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

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ABSTRACT:

When a structure is subjected to earthquake, it responds by vibrating. An earthquake force can be resolved into three mutually perpendicular directions-the two horizontal directions (x and y) and the vertical direction (z). This motion causes the structure to vibrate or shake in all three directions; the predominant direction of shaking is horizontal. It is very essential to consider the effects of lateral loads induced from wind and earthquakes in the analysis of reinforced concrete structures, especially for high-rise buildings. The basic intent of analysis for earthquake resistant structures is that buildings should be able to resist minor earthquakes without damage. It resists moderate earthquakes without structural damage but sometimes non-structural damage will resist major earthquakes without collapse the major structure. To avoid collapse during a major earthquake, members must be ductile enough to absorb and dissipate energy by post-elastic deformation. Redundancy in the structural system permits redistribution of internal forces in the failure of key elements. When the primary element or system yields or fails, the lateral force certainly redistributed to a secondary system to prevent progressive failure. The objectives of the present work is to study the behavior of a multi storied R C building irregular in plan subjected to earth quake load by adopting Response spectrum analysis.

The present study is limited to reinforced concrete (RC) multi-storied commercial building with FOUR different zones II, III, IV & V .The analysis is Carried out the help of FEM software's ETabs. The building model in the study has twenty storey's with constant storey height of 3m. FOUR models are used to analyze with different bay lengths and the number of Bays and the bay-width along two horizontal directions are kept constant in each model for convenience. Different values of SEISMIC ZONE FACTOR are taken and their corresponding effects are interpreted in the results.

I.INTRODUCTION:

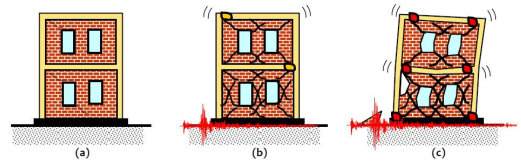
Dynamic actions are caused on buildings by both wind and earthquakes. But, design for wind forces and for earthquake effects are distinctly different. The intuitive philosophy of structural design uses force as the basis, which is consistent in wind design, wherein the building is subjected to a pressure on its exposed surface area; this is force-type loading. However, in earthquake design, the building is subjected to random motion of the ground at its base, which induces inertia forces in the building that in turn cause stresses; this is displacement-type loading. Another way of expressing this difference is through the load-deformation curve of the building – the demand on the building is force(i.e., vertical axis) in force-type loading imposed by wind pressure, and displacement(i.e., horizontal axis) in displacement-type loading imposed by earthquake shaking. Wind force on the building has a non-zero mean component superposed with a relatively small oscillating component. Thus, under wind forces, the building may experience small fluctuations in the stress field, but reversal of stresses occurs only when the direction of wind reverses, which happens only over a large duration of time. On the other hand, the motion of the ground during the earthquake is cyclic about the neutral position of the structure. Thus, the stresses in the building due to seismic actions undergo many complete reversals and that to over the small duration of earthquake.

BASIC ASPECTS OF SEISMIC DESIGN

The mass of the building being designed controls seismic design in addition to the building stiffness, because earthquake induces inertia forces that are proportional to the building mass. Designing buildings to behave elastically during earthquakes without damage may render the project economically unviable. As a consequence, it may be necessary for the structure to undergo damage and thereby dissipate the energy input to it during the earthquake. Therefore, the traditional earthquake-resistant design philosophy requires that normal buildings should be able to resist:

(a) Minor (and frequent) shaking with no damage to structural and non-structural elements;
(b) Moderate shaking with minor damage to structural elements, and some damage to non-structural elements; and
(c) Severe (and infrequent) shaking with damage to structural elements, but with NO collapse (to save life and property inside/adjoining the building).

. In contrast, structural damage is not acceptable under design wind forces. For this reason, design against earthquake effects is called as earthquake-resistant design and not earthquake-proof design

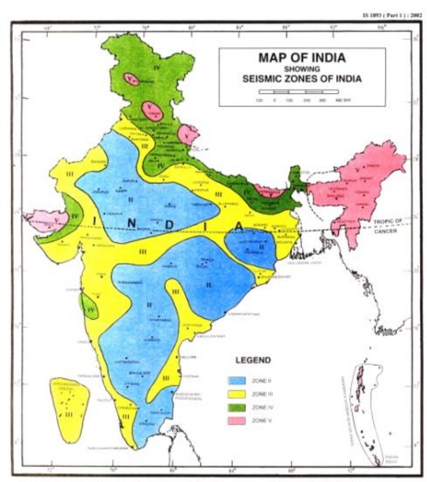


Earthquake-Resistant Design Philosophy for buildings

(a) Minor (Frequent) Shaking –No/Hardly any damage
(b) Moderate Shaking – Minor structural damage, and some non-structural damage
(c) Severe (Infrequent) Shaking – Structural damage, but NO collapse

SEISMIC ZONES OF INDIA

Based on the levels of intensities sustained during damaging past earthquakes, the seismic zone map is revised with only four zones, instead of five. Erstwhile Zone I has been merged to Zone II. Hence, Zone I does not appear in the new zoning; only Zones II, III, IV and V.



Modified Seismic zones of INDIA (IS 1893-PART 1 2002).

OBJECTIVES OF THE STUDY

The present work aims at the study of following objectives:

1. How the seismic evaluation of a building should be carried out.
2. To study the behavior of a building under the action of seismic loads and wind loads.
3. To compare various analysis results of building under zone II, III, IV and zone V using ETABS Software.
4. The building model in the study has twenty storey's with constant storey height of 3m.five models are used to analyze with constant bay lengths and the number of Bays and the bay-width along two horizontal directions are kept constant in each model for convenience.
5. Different values of zone factor are taken and their corresponding effects are interpreted in the results.
6. Different values of wind speeds are taken for wind analysis and their corresponding effects of building structure are interpreted in the results.

SCOPE OF THE STUDY

1. Based on project, study was undertaken with a view to determine the extent of possible changes in the seismic behavior of RC Building Models.

2. RC framed buildings are firstly designed for gravity loads and then for seismic loads.

3. The study has been carried out by introducing symmetrical bare frame building models on different zones using equivalent static method and Response Spectrum Analysis.

4. The study highlights the effect of seismic zone factor in different zones that is in Zone II, Zone III, Zone IV and Zone V which is considered in the seismic performance evaluation of buildings.

5. The study emphasis and discusses the effect of seismic zone factor on the seismic performance of G+20 building structure.

6. The entire process of modeling, analysis and design of all the primary elements for all the models are carried by using ETABS 9.7 nonlinear version software.

II. LITRETURE RIVIEW

JagMohan Humar et al (2013):

Determination of seismic design forces by equivalent static load method. The base shear and overturning moment adjustments presented in this paper form the basis for the corresponding provisions in the 2005 NBCC. The following conclusions are drawn from the results presented in this paper:

1. The base shear adjustment factor Mv and the overturning moment reduction factor J are both dependent on the characteristics of the lateral force resisting system. The factor Mv is largest for a flexural wall system and smallest for a moment-resisting frame. On the other hand, J is smallest for a flexural wall and largest for a moment resisting frame.

2. The factors Mv and J also depend on the first mode period Ta. Thus Mv increases with an increase in Ta, whereas J decreases with an increase in Ta.

3. The factors Mv and J strongly depend on the shape of the response spectrum. Compared with the western regions of Canada, the UHS for the eastern regions drops more rapidly with an increase in period. Thus the higher mode contribution is more predominant in the east; as a consequence, Mv values are larger and J values smaller for the eastern region.

Conrad PAULSON et al (2004): Seismic versus wind design base shear forces in eastern and Midwestern United States.

For low-rise structures, however, seismic design forces may at times be significant, even in the relatively low ground shaking design hazard of Chicago. Site soil classification has a significant influence as to whether seismic or wind controls the design base shear. For low-rise buildings on sites of soil in Chicago and New York City, seismic demands can dominate lateral strength proportioning. However, wind design usually governs strength proportioning for low-rise buildings on rock, particularly in areas of high wind exposure.

On a practical basis, the effects of increased seismic demands on the economy of the lateral load system may not be significant. Particularly in Chicago, even though the strength requirement due to seismic design may be twice that of wind for some low-rise structures, both of these forces are relatively small in absolute force magnitude. Consequently, when the incremental increase of structure costs due to the seismic strength requirements is compared to the total cost of a structure, the change in total cost may not be significant.

Other than the anomaly associated with the introduction of the soils coefficients in ASCE 7-95, which seems to have been rectified with the ASCE 7-98 edition, there appears to be no dramatic, overall increase in seismic design accelerations with the newer editions of ASCE 7 for regions of low to moderate seismicity in the Midwestern and Eastern United States. In fact, the newest edition of ASCE 7 produces smaller design accelerations in Atlanta and New York City than the older editions.

AzlanAdnan, SuhanaSuradi et al (2008):

Comparison on the effect of earthquake and wind loads on the performance of reinforced concrete buildings.

III. METHODLOGY

SEISMIC ANALYSIS AS PER THE IS CODE

When a structure is subjected to earthquake, it responds by vibrating. An earthquake force can be resolved into three mutually perpendicular directions- the two horizontal directions (x and y) and the vertical direction (z). This motion causes the structure to vibrate or shake in all three directions; the predominant direction of shaking is horizontal. All the structures are primarily designed for gravity loads-force equal to mass time's gravity in the vertical direction. Because of the inherent factor of safety used in the design specifications, most structures tend to be adequately protected against vertical shaking. Vertical acceleration should also be considered in structures with large spans, those in which stability for design, or for overall stability analysis of structures.

IS 1893 (part-1) code recommends that detailed dynamic analysis, or pseudo static analysis should be carried out depending on the importance of the problem. IS 1893(part1): 2002 recommends use of modal analysis using response spectrum method and equivalent lateral force method for building of height less than 40 m in all seismic zones.

WIND ANALYSIS

The basic wind speed (Vb) for any site shall be obtained IS 875-1987(3) and shall be modified to get the design wind velocity at any height (Vz) for a chosen structure.

$$V_z = V_b\, k_1 k_2\, k_3$$

Where,

V_z = design wind speed at any height z in m/s,

V_b = Basic wind speed in m/s,

k_1 = probability factor (risk coefficient),

k_2 = terrain roughness and height factor and

k_3 = topography factor.

The basic wind speed map of India, as applicable at 10 m height above mean ground level for different zones of the country selected from the code. The design wind pressure at any height above mean ground level shall be obtained by the following relationship between wind pressure and wind velocity.

$$Pz = 0.6\, V_z^2$$

Where,

Pz = wind pressure in N/m2 at height z and

Vz = design wind speed in m/s at height z.

IV MODELING AND ANALYSIS

COMPUTER PROGRAM

In this study a computer program has been developed to analyze the reinforced concrete buildings under wind and earthquake loads taking into account the new changes in the IS-1893 PART-1 2002.The program calculates the base shear that resist the design lateral loads. It calculates also the center of mass and the center of rigidity ofthe building. Moments, lateral shear forces and the additional shear forces due to torsion on each vertical element resisting lateral load at the each floor are also calculated. All the results are illustrated graphically by the program to clearly showing the results

BUILDING CONFIGRATION

The building model in the study has twenty storeys with constant storey height of 3m. FOUR models are used to analyze with equal bay lengths and the number of Bays and the bay-width along two horizontal directions are kept constant in each model for convenience. Different values of ZONE FACTOR are taken and their corresponding effects are interpreted in the results. Other details are given below:

PARAMETERS	ZONE II	ZONE III	ZONE IV	ZONE V
Seismic zone factor	0.10	0.16	0.24	0.36
Basic wind speed	44 m/s	39 m/s	47 m/s	50 m/s
Response reduction factor	5	5	5	5
Importance factor	1	1	1	1
Soil condition	Medium	Medium	Medium	Medium
Slab thickness	0.150 m	0.150 m	0.150 m	0.150 m
Beam size	0.45x0.25 m	0.45x0.25 m	0.45x0.25 m	0.45x0.25 m
Column size	0.75x0.75 m	0.75x0.75 m	0.75x0.75 m	0.75x0.75 m
Live load	2 kN/m^2	2 kN/m^2	2 kN/m^2	2 kN/m^2
Dead load	4.5 kN/m^2	4.5 kN/m^2	4.5 kN/m^2	4.5 kN/m^2
Floor finish	1.1Kn/m^2	1.1Kn/m^2	1.1Kn/m^2	1.1Kn/m^2
Material properties	M_{30}	M_{30}	M_{30}	M_{30}

Building configuration data.

LOADING:

Loadingontallbuildingsdifferfromloadingonlow-risebuildinginitsaccumulationinto muchlargerstructuralforces,intheincreasedsignificanceofwindloading,andinthegreater importanceof dynamiceffects.

Therearethreetypesofloadconsideredinthisstructuralanalysisanddesign.Theyare gravityloads that includedead load and liveload,wind and earthquakeloads.

GRAVITY LOADS

Dead loads are defined as gravity loads that will be accelerated laterally with the structural frame under earthquakemotion.

Liveloadsaredefinedasgravityloadsthatdonotacceleratelaterallyatthesamerateas the structural frame when the structureundergoesearthquakemotion.

LATERAL LOADS

Therearecertainloadsthatarealmostalwaysa ppliedhorizontally,andthesemustoften be considered in structural analysisanddesign. Such loads are called lateral loads. Some kinds of lateral loads that areimportant forstructures arewind load andearthquakeload.

WIND LOAD

Theforcesexertedbywindsonbuildingsincreas edramaticallywiththeincreasedin buildingheights.Forbuildingofuptoabout10storiesando ftypicalproportion,thedesignis rarelyaffectedbywindload. Abovethisheight,however,theincreaseinsizeofstructur al membertoaccountforwindloading,incursa costpremiumthatincreaseprogressivelywith height.

EARTHQUAKE LOAD

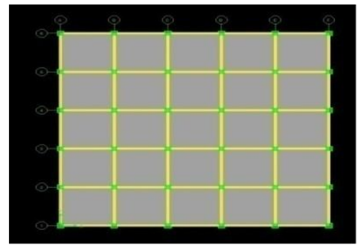
Earthquakeloadconsistsoftheinertialforcesoft hebuildingmassthatresultfromthe shakingofits foundation by a seismicdisturbance.Othersevereearthquakeforcesma yexist, such as those due to land sliding, subsidence, active faulting below the foundation, or liquefactionofthelocalsubgradeasaresult ofvibration.Whereasearthquakesoccur,their intensity isrelativeinverselyproportiontotheirfrequencyofoccurr ence;severeearthquakesare rare, moderate ones moreoften, and minor ones are relativelyfrequent.

LOAD COMBINATIONS

The various loads should, therefore, be combined in accordance with the stipulations in the relevant design codes. In the absence of such recommendations, the following loading combinations are made. The most unfavorable effect in the building, and structural member concerned may be adopted. It should also be recognized in load combinations that the simultaneously occurrence of maximum values of earthquake, Wind and imposed loads.

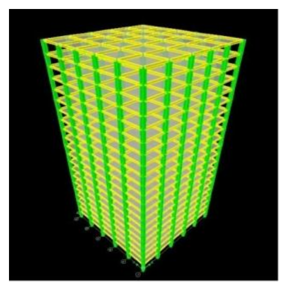
PLAN AND 3D MODEL OF BUILDING

PLAN:



Bare frame model in 2D view

3D MODEL:



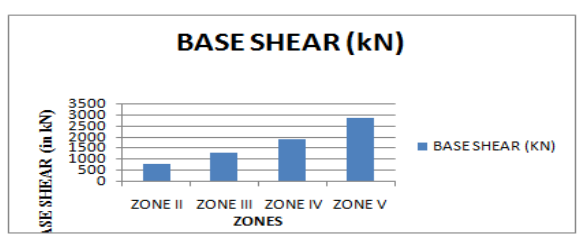
Bare frame model in 3D view.

V RESULTS AND DISCUSSION:

BASE SHEAR

ZONES	BASE SHEAR (kN)
ZONE II	802.6
ZONE III	1284
ZONE IV	1926
ZONE V	2889

Base shear values for different zones

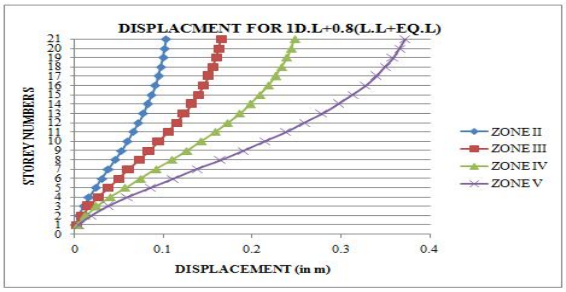


Variation of Base shear values For Different Zones of INDIA

POINT DISPLACEMENT:

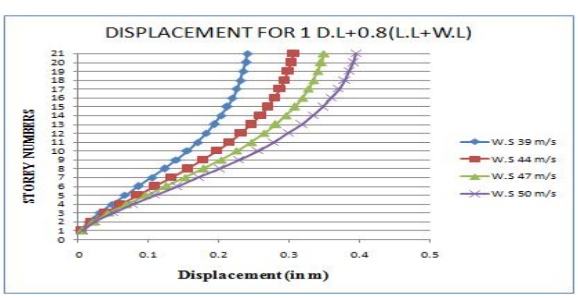
Displacement values for1D.L+0.8(L.L+EQ.L).

STOREY	Displacement (in m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.0014	0.0023	0.0034	0.0051
2	0.0051	0.0082	0.0123	0.0184
3	0.0104	0.0166	0.0249	0.0374
4	0.0167	0.0268	0.0401	0.0602
5	0.0237	0.0379	0.0569	0.0853
6	0.031	0.0496	0.0744	0.1116
7	0.0384	0.0614	0.0921	0.1382
8	0.0457	0.0731	0.1097	0.1645
9	0.0528	0.0845	0.1267	0.19
10	0.0596	0.0953	0.1429	0.2144
11	0.066	0.1055	0.1583	0.2374
12	0.0719	0.1151	0.1726	0.2589
13	0.0774	0.1238	0.1858	0.2787
14	0.0824	0.1318	0.1977	0.2966
15	0.0869	0.139	0.2085	0.3127
16	0.0908	0.1453	0.218	0.327
17	0.0942	0.1508	0.2262	0.3393
18	0.0972	0.1555	0.2332	0.3498
19	0.0996	0.1594	0.239	0.3586
20	0.1016	0.1626	0.2439	0.3658
21	0.1033	0.1653	0.248	0.372



DISPLACEMENT (UX) FOR LOAD COMBO 1D.L+0.8L.L+0.8W

STOREY	Displacement (in m)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	0.0042	0.0054	0.0061	0.0069
2	0.015	0.019	0.0217	0.0246
3	0.03	0.0382	0.0436	0.0493
4	0.0476	0.0606	0.0692	0.0783
5	0.0665	0.0847	0.0966	0.1093
6	0.0858	0.1092	0.1246	0.141
7	0.1047	0.1332	0.152	0.1721
8	0.1228	0.1563	0.1783	0.2018
9	0.1398	0.1779	0.203	0.2297
10	0.1554	0.1978	0.2257	0.2555
11	0.1697	0.216	0.2464	0.2789
12	0.1825	0.2323	0.265	0.2999
13	0.1938	0.2467	0.2815	0.3186
14	0.2038	0.2594	0.296	0.335
15	0.2124	0.2703	0.3084	0.3491
16	0.2197	0.2796	0.3191	0.3611
17	0.2258	0.2874	0.328	0.3712
18	0.2309	0.2939	0.3353	0.3795
19	0.235	0.2991	0.3413	0.3862
20	0.2383	0.3033	0.3461	0.3917
21	0.2411	0.3069	0.3502	0.3963

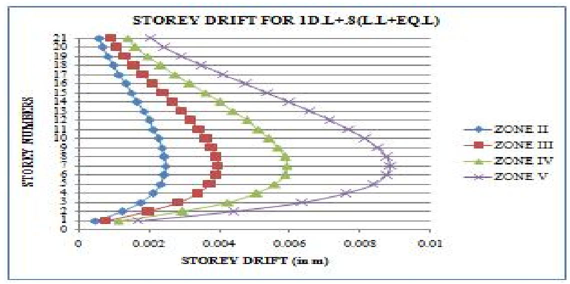


STOREY DRIFT FOR EARTH QUAKE LOAD:

Storey drift values for 1D.L+0.8(L.L+EQ.L)

STOREY	STOREY DRIFT (in m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000473	0.000756	0.001134	0.001702
2	0.00123	0.001968	0.002952	0.004428
3	0.00176	0.002815	0.004223	0.006334
4	0.002111	0.003377	0.005066	0.007599
5	0.002325	0.00372	0.005579	0.008369
6	0.002434	0.003894	0.005841	0.008761
7	0.002464	0.003942	0.005913	0.00887
8	0.002435	0.003896	0.005845	0.008767
9	0.002363	0.003781	0.005671	0.008507
10	0.002259	0.003614	0.005422	0.008133
11	0.002132	0.00341	0.005116	0.007674
12	0.001987	0.003179	0.004769	0.007153
13	0.00183	0.002928	0.004392	0.006587
14	0.001664	0.002662	0.003993	0.00599
15	0.001492	0.002387	0.00358	0.005371
16	0.001317	0.002107	0.00316	0.004741
17	0.001142	0.001827	0.002741	0.004111
18	0.000972	0.001555	0.002333	0.003499
19	0.000813	0.0013	0.001951	0.002926
20	0.000675	0.001079	0.001619	0.002429
21	0.000573	0.000917	0.001375	0.002062

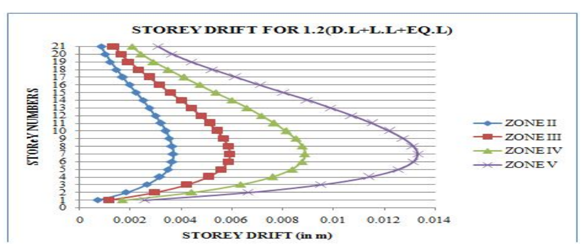
Graph:



Storey drift values for load 1.2 (D.L+L.L+EQ)

STOREY	STOREY DRIFT (in m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000709	0.001134	0.001702	0.002553
2	0.001845	0.002952	0.004428	0.006642
3	0.002639	0.004223	0.006334	0.009502
4	0.003166	0.005066	0.007599	0.011399
5	0.003487	0.005579	0.008369	0.012553
6	0.003651	0.005841	0.008761	0.013142
7	0.003696	0.005913	0.00887	0.013305
8	0.003653	0.005845	0.008767	0.01315
9	0.003545	0.005671	0.008507	0.012761
10	0.003389	0.005422	0.008133	0.012199
11	0.003197	0.005116	0.007674	0.01151
12	0.00298	0.004769	0.007153	0.010729
13	0.002745	0.004392	0.006587	0.009881
14	0.002496	0.003993	0.00599	0.008985
15	0.002238	0.00358	0.005371	0.008056
16	0.001975	0.00316	0.004741	0.007111
17	0.001713	0.002741	0.004111	0.006167
18	0.001458	0.002333	0.003499	0.005248
19	0.001219	0.001951	0.002926	0.004389
20	0.001012	0.001619	0.002429	0.003643
21	0.000859	0.001375	0.002062	0.003093

Graph:

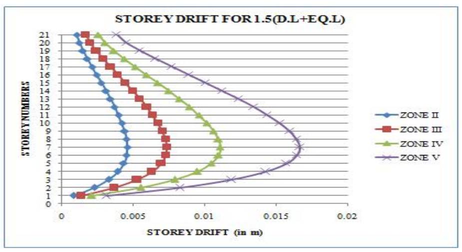


Storey drift for 1.2 (D.L+L.L+EQ)

STOREY DRIFT FOR 1.5 (D.L+EQ)

Storey	STOREY DRIFT (in m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	0.000886	0.001418	0.002127	0.003191
2	0.002306	0.00369	0.005535	0.008302
3	0.003299	0.005279	0.007918	0.011877
4	0.003958	0.006333	0.009499	0.014249
5	0.004359	0.006974	0.010461	0.015692
6	0.004563	0.007301	0.010952	0.016428
7	0.00462	0.007392	0.011087	0.016631
8	0.004566	0.007306	0.010959	0.016438
9	0.004431	0.007089	0.010634	0.015951
10	0.004236	0.006777	0.010166	0.015249
11	0.003997	0.006395	0.009592	0.014388
12	0.003725	0.005961	0.008941	0.013412
13	0.003431	0.005489	0.008234	0.012351
14	0.00312	0.004991	0.007487	0.011231
15	0.002797	0.004476	0.006713	0.01007
16	0.002469	0.003951	0.005926	0.008889
17	0.002141	0.003426	0.005139	0.007709
18	0.001822	0.002916	0.004373	0.00656
19	0.001524	0.002438	0.003657	0.005486
20	0.001265	0.002024	0.003036	0.004553
21	0.001074	0.001719	0.002578	0.003867

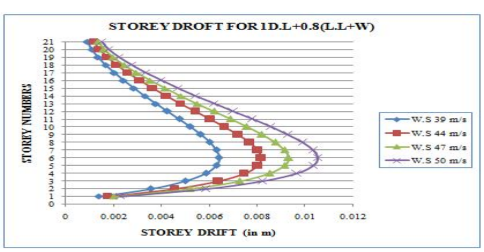
Graph:



STOREY DRIFT FOR WIND LOAD (W.L):

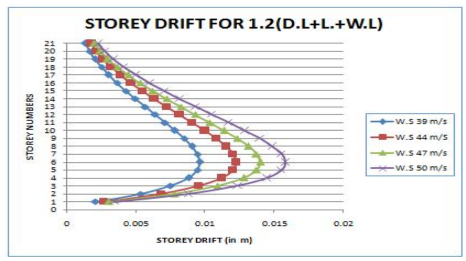
Storey drift for 1D.L+0.8(L.L+W.L)

Storey	39 m/s	44 m/s	47 m/s	50 m/s
1	0.001403	0.00179	0.00204	0.002306
2	0.003582	0.00456	0.0052	0.005888
3	0.005014	0.00638	0.00728	0.008242
4	0.005873	0.00748	0.00853	0.009654
5	0.006302	0.00802	0.00915	0.010359
6	0.006415	0.00817	0.00932	0.010545
7	0.006302	0.00802	0.00915	0.010359
8	0.006033	0.00768	0.00876	0.009916
9	0.00566	0.0072	0.00822	0.009303
10	0.005224	0.00665	0.00759	0.008586
11	0.004753	0.00605	0.0069	0.007812
12	0.004268	0.00543	0.0062	0.007015
13	0.003785	0.00482	0.0055	0.006222
14	0.003314	0.00422	0.00481	0.005448
15	0.002863	0.00364	0.00416	0.004706
16	0.002437	0.0031	0.00354	0.004006
17	0.002042	0.0026	0.00297	0.003356
18	0.001683	0.00214	0.00244	0.002766
19	0.00137	0.00174	0.00199	0.002251
20	0.001114	0.00142	0.00162	0.001831
21	0.000937	0.00119	0.00136	0.00154



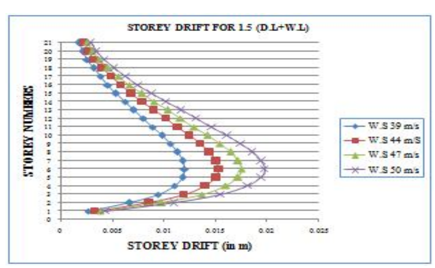
STOREY DRIFT FOR 1.2 (D.L+L.L+W.L)

Storey	STOREY DRIFT (in m)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	0.002104	0.002678	0.003056	0.003459
2	0.005374	0.00684	0.007804	0.008832
3	0.007521	0.009573	0.010923	0.012362
4	0.00881	0.011214	0.012795	0.014481
5	0.009454	0.012033	0.01373	0.015538
6	0.009623	0.012249	0.013976	0.015817
7	0.009453	0.012033	0.013729	0.015538
8	0.009049	0.011518	0.013142	0.014874
9	0.00849	0.010807	0.01233	0.013955
10	0.007835	0.009973	0.01138	0.012879
11	0.007129	0.009074	0.010353	0.011717
12	0.006402	0.008149	0.009298	0.010523
13	0.005678	0.007227	0.008246	0.009333
14	0.004972	0.006328	0.00722	0.008172
15	0.004295	0.005466	0.006237	0.007059
16	0.003655	0.004653	0.005309	0.006008
17	0.003062	0.003898	0.004447	0.005033
18	0.002524	0.003213	0.003666	0.004149
19	0.002054	0.002615	0.002984	0.003377
20	0.001671	0.002127	0.002427	0.002747
21	0.001405	0.001789	0.002041	0.00231



STOREY DRIFT FOR 1.5 (D.L+W.L)

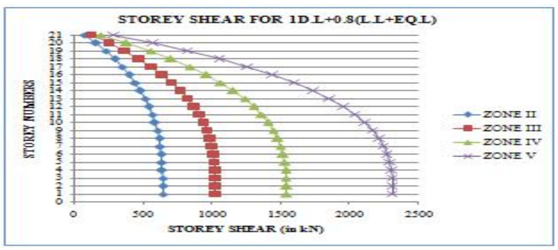
Storey	STOREY DRIFT (in m)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	0.00263	0.003348	0.00382	0.004323
2	0.006717	0.00855	0.009755	0.011041
3	0.009402	0.011967	0.013654	0.015453
4	0.011012	0.014017	0.015994	0.018101
5	0.011817	0.015041	0.017162	0.019423
6	0.012029	0.015311	0.01747	0.019771
7	0.011817	0.015041	0.017162	0.019423
8	0.011311	0.014398	0.016428	0.018592
9	0.010613	0.013508	0.015413	0.017443
10	0.009794	0.012466	0.014224	0.016098
11	0.008911	0.011342	0.012942	0.014647
12	0.008003	0.010186	0.011623	0.013154
13	0.007097	0.009034	0.010308	0.011666
14	0.006215	0.00791	0.009026	0.010215
15	0.005368	0.006833	0.007796	0.008823
16	0.004569	0.005816	0.006636	0.00751
17	0.003828	0.004872	0.005559	0.006292
18	0.003155	0.004016	0.004583	0.005186
19	0.002568	0.003269	0.003729	0.004221
20	0.002089	0.002659	0.003034	0.003434
21	0.001757	0.002236	0.002551	0.002887



STOREY SHEAR FOR EARTH QUAKE LOAD

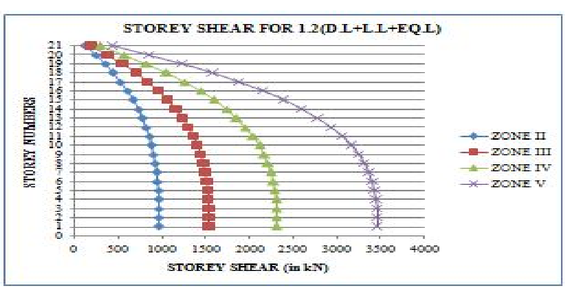
STOREY SHEAR FOR 1D.L+0.8(L.L+EQ.L)

Storey	STOREY SHEAR (in kN)			
	VX (ZONE II)	VX (ZONE III)	VX (ZONE IV)	VX (ZONE V)
1	642.1	1027.36	1541.04	2311.55
2	641.9	1027.04	1540.57	2310.85
3	641.12	1025.79	1538.69	2308.03
4	639.36	1022.98	1534.46	2301.7
5	636.23	1017.97	1526.95	2290.43
6	631.34	1010.14	1515.22	2272.82
7	624.3	998.88	1498.31	2247.47
8	614.71	983.54	1475.31	2212.97
9	602.19	963.51	1445.26	2167.9
10	586.35	938.16	1407.24	2110.86
11	566.79	906.86	1360.29	2040.43
12	543.12	868.99	1303.48	1955.23
13	514.95	823.92	1235.88	1853.82
14	481.89	771.03	1156.54	1734.81
15	443.55	709.68	1064.52	1596.78
16	399.54	639.26	958.89	1438.34
17	349.46	559.14	838.71	1258.06
18	292.93	468.69	703.03	1054.54
19	229.55	367.28	550.92	826.38
20	158.93	254.29	381.44	572.16
21	80.69	129.1	193.65	290.48



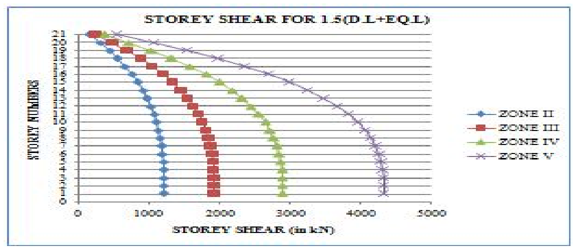
STOREY SHEAR FOR 1.2(D.L+L.L+EQ.L)

Storey	STOREY SHEAR (in kN)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	963.15	1541.04	2311.55	3467.33
2	962.85	1540.57	2310.85	3466.28
3	961.68	1538.69	2308.03	3462.05
4	959.04	1534.46	2301.7	3452.54
5	954.35	1526.95	2290.43	3435.64
6	947.01	1515.22	2272.82	3409.23
7	936.45	1498.31	2247.47	3371.21
8	922.07	1475.31	2212.97	3319.45
9	903.29	1445.26	2167.9	3251.84
10	879.52	1407.24	2110.86	3166.28
11	850.18	1360.29	2040.43	3060.65
12	814.68	1303.48	1955.23	2932.84
13	772.42	1235.88	1853.82	2780.73
14	722.84	1156.54	1734.81	2602.21
15	665.33	1064.52	1596.78	2395.18
16	599.31	958.89	1438.34	2157.51
17	524.19	838.71	1258.06	1887.09
18	439.39	703.03	1054.54	1581.82
19	344.33	550.92	826.38	1239.57
20	238.4	381.44	572.16	858.24
21	121.03	193.65	290.48	435.72



STOREY SHEAR FOR 1.5(D.L+EQ.L)

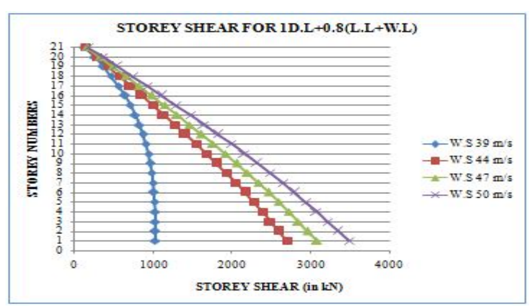
Storey	STOREY SHEAR (in kN)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	1203.93	1926.3	2889.44	4334.16
2	1203.57	1925.71	2888.56	4332.84
3	1202.1	1923.36	2885.04	4327.56
4	1198.8	1918.08	2877.12	4315.68
5	1192.93	1908.69	2863.04	4294.55
6	1183.76	1894.02	2841.03	4261.54
7	1170.56	1872.89	2809.34	4214.01
8	1152.59	1844.14	2766.21	4149.31
9	1129.11	1806.58	2709.87	4064.81
10	1099.4	1759.05	2638.57	3957.85
11	1062.73	1700.36	2550.54	3825.81
12	1018.35	1629.35	2444.03	3666.05
13	965.53	1544.85	2317.27	3475.91
14	903.55	1445.67	2168.51	3252.77
15	831.66	1330.65	1995.98	2993.97
16	749.13	1198.61	1797.92	2696.88
17	655.24	1048.38	1572.57	2358.86
18	549.24	878.79	1318.18	1977.27
19	430.41	688.65	1032.98	1549.46
20	298	476.8	715.2	1072.8
21	151.29	242.06	363.1	544.65



STOREY SHEAR FOR WIND LOAD (W.L)

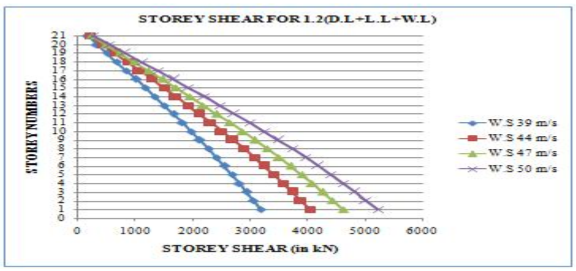
STOREY SHEAR FOR 1D.L+0.8(L.L+W.L)

Storey	STOREY SHEAR (in kN)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	1027.36	2700.08	3080.82	3486.67
2	1027.04	2595.66	2961.68	3351.83
3	1025.79	2491.24	2842.53	3216.99
4	1022.98	2386.57	2723.1	3081.82
5	1017.97	2278.67	2599.99	2942.49
6	1010.14	2165.76	2471.16	2796.7
7	998.88	2048.61	2337.49	2645.42
8	983.54	1927.63	2199.45	2489.19
9	963.51	1803.14	2057.41	2328.44
10	938.16	1675.15	1911.36	2163.15
11	906.86	1543.88	1761.59	1993.65
12	868.99	1410.52	1609.43	1821.44
13	823.92	1275.35	1455.19	1646.89
14	771.03	1138.36	1298.88	1469.99
15	709.68	999.52	1140.47	1290.71
16	639.26	858.84	979.95	1109.04
17	559.14	716.3	817.31	924.98
18	468.69	572.2	652.89	738.9
19	367.28	427.01	487.22	551.41
20	254.29	280.76	320.35	362.55
21	129.1	133.45	152.26	172.32



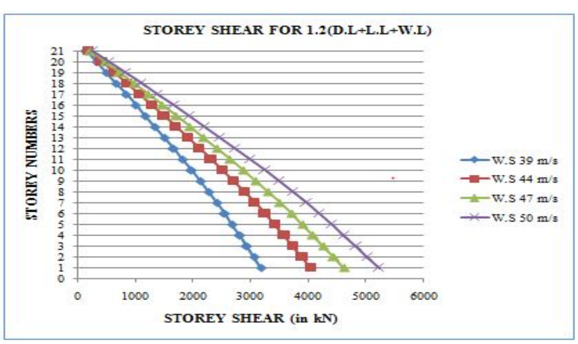
STOREY SHEAR FOR 1.2(D.L+L.L+W.L)

Storey	STOREY SHEAR (in kN)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	3181.94	4050.12	4621.24	5230.01
2	3058.88	3893.49	4442.52	5027.75
3	2935.83	3736.86	4263.8	4825.49
4	2812.47	3579.85	4084.65	4622.74
5	2685.32	3418	3899.98	4413.74
6	2552.26	3248.64	3706.74	4195.04
7	2414.21	3072.92	3506.24	3968.13
8	2271.63	2891.44	3299.17	3733.78
9	2124.93	2704.72	3086.12	3492.66
10	1974.09	2512.72	2867.04	3244.73
11	1819.41	2315.83	2642.39	2990.48
12	1662.25	2115.79	2414.14	2732.16
13	1502.95	1913.03	2182.79	2470.34
14	1341.51	1707.54	1948.32	2204.98
15	1177.9	1499.29	1710.7	1936.06
16	1012.11	1288.26	1469.92	1663.56
17	844.14	1074.46	1225.97	1387.47
18	674.32	858.31	979.34	1108.35
19	503.22	640.52	730.84	827.11
20	330.86	421.14	480.52	543.83
21	157.26	200.17	228.4	258.48



STOREY SHEAR FOR 1.5(D.L+W.L):

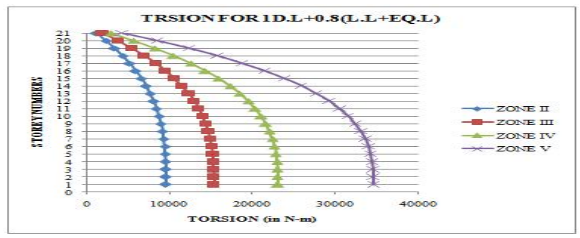
Storey	STOREY SHEAR (in kN)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	3977.42	5062.65	5776.55	6537.51
2	3823.6	4866.86	5553.15	6284.69
3	3669.78	4671.07	5329.75	6031.86
4	3515.59	4474.81	5105.81	5778.42
5	3356.65	4272.5	4874.97	5517.17
6	3190.33	4060.8	4633.43	5243.8
7	3017.76	3841.15	4382.8	4960.16
8	2839.54	3614.3	4123.97	4667.23
9	2656.17	3380.9	3857.64	4365.83
10	2467.62	3140.9	3583.8	4055.91
11	2274.26	2894.78	3302.98	3738.1
12	2077.81	2644.73	3017.67	3415.2
13	1878.69	2391.29	2728.49	3087.92
14	1676.89	2134.42	2435.4	2756.22
15	1472.38	1874.11	2138.38	2420.08
16	1265.14	1610.33	1837.41	2079.45
17	1055.17	1343.07	1532.46	1734.34
18	842.9	1072.88	1224.17	1385.44
19	629.02	800.64	913.55	1033.89
20	413.58	526.42	600.66	679.78
21	196.58	250.21	285.5	323.11



TORSIONAL FORCE FOR EARTH QUAKE LOADS:

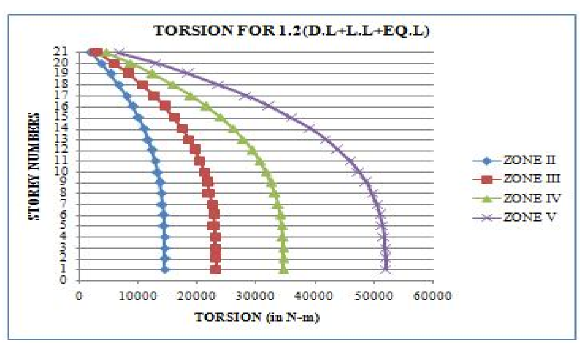
TORSION FOR 1D.L+0.8(L.L+EQ.L):

Storey	TORSION (in N-m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	9631.477	15410.363	23115.544	34673.317
2	9628.543	15405.668	23108.502	34662.753
3	9616.806	15386.889	23080.334	34620.501
4	9590.398	15344.637	23016.955	34525.433
5	9543.451	15269.521	22904.282	34356.423
6	9470.096	15152.153	22728.23	34092.345
7	9364.465	14983.143	22474.715	33712.073
8	9220.689	14753.102	22129.653	33194.48
9	9032.9	14452.64	21678.96	32518.441
10	8795.23	14072.368	21108.552	31662.828
11	8501.81	13602.896	20404.344	30606.516
12	8146.772	13034.835	19552.253	29328.379
13	7724.247	12358.796	18538.193	27807.29
14	7228.368	11565.388	17348.082	26022.123
15	6653.264	10645.223	15967.835	23951.752
16	5993.07	9588.911	14383.367	21575.051
17	5241.915	8387.063	12580.595	18870.893
18	4393.931	7030.29	10545.434	15818.152
19	3443.25	5509.201	8263.801	12395.702
20	2384.004	3814.407	5721.611	8582.416
21	1210.325	1936.52	2904.779	4357.169



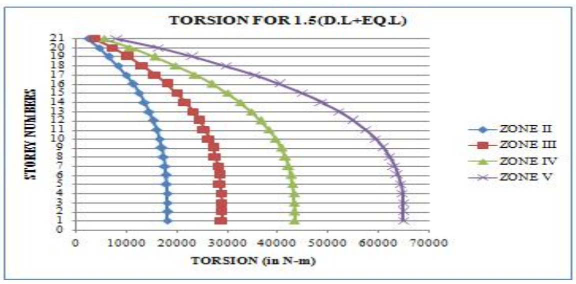
TORSION FOR 1.2(D.L+L.L+EQ.L):

Storey	TORSION (in N-m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	14447.215	23115.544	34673.317	52009.975
2	14442.814	23108.502	34662.753	51994.13
3	14425.209	23080.334	34620.501	51930.751
4	14385.597	23016.955	34525.433	51788.149
5	14315.176	22904.282	34356.423	51534.635
6	14205.144	22728.23	34092.345	51138.518
7	14046.697	22474.715	33712.073	50568.109
8	13831.033	22129.653	33194.48	49791.72
9	13549.35	21678.96	32518.441	48777.661
10	13192.845	21108.552	31662.828	47494.242
11	12752.715	20404.344	30606.516	45909.774
12	12220.158	19552.253	29328.379	43992.569
13	11586.371	18538.193	27807.29	41710.935
14	10842.551	17348.082	26022.123	39033.185
15	9979.897	15967.835	23951.752	35927.628
16	8989.604	14383.367	21575.051	32362.576
17	7862.872	12580.595	18870.893	28306.339
18	6590.897	10545.434	15818.152	23727.227
19	5164.876	8263.801	12395.702	18593.552
20	3576.007	5721.611	8582.416	12873.624
21	1815.487	2904.779	4357.169	6535.754



TORSION FOR 1.5(D.L+EQ.L):

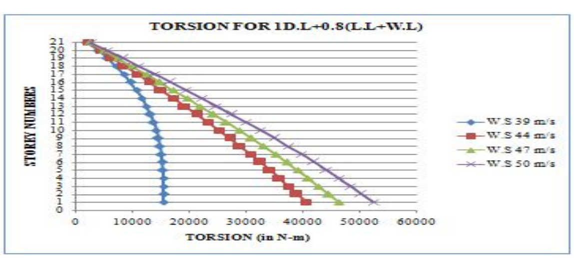
Storey	TORSION (in N-m)			
	ZONE II	ZONE III	ZONE IV	ZONE V
1	18059.019	28894.43	43341.646	65012.469
2	18053.517	28885.628	43328.442	64992.663
3	18031.511	28850.417	43275.626	64913.439
4	17981.996	28771.194	43156.791	64735.187
5	17893.97	28630.353	42945.529	64418.293
6	17756.43	28410.288	42615.431	63923.147
7	17558.371	28093.394	42140.091	63210.137
8	17288.792	27662.067	41493.1	62239.65
9	16936.688	27098.7	40648.051	60972.076
10	16491.056	26385.69	39578.535	59367.803
11	15940.894	25505.43	38258.145	57387.218
12	15275.197	24440.316	36660.474	54990.711
13	14482.964	23172.742	34759.113	52138.669
14	13553.189	21685.103	32527.654	48791.481
15	12474.871	19959.793	29939.69	44909.535
16	11237.006	17979.209	26968.813	40453.22
17	9828.59	15725.744	23588.616	35382.924
18	8238.621	13181.793	19772.69	29659.034
19	6456.095	10329.751	15494.627	23241.94
20	4470.008	7152.013	10728.02	16092.03
21	2269.359	3630.974	5446.461	8169.692



TORSION FORCE FOR WIND LOAD:

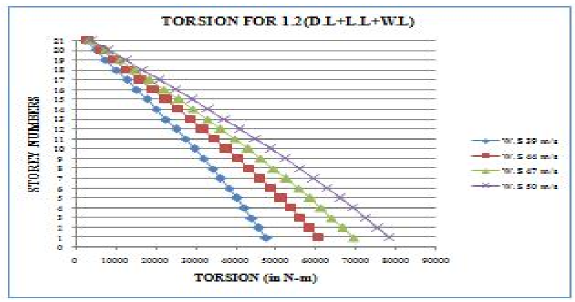
TORSION FOR 1D.L+0.8(L.L+W.L):

Storey	TORSION (in N-m)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	15410.363	40501.195	46212.365	52300.097
2	15405.668	38934.892	44425.194	50277.494
3	15386.889	37368.588	42638.022	48254.892
4	15344.637	35798.478	40846.507	46227.373
5	15269.521	34179.981	38999.782	44137.372
6	15152.153	32486.415	37067.403	41950.433
7	14983.143	30729.202	35062.401	39681.305
8	14753.102	28914.429	32991.722	37337.847
9	14452.64	27047.166	30861.152	34926.609
10	14072.368	25127.184	28670.429	32447.294
11	13602.896	23158.264	26423.866	29904.783
12	13034.835	21157.875	24141.398	27321.636
13	12358.796	19130.301	21827.91	24703.384
14	11565.388	17075.358	19483.196	22049.791
15	10645.223	14992.864	17107.044	19360.62
16	9588.911	12882.635	14699.246	16635.634
17	8387.063	10744.564	12259.68	13874.695
18	7030.29	8583.068	9793.387	11083.507
19	5509.201	6405.159	7308.365	8271.124
20	3814.407	4211.39	4805.248	5438.261
21	1936.52	2001.703	2283.968	2584.844



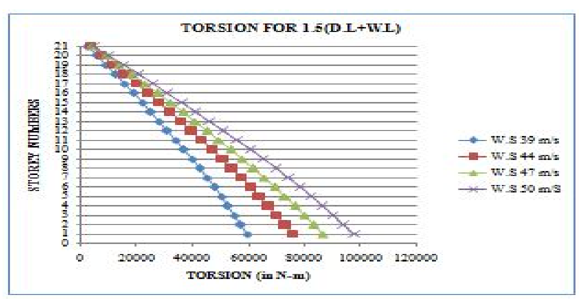
TORSION FOR 1.2(D.L+L.L+W.L):

Storey	TORSION (in N-m)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	47729.068	60751.792	69318.548	78450.145
2	45883.241	58402.337	66637.791	75416.241
3	44037.414	56052.882	63957.034	72382.338
4	42187.101	53697.716	61269.76	69341.059
5	40279.766	51269.971	58499.673	66206.058
6	38283.965	48729.623	55601.104	62925.65
7	36213.159	46093.803	52593.601	59521.957
8	34074.519	43371.643	49487.583	56006.771
9	31874.023	40570.749	46291.727	52389.913
10	29611.4	37690.777	43005.643	48670.941
11	27291.105	34737.396	39635.8	44857.175
12	24933.725	31736.812	36212.096	40982.454
13	22544.309	28695.451	32741.866	37055.076
14	20122.64	25613.038	29224.794	33074.687
15	17668.502	22489.296	25660.566	29040.93
16	15181.679	19323.952	22048.869	24953.451
17	12662.046	16116.845	18389.52	20812.042
18	10114.808	12874.601	14690.08	16625.26
19	7548.228	9607.738	10962.548	12406.686
20	4962.957	6317.085	7207.872	8157.392
21	2358.929	3002.555	3425.953	3877.266



TORSION FOR 1.5(D.L+W.L)

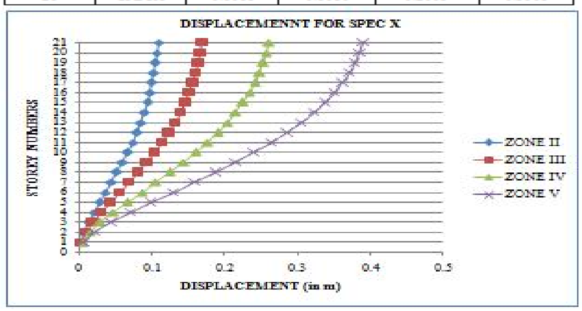
Storey	TORSION (in N-m)			
	39 m/s	44 m/s	47 m/s	50 m/s
1	59661.335	75939.74	86648.185	98062.681
2	57354.052	73002.922	83297.239	94270.302
3	55046.768	70066.103	79946.292	90477.922
4	52733.876	67122.145	76587.2	86676.324
5	50349.707	64087.464	73124.591	82757.573
6	47854.957	60912.029	69501.38	78657.062
7	45266.448	57617.254	65742.001	74402.446
8	42593.149	54214.554	61859.478	70008.464
9	39842.529	50713.436	57864.659	65487.391
10	37014.25	47113.471	53757.054	60838.676
11	34113.881	43421.745	49544.75	56071.468
12	31167.156	39671.015	45265.12	51228.067
13	28180.386	35869.314	40927.332	46318.846
14	25153.3	32016.297	36530.992	41343.359
15	22085.628	28111.621	32075.708	36301.163
16	18977.099	24154.94	27561.086	31191.814
17	15827.558	20146.057	22986.9	26015.052
18	12643.51	16093.252	18362.6	20781.575
19	9435.285	12009.672	13703.185	15508.358
20	6203.697	7896.356	9009.84	10196.74
21	2948.661	3753.194	4282.441	4846.583



RESULTS OBTAINED BY RESPONSE SPECTROM METHOD (RSM):

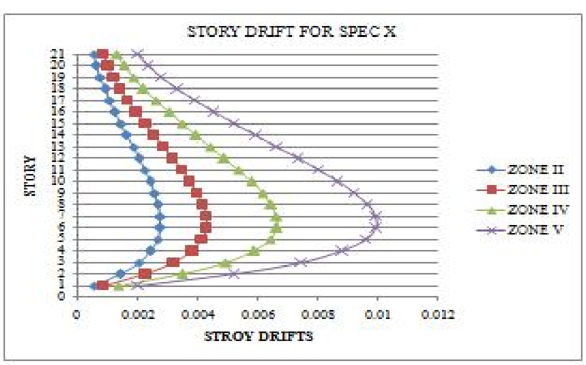
DISPLACEMENTS FOR SPEC X:

Storey	Load	Displacement (UX) (in m)			
		ZONE II	ZONE III	ZONE IV	ZONE V
1	SPECX	0.0017	0.0026	0.0041	0.0061
2	SPECX	0.0061	0.0094	0.0145	0.0218
3	SPECX	0.0122	0.019	0.0294	0.0441
4	SPECX	0.0196	0.0305	0.047	0.0705
5	SPECX	0.0276	0.0429	0.0662	0.0993
6	SPECX	0.0358	0.0557	0.086	0.129
7	SPECX	0.0441	0.0685	0.1057	0.1586
8	SPECX	0.0521	0.081	0.1249	0.1874
9	SPECX	0.0597	0.0928	0.1432	0.2149
10	SPECX	0.0668	0.1039	0.1604	0.2406
11	SPECX	0.0735	0.1142	0.1762	0.2644
12	SPECX	0.0795	0.1236	0.1907	0.2861
13	SPECX	0.0849	0.132	0.2037	0.3056
14	SPECX	0.0897	0.1395	0.2152	0.3229
15	SPECX	0.0939	0.146	0.2253	0.3381
16	SPECX	0.0975	0.1516	0.234	0.3511
17	SPECX	0.1006	0.1564	0.2414	0.3622
18	SPECX	0.1032	0.1604	0.2475	0.3714
19	SPECX	0.1053	0.1637	0.2526	0.379
20	SPECX	0.107	0.1664	0.2568	0.3852
21	SPECX	0.1085	0.1686	0.2603	0.3905



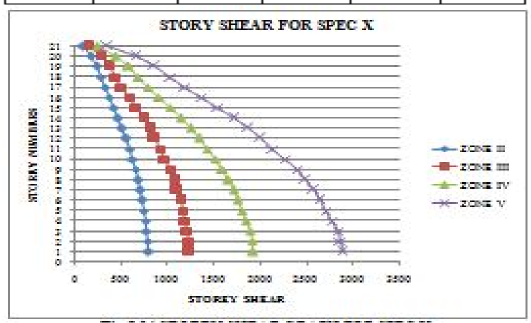
STOREY DRIFT FOR SPEC X:

Storey	Load	DriftX			
		ZONE II	ZONE II	ZONE IV	ZONE V
1	SPECX	0.000563	0.000876	0.001352	0.002029
2	SPECX	0.001456	0.002264	0.003493	0.005241
3	SPECX	0.002064	0.003209	0.004952	0.00743
4	SPECX	0.00245	0.00381	0.00588	0.008821
5	SPECX	0.002668	0.004148	0.006402	0.009605
6	SPECX	0.002759	0.00429	0.006621	0.009933
7	SPECX	0.002757	0.004286	0.006615	0.009924
8	SPECX	0.002685	0.004175	0.006443	0.009666
9	SPECX	0.002564	0.003986	0.006152	0.009229
10	SPECX	0.002408	0.003744	0.005778	0.008669
11	SPECX	0.002231	0.003468	0.005352	0.00803
12	SPECX	0.002041	0.003173	0.004897	0.007347
13	SPECX	0.001845	0.002868	0.004427	0.006641
14	SPECX	0.001647	0.002561	0.003952	0.005929
15	SPECX	0.001451	0.002257	0.003483	0.005225
16	SPECX	0.001263	0.001963	0.003029	0.004545
17	SPECX	0.001085	0.001687	0.002604	0.003907
18	SPECX	0.000923	0.001435	0.002214	0.003322
19	SPECX	0.000777	0.001209	0.001865	0.002798
20	SPECX	0.000652	0.001014	0.001564	0.002347
21	SPECX	0.000558	0.000867	0.001338	0.002007



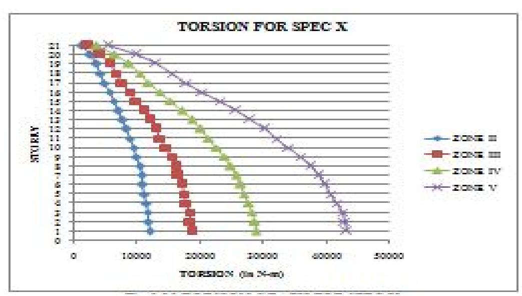
STOREY SHEAR FOR SPEC X:

STOREY	Load	STOREY SHEAR (VX)			
		ZONE II	ZONE III	ZONE IV	ZONE V
1	SPECX	802.55	1247.83	1925.75	2889.22
2	SPECX	798.94	1242.21	1917.07	2876.2
3	SPECX	788.02	1225.24	1890.88	2836.9
4	SPECX	771.34	1199.3	1850.84	2776.84
5	SPECX	753.09	1170.93	1807.06	2711.15
6	SPECX	735.72	1143.92	1765.38	2648.62
7	SPECX	717.6	1115.74	1721.89	2583.37
8	SPECX	694.98	1080.57	1667.62	2501.94
9	SPECX	665.87	1035.31	1597.76	2397.14
10	SPECX	631.8	982.34	1516.02	2274.49
11	SPECX	596.02	926.71	1430.16	2145.69
12	SPECX	559.99	870.68	1343.7	2015.97
13	SPECX	521.85	811.39	1252.2	1878.69
14	SPECX	478.68	744.26	1148.6	1723.26
15	SPECX	430.15	668.8	1032.14	1548.54
16	SPECX	379.97	590.79	911.76	1367.92
17	SPECX	333.05	517.83	799.16	1198.98
18	SPECX	289.8	450.6	695.39	1043.31
19	SPECX	243.33	378.33	583.87	875.98
20	SPECX	183.02	284.57	439.17	658.89
21	SPECX	100.73	156.61	241.7	362.62



TORSION FOR SPEC X

STOREY	Load	TORSION (in N-m)			
		ZONE II	ZONE III	ZONE IV	ZONE V
1	SPECX	12038.31	18717.5	28886.23	43338.28
2	SPECX	11984.09	18633.2	28756.12	43143.07
3	SPECX	11820.32	18378.56	28363.15	42553.49
4	SPECX	11570.07	17989.47	27762.67	41652.59
5	SPECX	11296.35	17563.89	27105.89	40667.21
6	SPECX	11035.8	17158.78	26480.69	39729.22
7	SPECX	10763.97	16736.12	25828.42	38750.61
8	SPECX	10424.68	16208.58	25014.28	37529.15
9	SPECX	9988.006	15529.63	23966.47	35957.12
10	SPECX	9476.979	14735.07	22740.25	34117.41
11	SPECX	8940.284	13900.6	21452.44	32185.29
12	SPECX	8399.808	13060.26	20155.55	30239.56
13	SPECX	7827.814	12170.91	18783.04	28180.36
14	SPECX	7180.19	11163.96	17229.05	25848.9
15	SPECX	6452.179	10032.03	15482.17	23228.04
16	SPECX	5699.6	8861.898	13676.34	20518.73
17	SPECX	4995.711	7767.471	11987.34	17984.71
18	SPECX	4347.074	6758.952	10430.91	15649.6
19	SPECX	3649.911	5674.984	8758.055	13139.79
20	SPECX	2745.365	4268.571	6587.573	9883.396
21	SPECX	1510.902	2349.193	3625.448	5439.292



VI CONCLUSIONS

The Following conclusions are made from the present study

1.The base shear of structure increases as we go to higher seismic zones. For a similar building the base shear value of ZONE II is 802.6 KN and ZONE V is 2889 KN. This means base shear increases by more than 350% if seismic ZONE changes from II to V.

2.The displacement of building models increases with the increasing of seismic Zones. The displacement is very high at roof and very low at the base. The displacement occur at the ZONE II is 0.1033 and ZONE IV is 0.372. This means base shear increases by more than 27% if seismic ZONE changes from II to V.

3.The displacement of building models increases with the increasing of wind pressure. The displacement is very high at roof and very low at the base. The displacement occurs at the wind space 39 m/s is 0.2411 and at the wind speed 50 m/s is 0.3963. This means the displacement is increases by more than 50 % from wind speed 39 m/s to 50 m/s.

4.The storey drift is mainly occurred at the middle of the building structure. From table 5.4 to 5.6 and fig 5.4 to 5.6, it is concluded that the storey drift increases with the increasing of seismic zone factor. And the maximum storey drift is available at ZONE V for the max. Load combo at 7th floor. The storey drift for ZONE II is 0.00887 and storey drift for ZONE V is 0.016631m at 7 th floor. This means the storey drift is increases by more than 50% when compare to ZONE II to ZONE V.

5.The storey drift due to wind load is maximum at the middle of the structure i.e., at 6th floor and it is gradually increasing by increasing the wind pressure. The value of storey drift at wind speed 39 m/s is 0.010545 and at high wind speed (50 m/s) is0.019771. this means the storey drift is increases by more than 150% if the wind speed changes low wind speed (39 m/s) to high wind speed (50 m/s).

6. From results it is observed that the Storey Shear is decreased as height of the building increased and reduced at top floor in all the building models subjected to seismic loads considered. The storey shear is maximum at the base. And the storey shear value for the model in ZONE II is151.29 and ZONE V is 544.65.This means the storey shear is increases by more than 27% when compare to ZONE II to ZONE V.

7.From table 5.16-5.18 and fig 5.16-5.18 it is concluded that as the seismic zone factor increases, the torsion affect on the building is also increases. And the torsion is mainly effect on base of the building structure. The torsion at the base of the model in ZONE II is 1815.487and ZONE V is 6535.754. This means the storey drift is increases by more than 25% when compare to ZONE II to ZONE V.

8.From table 5.19-5.21 and fig 5.19-5.21 it is concluded that as the wind pressure increases, the torsion affect on the building is also increases. And the torsion is mainly effect on base of the building structure. The torsion at the base of the model in 39 m/s is 59661.335 and 50m/s are 98062.681. This means the torsion is increases by more than 50% when compare to low wind pressure to high wind pressure.

9.By using shear walls, dampers, rubber pads, spring we can reduce damage of seismic effect of an R C building resting on high seismic zone.

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