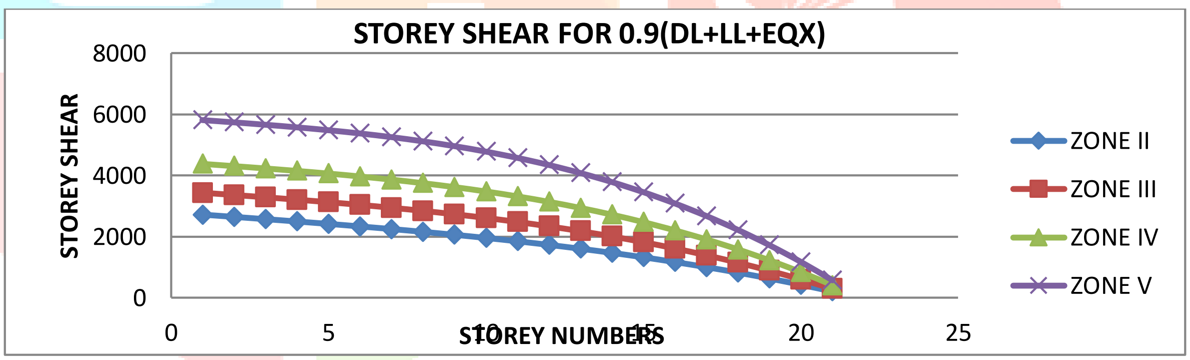

Fig 22: Storey shear graph for 0.9(DL+LL+EQX)

From the above storey shear graph (fig 22) it is clear that, the Storey Shear is decreased as height of the building increased and reduced at top floor in all the building models. The storey shear is maximum at the base. And the storey. shear value for the model in ZONE II is 214.8871 KN and ZONE V is 584.0534 KN.

6.5.4 Storey shear for 0.9(DL+LL+EQY)

STOREY	STOREY SHEAR			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	2722.962	3438.199	4391.848	5822.323
2	2649.696	3364.714	4318.07	5748.105
3	2575.332	3289.472	4241.658	5669.937
4	2499.14	3211.303	4160.855	5585.182
5	2420.385	3129.037	4073.905	5491.208
6	2338.338	3041.502	3979.052	5385.378
7	2252.267	2947.527	3874.54	5265.06
8	2161.439	2845.942	3758.613	5127.619
9	2065.122	2735.576	3629.514	4970.421
10	1962.586	2615.258	3485.487	4790.83
11	1853.098	2483.817	3324.776	4586.213
12	1735.927	2340.083	3145.624	4353.936
13	1610.34	2182.884	2946.276	4091.364
14	1475.606	2011.05	2724.975	3795.863
15	1330.994	1823.41	2479.965	3464.798
16	1175.771	1618.794	2209.49	3095.536
17	1009.206	1396.029	1911.794	2685.441
18	830.5665	1153.947	1585.12	2231.88
19	639.1215	891.3744	1227.712	1732.218
20	434.1389	607.1423	837.8135	1183.82
21	214.8871	300.0793	413.669	584.0534

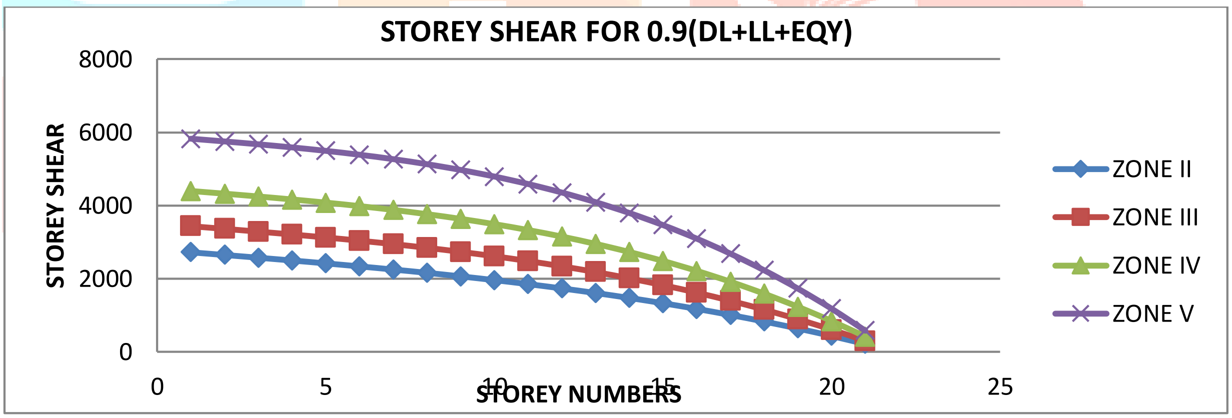

Fig 23: Storey shear graph for 0.9(DL+LL+EQY)

If you look at the graph of storey shear shown in Fig. 23, you can see that it decreases with building height and is lowest at the top level. The model's shear value per storey in Zone II is 214.8871 KN, whereas in Zone V it jumps to 584.0534 KN.

6.6 STOREY SHEAR FOR WIND LOAD

6.6.1 Storey shear for 1.2(DL+LL+WX)

STOREY	STOREY SHEAR			
	33 m/s	39 m/s	46 m/s	50 m/s
1	4509.164	5488.191	6836.619	7497.075
2	4314.111	5254.32	6549.284	7184.131
3	4119.057	5020.449	6261.949	6871.186
4	3923.713	4786.17	5974.047	6557.718
5	3724.655	4546.707	5678.931	6237.584
6	3520.181	4299.677	5373.289	5907.111
7	3312.611	4048.325	5061.634	5567.87
8	3102.295	3793.136	4744.642	5220.702
9	2888.832	3533.552	4421.535	4866.303
10	2672.147	3269.469	4092.168	4504.643
11	2452.472	3001.208	3756.991	4136.241
12	2230.875	2730.263	3418.078	3763.506
13	2007.617	2456.999	3075.939	3387.026
14	1782.688	2181.4	2730.553	3006.776
15	1556.076	1903.452	2381.897	2622.731
16	1327.771	1623.138	2029.951	2234.866
17	1097.766	1340.45	1674.702	1843.165
18	866.3308	1055.764	1316.674	1448.239
19	633.8939	769.6799	956.7	1051.051
20	400.489	482.2434	594.8448	651.6791
21	166.1127	193.4499	231.1019	250.1146

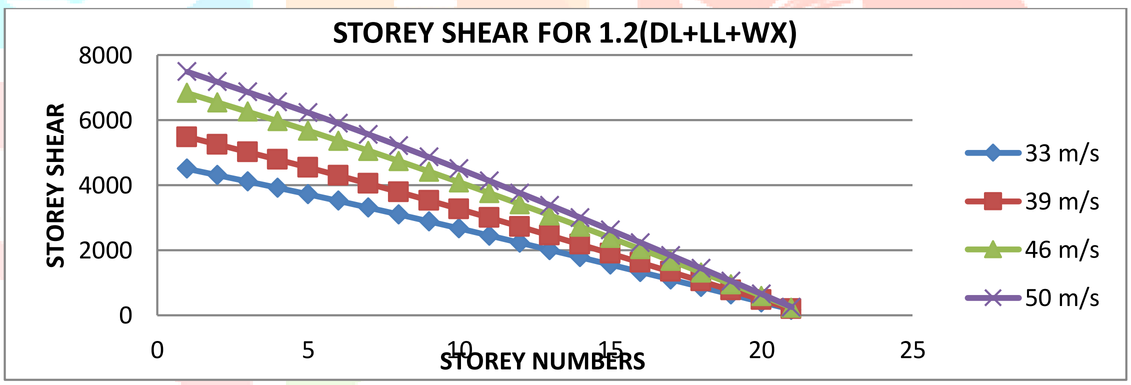

Fig 24: Storey shear graph for 1.2(DL+LL+WX)

The above graph of storey shear (fig. 24) shows that, in all building models, storey shear is reduced towards the top level as height increases. Storey shear is 166.1127 kN when the wind is blowing at 33 meters per second and 250.11 kN when the wind is blowing at 50 meters per second.

6.6.2 Storey shear for 1.2(DL+LL+WY)

STOREY	STOREY SHEAR			
	33 m/s	39 m/s	46 m/s	50 m/s
1	4509.164	5488.191	6836.619	7497.075
2	4314.111	5254.32	6549.284	7184.131
3	4119.057	5020.449	6261.949	6871.186
4	3923.713	4786.17	5974.047	6557.718
5	3724.655	4546.707	5678.931	6237.584
6	3520.181	4299.677	5373.289	5907.111
7	3312.611	4048.325	5061.634	5567.87
8	3102.295	3793.136	4744.642	5220.702
9	2888.832	3533.552	4421.535	4866.303
10	2672.147	3269.469	4092.168	4504.643
11	2452.472	3001.208	3756.991	4136.241
12	2230.875	2730.263	3418.078	3763.506
13	2007.617	2456.999	3075.939	3387.026
14	1782.688	2181.4	2730.553	3006.776
15	1556.076	1903.452	2381.897	2622.731
16	1327.771	1623.138	2029.951	2234.866
17	1097.766	1340.45	1674.702	1843.165
18	866.3308	1055.764	1316.674	1448.239
19	633.8939	769.6799	956.7	1051.051
20	400.489	482.2434	594.8448	651.6791
21	166.1127	193.4499	231.1019	250.1146

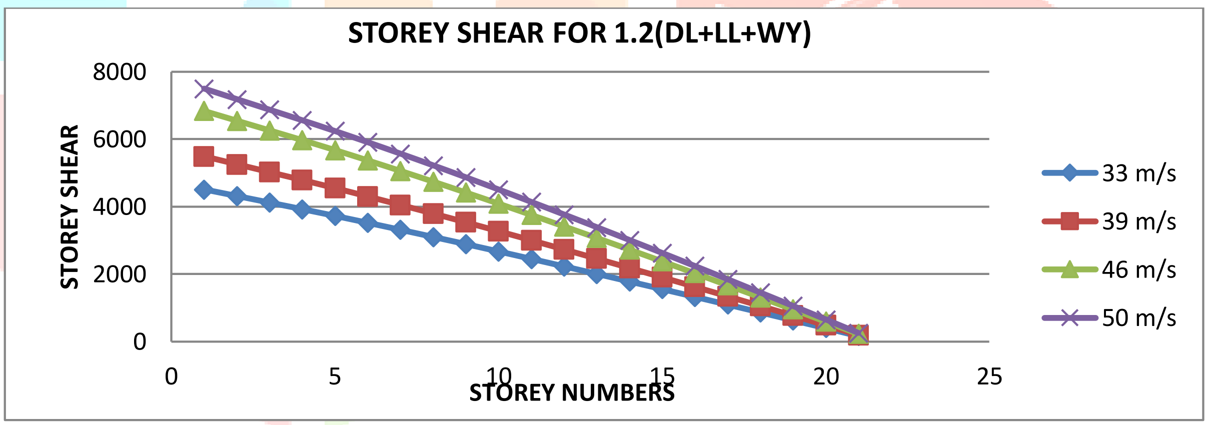

Fig 25: Storey shear graph for 1.2(DL+LL+WY)

As can be seen in the storey shear graph (fig. 25), storey shear decreases with increasing building height and is lowest at the top level. Storey shear is 166.1127 kN when the wind is blowing at 33 meters per second and 250.11 kN when the wind is blowing at 50 meters per second.

6.6.3 Storey shear for 0.9(DL+LL+WX)

STOREY	STOREY SHEAR			
	33 m/s	39 m/s	46 m/s	50 m/s
1	3381.873	4116.143	5127.464	5622.806
2	3235.583	3940.74	4911.963	5388.098
3	3089.293	3765.337	4696.461	5153.39
4	2942.784	3589.628	4480.535	4918.288
5	2793.491	3410.03	4259.198	4678.188
6	2640.136	3224.758	4029.967	4430.333
7	2484.459	3036.244	3796.226	4175.903
8	2326.721	2844.852	3558.481	3915.526
9	2166.624	2650.164	3316.151	3649.727
10	2004.11	2452.101	3069.126	3378.482
11	1839.354	2250.906	2817.743	3102.181
12	1673.156	2047.697	2563.559	2822.629
13	1505.713	1842.749	2306.955	2540.269
14	1337.016	1636.05	2047.915	2255.082
15	1167.057	1427.589	1786.423	1967.048
16	995.8281	1217.353	1522.463	1676.149
17	823.3243	1005.337	1256.026	1382.374
18	649.7481	791.8233	987.5057	1086.179
19	475.4204	577.2599	717.525	788.2883
20	300.3668	361.6825	446.1336	488.7593
21	124.5845	145.0874	173.3264	187.5859

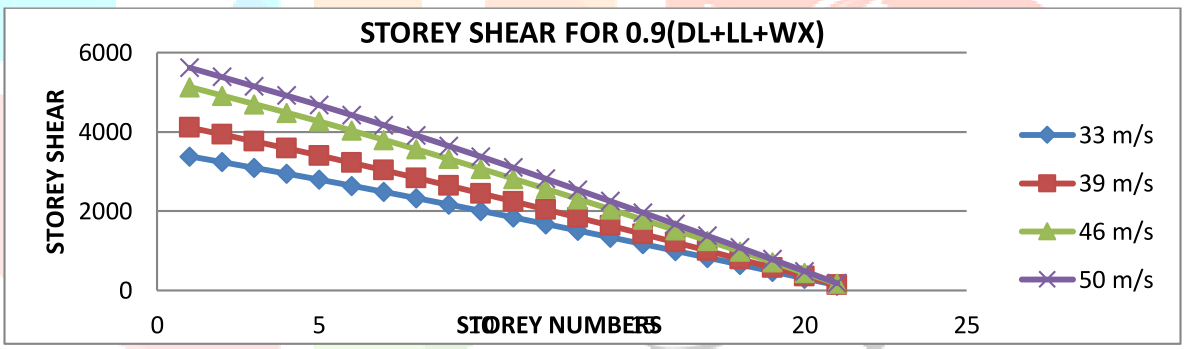

Fig 26: Storey shear graph for 0.9(DL+LL+WX)

The above graph of storey shear (fig. 26) shows that, in all building models, storey shear is reduced towards the top level as height increases. At a low wind speed of 33 m/s, the storey shear value is 124.5845 KN, while at a high wind speed of 50 m/s, it is 187.5859 kN.

6.6.4 Storey shear for 0.9(DL+LL+WY)

STOREY	STOREY SHEAR			
	33 m/s	39 m/s	46 m/s	50 m/s
1	3381.873	4116.143	5127.464	5622.806
2	3235.583	3940.74	4911.963	5388.098
3	3089.293	3765.337	4696.461	5153.39
4	2942.784	3589.628	4480.535	4918.288
5	2793.491	3410.03	4259.198	4678.188
6	2640.136	3224.758	4029.967	4430.333
7	2484.459	3036.244	3796.226	4175.903
8	2326.721	2844.852	3558.481	3915.526
9	2166.624	2650.164	3316.151	3649.727
10	2004.11	2452.101	3069.126	3378.482
11	1839.354	2250.906	2817.743	3102.181
12	1673.156	2047.697	2563.559	2822.629
13	1505.713	1842.749	2306.955	2540.269
14	1337.016	1636.05	2047.915	2255.082
15	1167.057	1427.589	1786.423	1967.048
16	995.8281	1217.353	1522.463	1676.149
17	823.3243	1005.337	1256.026	1382.374
18	649.7481	791.8233	987.5057	1086.179
19	475.4204	577.2599	717.525	788.2883
20	300.3668	361.6825	446.1336	488.7593
21	124.5845	145.0874	173.3264	187.5859

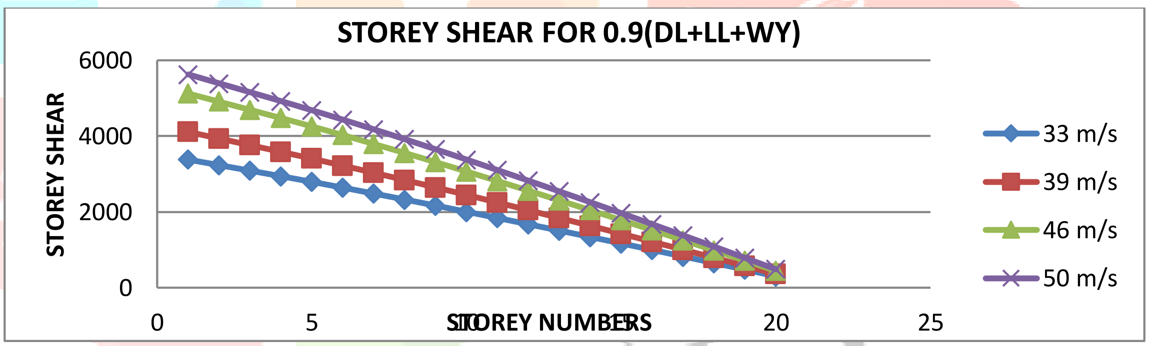

Fig 27: Storey shear graph for 0.9(DL+LL+WY)

As can be seen in the graph of storey shear above (fig. 27), storey shear decreases with increasing building height and is lowest at the top level. At a low wind speed of 33 m/s, the storey shear value is 124.5845 KN, while at a high wind speed of 50 m/s, it is 187.5859 kN.

6.7 RESPONSE SPECTRUM METHOD

6.7.1 DISPLACEMENT FOR SPEC X:

STOREY	DISPLACEMENT			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000369	0.00059	0.000885	0.001327
2	0.001199	0.001919	0.002878	0.004317
3	0.002256	0.00361	0.005415	0.008122
4	0.003417	0.005468	0.008202	0.012303
5	0.004618	0.007389	0.011083	0.016625
6	0.005822	0.009315	0.013972	0.020958
7	0.007006	0.01121	0.016815	0.025222
8	0.008158	0.013052	0.019578	0.029367
9	0.009265	0.014825	0.022237	0.033355
10	0.010321	0.016514	0.024771	0.037157
11	0.011318	0.018109	0.027164	0.040746
12	0.012251	0.019601	0.029401	0.044102
13	0.013112	0.020979	0.031469	0.047203
14	0.013898	0.022237	0.033355	0.050032
15	0.014603	0.023365	0.035048	0.052572
16	0.015225	0.024359	0.036539	0.054809
17	0.015759	0.025214	0.037821	0.056732
18	0.016205	0.025927	0.038891	0.058336
19	0.016564	0.026502	0.039752	0.059629
20	0.016843	0.026948	0.040422	0.060633
21	0.017059	0.027294	0.040941	0.061411

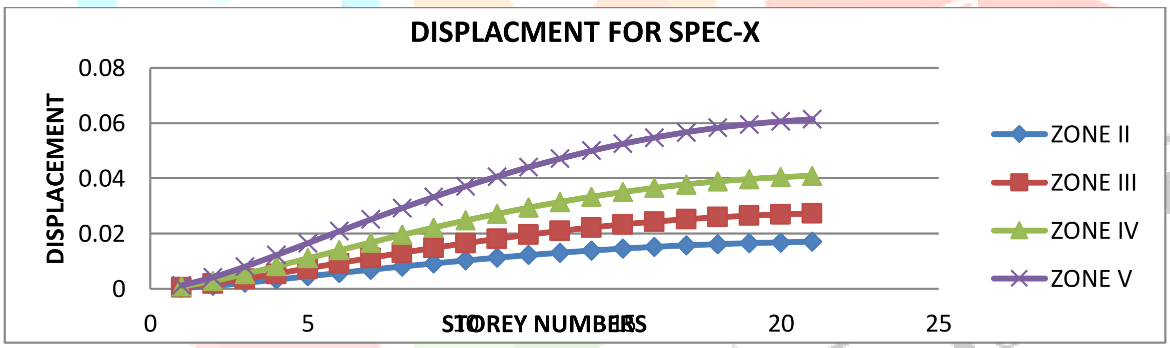

Fig 28: Displacement graph for SPEC X

Figure 28 shows that when seismic zones expand, so does the displacement of the building models inside them. Displacement is extreme at the top and minimal at the bottom. It has been calculated that a zone II displacement of 0.001032m and a zone V displacement of 0.002192m have occurred. What this implies is that the amount of space being moved is going to rise by a factor of 200. It's possible that Zone II may become Zone V.

6.7.2 STOREY DRIFT FOR SPEC X:

STOREY	STOREY DRIFT			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000123	0.000197	0.000295	0.000442
2	0.000277	0.000443	0.000664	0.000997
3	0.000352	0.000564	0.000846	0.001268
4	0.000387	0.00062	0.000929	0.001394
5	0.0004	0.000641	0.000961	0.001441
6	0.000402	0.000643	0.000964	0.001446
7	0.000396	0.000633	0.000949	0.001424
8	0.000385	0.000616	0.000924	0.001386
9	0.000371	0.000593	0.00089	0.001335
10	0.000354	0.000567	0.00085	0.001275
11	0.000335	0.000536	0.000804	0.001206
12	0.000314	0.000502	0.000754	0.00113
13	0.000291	0.000466	0.000698	0.001048
14	0.000266	0.000426	0.000639	0.000959
15	0.00024	0.000384	0.000576	0.000864
16	0.000212	0.000339	0.000509	0.000764
17	0.000183	0.000293	0.00044	0.000659
18	0.000154	0.000246	0.000368	0.000553
19	0.000124	0.000199	0.000298	0.000447
20	9.70E-05	0.000155	0.000232	0.000348
21	7.50E-05	0.00012	0.000179	0.000269

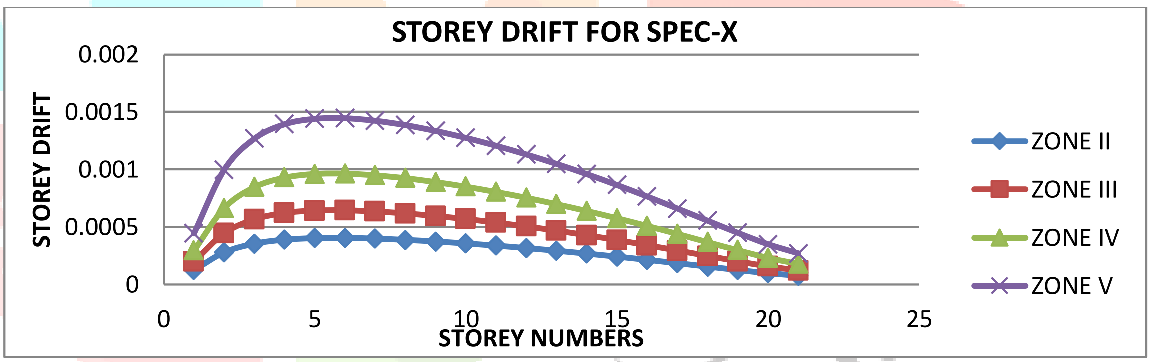

Fig 29: Storey drift graph for SPEC X

As can be seen in graph of storey drift above (fig. 29), as the seismic zone factor rises, so does the amount of storey drift. Also, ZONE V has the most potential for storey drift. Displacement along a storey is 0.000402 in zone II and 0.001446 in zone V.

6.7.3 STOREY SHEAR FOR SPEC X:

STOREY	STOREY SHEAR			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	1324.5131	2119.221	3178.8315	4768.2473
2	1321.6835	2114.6936	3172.0404	4758.0607
3	1312.6938	2100.31	3150.465	4725.6975
4	1296.3894	2074.2231	3111.3346	4667.0019
5	1272.751	2036.4016	3054.6024	4581.9036
6	1242.1319	1987.4111	2981.1166	4471.675
7	1204.8381	1927.7409	2891.6114	4337.4171
8	1161.0627	1857.7003	2786.5504	4179.8256
9	1111.0151	1777.6241	2666.4362	3999.6543
10	1055.0116	1688.0186	2532.0279	3798.0419
11	993.4118	1589.4589	2384.1884	3576.2825
12	926.4766	1482.3625	2223.5437	3335.3156
13	854.3129	1366.9007	2050.3511	3075.5266
14	776.9755	1243.1608	1864.7412	2797.1118
15	694.6175	1111.3881	1667.0821	2500.6232
16	607.5143	972.0228	1458.0343	2187.0514
17	515.8972	825.4354	1238.1532	1857.2298
18	419.7467	671.5947	1007.3921	1511.0881
19	318.7805	510.0488	765.0733	1147.6099
20	212.7268	340.3628	510.5442	765.8163
21	101.681	162.6896	244.0344	366.0516

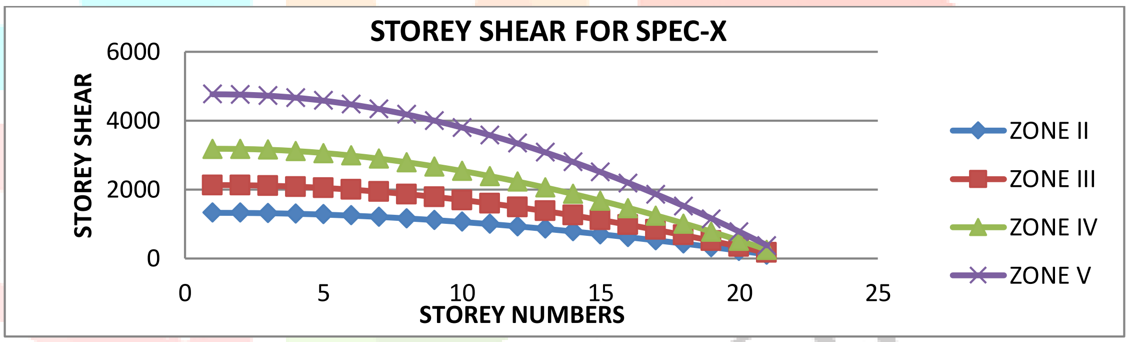

Fig 30: Storey shear graph for SPEC X

The above graph of storey shear (fig. 30) shows that, in all building models, storey shear decreases with increasing building height and is lowest at the top level. The strongest story shear is towards the floor. And the model's storey shear value in ZONE II is 101.681 KN, while in ZONE V it is 366.0516 KN.

VII. CONCLUSIONS

Based on this research, relevant findings have been drawn as:

1. As we go upward in the seismic zone, its base shear of structure rises. Shear values for Zone II are 1324.5 KN, while for Zone V, they are 4768.2 KN for a comparable structure.For example, if seismic ZONE moves from II to V,base shear will rise by over more 360 %.
2. With a rise in number of seismic zones, models of buildings are displaced farther. As you go up, the displacement becomes much larger, and as you go down, it gets less. The ZONE II displacement is 0.017059m, whereas the ZONE V displacement is 0.0614 m. Changing the seismic ZONE from II to V results in a 350 percent increase in it.
3. Wind pressure increases displacement of building models. At the top, the displacement is quite high, and at the bottom, it is very low. At wind speeds of 33 m/s and 50 m/s, the displacement is 0.0475885 m and 0.078398 m, respectively. As the wind speed rises from 33m/s to 50 m/s, the displacement rises by over half.
4. The storey drift occurs mostly in the midsection of the structure. Table 5.3.1, 5.3.2&5.3.3 show that when the seismic zone factor rises, storey drifting rises as well. ZONE V also offers the maximal storey drift for maximum load combination upon that 5th level. At the 5th level, ZONE II has a storey drift of 0.001069 and ZONE V has a storey drift of 0.0023899 m. In other words, the storey drift in ZONE II to ZONE V has increased by more than 50%.
5. In the centre of the building, at the 5th level, the storey drift is greatest owing to the wind load, and it increases steadily as the wind pressure increases. At a wind speed of 33m/s, value of storey drifting is 0.00122, whereas at a wind speed

of 50 m/s, it is 0.002011. If the wind speed rises from 33 m/s to 50 m/s, the storey drift rises by over 165 percent.

6. Even as height of structure is raised, the storey shear decreases, and it is at its lowest at the top floor when all building models exposed to seismic stresses are taken into account. The strongest story shear is towards the floor. In addition, the model's storey shear value is 101.681 KN in zone II and 366.051 KN in zone V. This translates to a 350% increase in storey shear.
7. We can lessen the damage caused by a seismic event on a R C structure located in a high seismic zone by adding shear walls, damper, rubber padding, and springs.

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