WIND ANALYSIS ON HIGH RISE BUILDING

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Abstract - Wind in the air there is a continously transport of wind from low to high layers in order to make the earth's radition without balance. The wind code criteria for defined of dynamic analyses for earthquake loads are diverse from wind loads. In the design of high rise buildings both wind loads and earthquake loads need to be considered. All direction has different wind effect for each of the wind charactaristics. There is wind design of tall buildings for calculated characteristics of wind effect and wind effect in each direction. The wind pressure of size is a function of exerted tempo of the wind topography, hight of the building, internal pressure, and shape of the building. Load applied on the building are transferred to the structural system and they of the must be moved by the foundation in the ground. The structure engineer should be ensure that constructed building is safe and more life for the structure for wind load. Also analyzed for wind load case at different terrain category are studied. It is analyzed different types of story heights with gust factor method of wind load in excel .It is study of G+15, G+25 and G+35 multistorey building with opening for wind load ETABS 17 is being utilised for the modeling and to analyze the structure.

Key Words: **ETABS,Gust Factor in Excel, Story Displacements, Story Drift, Story Shear, Overturning Moment.**

1. INTRODUCTION

Wind have very large scale of Horizontal movement of free air. In the air there is a continously transport of wind from low to high layers in order to make the earth's radition without balance.The wind code criteria for defined of dynamic analyses for earthquake loads are diverse from wind loads.In the design of high rise buildings both wind loads and earthquake loads need to be considered.

Wind loads will depend upon the wind quickness and the form of the high rise building.The structure of high rise building is ready to carry all loads like dead load of structure and gravity load of beams.The importance of the high structure effects are included in reached at the distribution of lateral forces to the tallness of the building.

The windward pressure are go with along the tallness of the building.The pressure of leeward direction is go with constant and it is pressure that pulling the wind effect but it is do not pushing the wind effect.

The effect of wind can be divided into two components they are,

1. Static analysis
2. Dynamic analysis

The wind effect of all direction like along-wind,across-wind and torsional wind are not same in consideration because of wind speed of all diection is difference for wind effect ratiofor tall structure of the building.The wind force with direction of across wind and torsional wind is not zero when the along wind force effect is on high. When the wind defination is required than combination of along wind,across wind and torsional wind direction is must .That is why all three loads of direction is important for wind effect of the tall building structure.

The tallness of building in reference is also called as the roof tallness of the structure..The across wind effectd is based on to the tall building of wind pressure coefficient and wind energy coefficient.The loading effect of the all parts of the tall building is calculated by the dynamic analysis with the consideration of fluactuning of wind energy,dynamic analysis of each parts and characteristics of wind.

A Dynamic analysis is classified as either:

1. **Along-wind Effect**
2. **Across-wind Effect**

The wind effect of the along direction is affected to the drag components and the across direction of the structure is affected to lift components of the building.

2. LITRETURE REVIEW

Miss. Homeshwari V. Gedam(2018) The under construction urban country like india has very important to construct large amount of high rise building.In these building, wind is very important factor for safety and strength purpose.In india there is many high rise building which is affected due to the wind effect of the all directions. The wind load is designed by the based of indian standard code for wind which is 875 part3.In this paper shows that high rise building of wind effect is based on the aspect ratio,for example H/B.Where the word H is defined as the hight of the building and B is defined as the width of the building.which is designed in the STAADPRO.

Mohammed Asim Ahmed(2015) Wind has flow with very rough surface of earth which is affected to the high rise building of the earth. For the worry about wind for structural engineer is to carry all loads of all structural frames of the building.Wind flows in low speed in rough terrain and it is high speed in the smooth terrain of the structure.This paper shows that the different story due to wind effect to the different terrain category.It is made models in ETABS2015.This model is also give information of the different hight with different terrain category of wind effect. When the story increase than the displacement of the story is also increased.

Ranjitha K. P (2014) This is shows that the calculation of static load and dynamic work loading analysis of the tall structure. The dynamic analysis with gust response factor and static wind effect are saying in this project.The different shape of the building with zoneI to zoneIV to determine wind effect based on IS875 part3.The wind pressure is very effective on the tall structure. Wind loading is load that different in to the both in time and space.The wind effect are calculate by physical and analytical for static wind effect by purpose of safety. The wind effect for Displacement of TG-1 is top as contrast to the other category for all types of different story building.The wind effect for Story drift of TG-1 is top as contrast to the other category for all types of different story building.The wind effect for Story shear of TG-1 is top as contrast to the other category for all types of different story building

3. METHODOLOGY

The wind effect is increse with atmospheric limited value will rise with tallness of the structure at top level to ground level which is called gradient wind. The wind effect of increasing is depends upon to terrain category. The increase value of the wind is does not made constant. The calculation of wind effect value is easier to do with insant scale and also fluatuating components value for wind effect of the tall building. As shown in the code, 6 different regions for our country code on to wind effect. Building has rise with wind effect, these 6 regions are 33, 39, 44, 47, 50 and 55 m/s are respectively. The building of basic wind tempo is increase with support of tallness of building, roughness of terain, topography of velocity.

3.1 Static analysis :

The wind energy effect of the building for the static analysis is depended on to the risk level, tallness,rough terain and topography. Design of wind raise in this building, Vz in m/s at tallness z for the chosen structure as following.

$$V_z = V_b\, K_1 * K_2 * K_3 * K_4$$

&

$$P_z = 0.6 V_z^2$$

3.2 Dynamic analysis :

The construction of tall structure should be designed for the dynamic analysis. When the wind speed is rise with mean hour than it is used to calculate dynamic analysis of wind.In the calculation of the dynamic analysis of the along wind analysis with the gust response factor method is mainly specified on to the below. The tall building calculation of across wind direction with gust factor method is given equation of 10.3 which is written in below.

Dynamic analysis two part:

1) Along wind
2) Across wind

Along Wind Response ::

In this effect, the value of the wind effect is to calculate with the mean hour of tallness z should be substracting with oust factor of the all sructure.This factor is based on to the tallnes of the structure h and ground level of the wind surface s.

Across Wind Response ::

The across wind direction for the tall building structure will be calculate for all terain category and different speed of wind with web tower. There is not nessesary to calculate across wind effect for all web tower.

4. MODELING

G+15,G+25 & G+35 story building is designed and analysis is for 5%,10% &15% opening. The models are analyzed by dynamic analysis method of wind that is response spectrum method for zone III. As categorized by Indian Standard Code 1893:2016 for earthquake resistant structures. In the present study the structure is subjected to wind loads and analysis is carried out by using the gust factor method.

TYPE – 1: Square plan with 5%, 10% & 15% opening for G+15 story building.

TYPE – 2: Square plan with 5%, 10% & 15% opening for G+25 story building.

TYPE – 3: Square plan with 5%, 10% & 15% opening for G+35 story building.

TYPE – 4: Rectangular plan with 5%, 10% & 15% opening forG+15 story building.

TYPE – 5: Rectangular plan with 5%, 10% & 15% opening forG+25 story building.

TYPE – 6: Rectangular plan with 5%, 10% & 15% opening forG+35 story building.

4.1 Methodology :

1 The Buildings are assumed to be in Zone-III.
2 Analysis of Floors using ETABS 2017.
3 The buildings are being designed as per IS 875(part 3)-2015 & IS 1893:2016.

4.2 Description of structure :

Table 1: - Geometrical data of structure

VARIABLES	DATA
Type of Structure	RCC Frame Structure
Floor to floor height	3m
Ground story height	3.5m
Grade of concrete	M50 for column & Slab, M30 for beam
Grade of steel	Fe 415
Density	25 KN/m³

Table 2 - Material properties for structure

	SQUARE PLAN			RECTANGULAR PLAN		
SECTION PROPERTIES	**G+15 STOREY**	**G+25 STOREY**	**G+35 STOREY**	**G+15 STOREY**	**G+25 STOREY**	**G+35 STOREY**
Size of column	700 X 700 mm & 900 x900 mm	700 X 700 mm & 1000 x1000 mm	700 X 700 mm & 900 x900 mm & 1150 x1150 mm	550 X 550 mm & 700 x700 mm	650 X 650 mm & 1100 x1100 mm	700 X 700 mm & 950 x950 mm & 1250 x1250 mm
Size of beam	300 x 600 mm	300 x 600 mm	300 x 600 mm	300 x 600 mm	300 x 600 mm	400 x 700 mm
Slab thickness	200 mm	250 mm	250 mm	200 mm	250 mm	250 mm
Shear wall thickness	200 mm	250 mm	300 mm	200 mm	250 mm	350 mm
Panel size	8 X 8 m	8 X 8 m	8 X 8 m	6 X 8 m	6 X 8 m	6 X 8 m

Table 3: - Wind Loads of structures

WIND LOADS	DATA
Wind speed, V_b	44 m/s
Importance factor	1
Risk Co-efficient, k	1
Topography, k3	1

SR..NO.	GRAVITY LOADS	DATA
1	Dead load	Default taken by ETABS
2	Live load	3 kN/m^2
3	Floor finish load	1.2 kN/m^2
4	Wall load(External)	13.8 kN/m^2
5	Wall load(Internal)	6.9 kN/m^2

Table 4: - Gravity Loads for structure

Table 5: - Seismic Loads of structures by using IS 1893-2016 seismic code

SR..NO.	SEISMIC LOADS	Conventional Slab DATA
1	Seismic Zone Factor, Z	0.16
2	Importance Factor	1
3	Response Reduction Factor	5

4.3 ETABS Models

Fig -1: Square plan of floor layout Model in ETABS

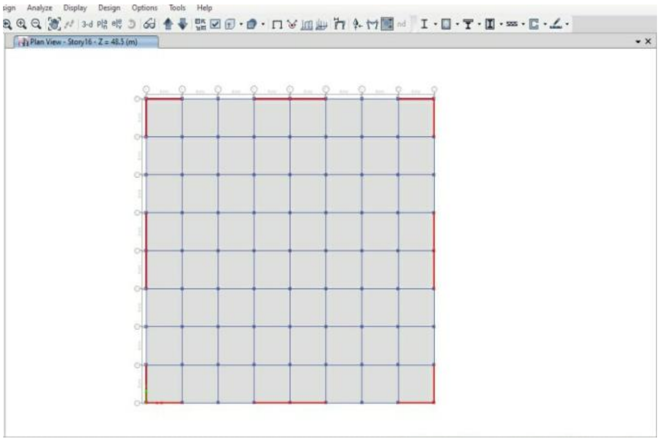


Fig -2: Square plan with 5% opening Model in ETABS

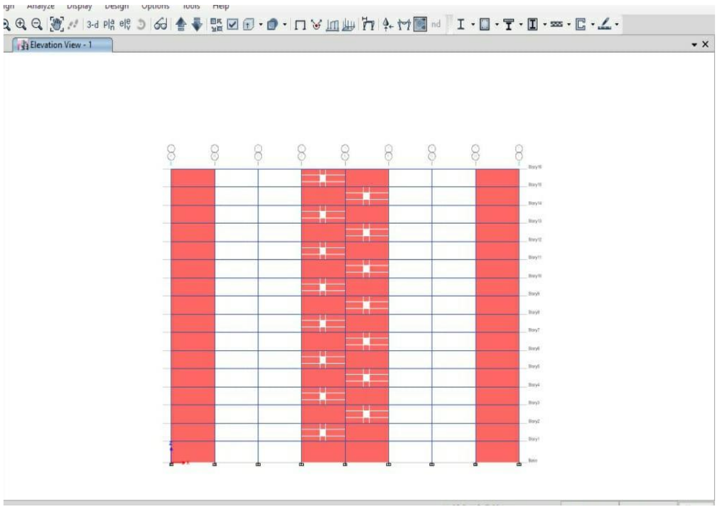


Fig.3: Square plan with 10% opening Model in ETABS

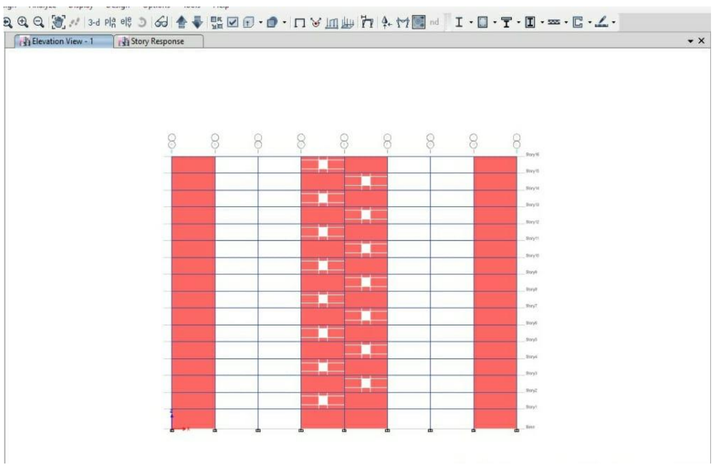


Fig.4: Square plan with 15% opening Model in ETABS

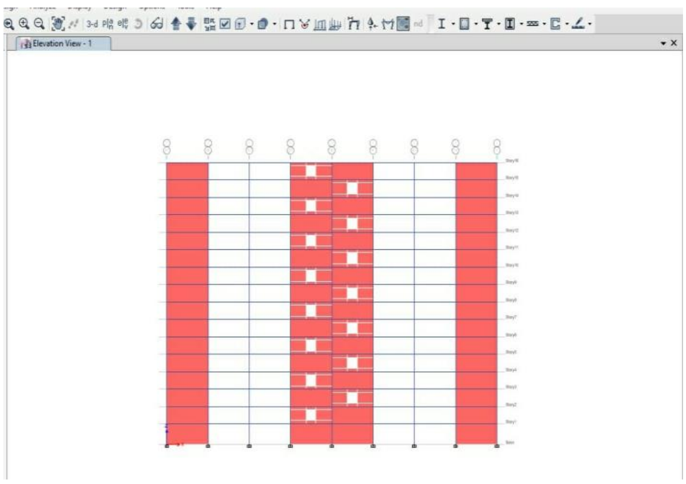


Fig. 5: Rectangular plan of floor layout Model in ETABS

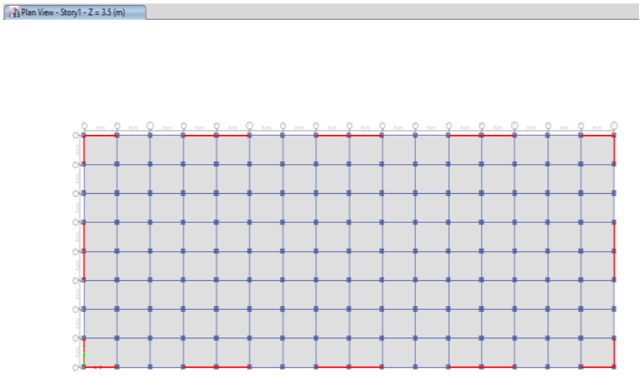


Fig. 6: Rectangular plan with 5% opening Model in ETABS

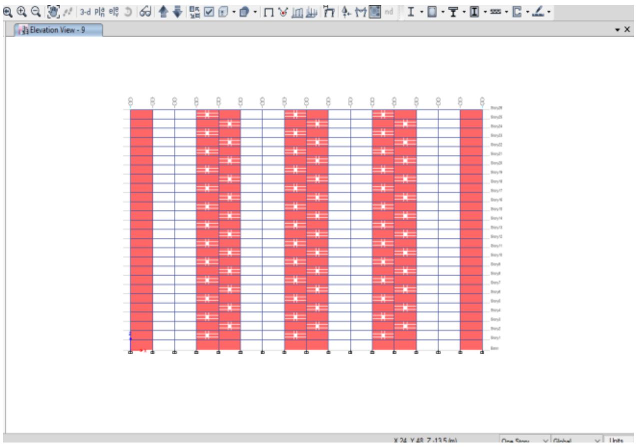


Fig. 7: Rectangular plan with 10% opening Model in ETABS

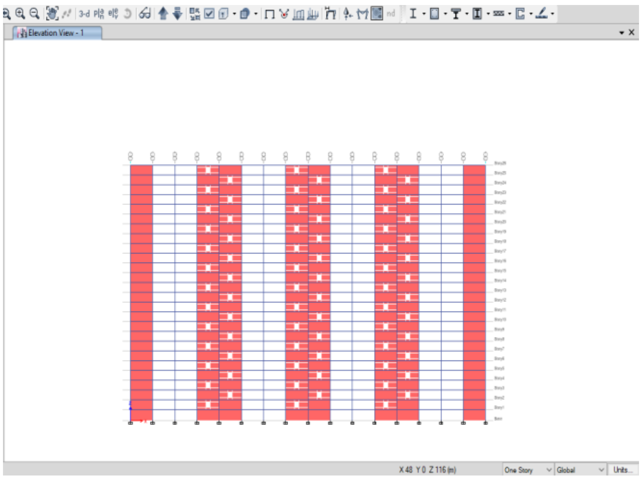
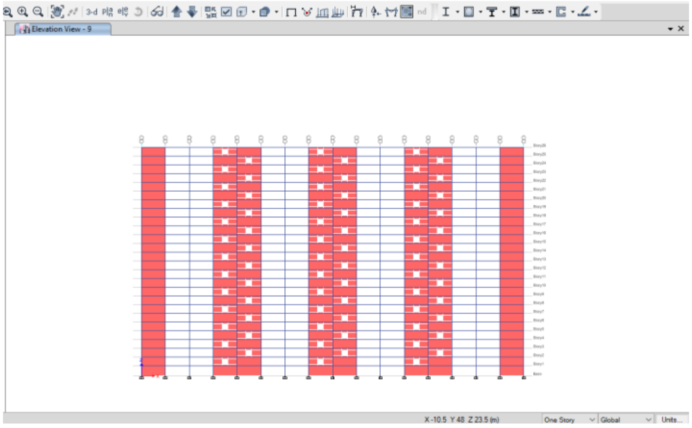


Fig. 8: Rectangular plan with 15% opening Model in ETABS



5. DYNAMIC EFFECT :

Dynamic effect is appiled for both square and rectangular plan. it is analysed in EXCEL with all terrain category for G+15, G+25 & G+35 storey building structure at along wind effect and across wind effect.

Fig. 9: Square plan with along wind effect in EXCEL

																	Select value	Gust Factor		Along the wind X	Y
Floor	h (m)	hi (m)	h/2 (m)	K2	Vz	Pz	Lh	Bsx	Bsy	Hs	Sx	Sy	Nx	Ny	Ex	Ey	I	Gx	Gy	orey Sh	orey Shear
16th F	3	48.5	1.5	0.697	30.668	0.564	126.1	0.744	0.744	2.00	0.104	0.104	1.267	1.267	0.078	0.078	0.195	5.11	5.11	442.9	276.8
15th F	3	45.5	1.5	0.689	30.316	0.551	124.1	0.741	0.741	1.88	0.102	0.102	1.261	1.261	0.078	0.078	0.196	5.07	5.07	429.4	268.4
14th F	3	42.5	1.5	0.681	29.964	0.539	122.0	0.737	0.737	1.77	0.100	0.100	1.254	1.254	0.078	0.078	0.196	5.02	5.02	415.3	259.6
13th F	3	39.5	1.5	0.671	29.524	0.523	119.8	0.733	0.733	1.66	0.098	0.098	1.250	1.250	0.078	0.078	0.196	4.97	4.97	399.1	249.4
12th F	3	36.5	1.5	0.661	29.084	0.508	117.5	0.728	0.728	1.57	0.096	0.096	1.244	1.244	0.079	0.079	0.196	4.92	4.92	383.3	239.6
11th F	3	33.5	1.5	0.65	28.6	0.491	115.0	0.723	0.723	1.48	0.094	0.094	1.238	1.238	0.079	0.079	0.196	4.87	4.87	366.8	229.2
10th F	3	30.5	1.5	0.639	28.116	0.474	112.3	0.717	0.717	1.40	0.092	0.092	1.231	1.231	0.079	0.079	0.196	4.82	4.82	350.8	219.2
9th F	3	27.5	1.5	0.625	27.5	0.454	109.5	0.710	0.710	1.32	0.089	0.089	1.226	1.226	0.079	0.079	0.196	4.76	4.76	331.8	207.4
8th F	3	24.5	1.5	0.611	26.884	0.434	106.3	0.702	0.702	1.26	0.086	0.086	1.218	1.218	0.080	0.080	0.196	4.71	4.71	313.5	196.0
7th F	3	21.5	1.5	0.594	26.136	0.410	102.9	0.693	0.693	1.20	0.083	0.083	1.213	1.213	0.080	0.080	0.196	4.65	4.65	292.7	182.9
6th F	3	18.5	1.5	0.575	25.3	0.384	99.1	0.683	0.683	1.15	0.079	0.079	1.207	1.207	0.080	0.080	0.196	4.59	4.59	270.6	169.1
5th F	3	15.5	1.5	0.553	24.332	0.355	94.8	0.671	0.671	1.10	0.075	0.075	1.201	1.201	0.080	0.080	0.196	4.52	4.52	246.5	154.1
4th F	3	12.5	1.5	0.525	23.1	0.320	89.9	0.656	0.656	1.07	0.069	0.069	1.198	1.198	0.081	0.081	0.197	4.45	4.45	218.8	136.7
3rd F	3	9.5	1.5	0.49	21.56	0.279	83.9	0.637	0.637	1.04	0.063	0.063	1.199	1.199	0.081	0.081	0.197	4.35	4.35	186.4	116.5
2nd F	3	6.5	1.5	0.442	19.448	0.227	76.3	0.612	0.612	1.02	0.054	0.054	1.209	1.209	0.080	0.080	0.197	4.22	4.22	147.1	91.9
1st F	3.5	3.5	1.75	0.364	16.016	0.154	65.4	0.571	0.571	1.01	0.040	0.040	1.257	1.257	0.078	0.078	0.193	3.97	3.97	109.6	68.5

B	64
D	64
H	48.5
CFx =	0.8
CFy =	0.5

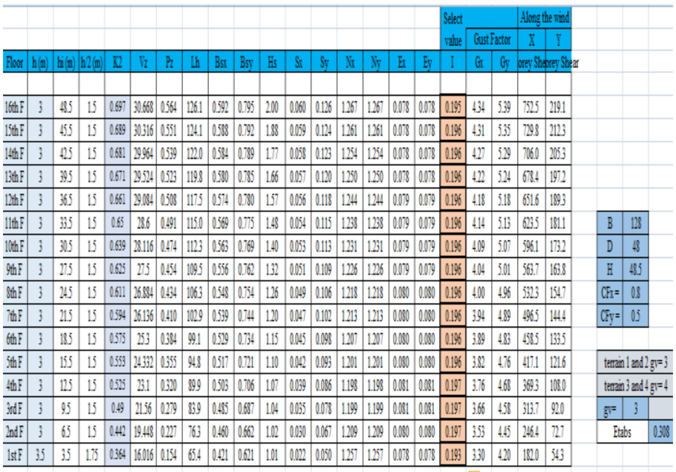
terrain 1 and 2 gv= 3	
terrain 3 and 4 gv= 4	
gv=	3
Etabs	0.308

Fig. 10: Square plan with across wind effect in EXCEL

									X	Y
Floor	h (m)	hi (m)	h/2 (m)	K2	Vz	Pz	Mcx	Mcy	orey She	orey Shear
16th F	3	48.5	1.5	0.697	30.668	0.56432	1782610.5	1409277	2273.5	1797.36
15th F	3	45.5	1.5	0.689	30.316	0.55144	1741924.6	1377112	2084.19	1647.69
14th F	3	42.5	1.5	0.681	29.964	0.5387	1701708.3	1345319	1901.82	1503.52
13th F	3	39.5	1.5	0.671	29.524	0.523	1652098.5	1306099	1716.05	1356.65
12th F	3	36.5	1.5	0.661	29.084	0.50753	1603222.6	1267459	1538.8	1216.53
11th F	3	33.5	1.5	0.65	28.6	0.49078	1550306.7	1225625	1365.71	1079.69
10th F	3	30.5	1.5	0.639	28.116	0.47431	1498278.7	1184493	1201.68	950.011
9th F	3	27.5	1.5	0.625	27.5	0.45375	1433345.7	1133159	1036.52	819.445
8th F	3	24.5	1.5	0.611	26.884	0.43365	1369851	1082962	882.542	697.711
7th F	3	21.5	1.5	0.594	26.136	0.40985	1294684	1023538	731.978	578.68
6th F	3	18.5	1.5	0.575	25.3	0.38405	1213183.8	959106	590.193	466.589
5th F	3	15.5	1.5	0.553	24.332	0.35523	1122124.8	887118	457.371	361.584
4th F	3	12.5	1.5	0.525	23.1	0.32017	1011368.7	799557	332.442	262.818
3rd F	3	9.5	1.5	0.49	21.56	0.2789	881014.51	696503	220.091	173.997
2nd F	3	6.5	1.5	0.442	19.448	0.22693	716861.8	566729	122.531	96.869
1st F	3.5	3.5	1.75	0.364	16.016	0.15391	486176.17	384356	44.7464	35.3751

B	64
D	64
H	48.5
etabs F	0.308
Cfx	0.8
Cfy	0.5

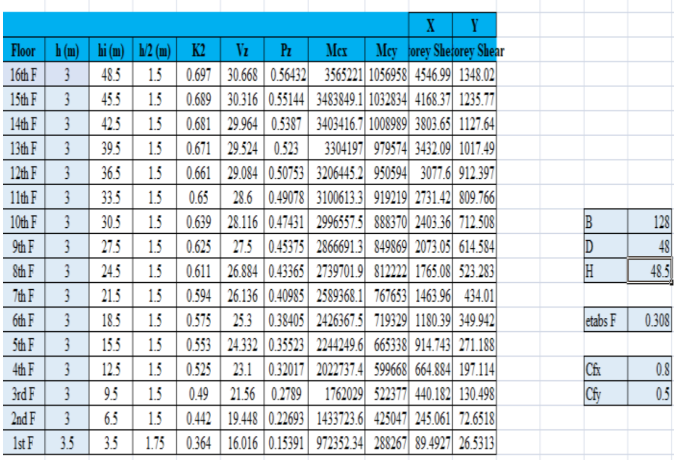
Fig. 11: Rectangular plan with along wind effect in EXCEL



Floor	h (m)	hi (m)	h/2 (m)	K2	Vz	Pz	Lh	Bsx	Bsy	Hs	Sx	Sy	Nx	Ny	Ex	Ey	Select value I	Gust Factor Gx	Gy	Along the wind X orey She	Y orey Shear
16th F	3	48.5	1.5	0.697	30.668	0.564	126.1	0.592	0.795	2.00	0.060	0.126	1.267	1.267	0.078	0.078	0.195	4.34	5.39	752.5	219.1
15th F	3	45.5	1.5	0.689	30.316	0.551	124.1	0.588	0.792	1.88	0.059	0.124	1.261	1.261	0.078	0.078	0.196	4.31	5.35	729.8	212.3
14th F	3	42.5	1.5	0.681	29.964	0.539	122.0	0.584	0.789	1.77	0.058	0.123	1.254	1.254	0.078	0.078	0.196	4.27	5.29	706.0	205.3
13th F	3	39.5	1.5	0.671	29.524	0.523	119.8	0.580	0.785	1.66	0.057	0.120	1.250	1.250	0.078	0.078	0.196	4.22	5.24	678.4	197.2
12th F	3	36.5	1.5	0.661	29.084	0.508	117.5	0.574	0.780	1.57	0.056	0.118	1.244	1.244	0.079	0.079	0.196	4.18	5.18	651.6	189.3
11th F	3	33.5	1.5	0.65	28.6	0.491	115.0	0.569	0.775	1.48	0.054	0.115	1.238	1.238	0.079	0.079	0.196	4.14	5.13	623.5	181.1
10th F	3	30.5	1.5	0.639	28.116	0.474	112.3	0.563	0.769	1.40	0.053	0.113	1.231	1.231	0.079	0.079	0.196	4.09	5.07	596.1	173.2
9th F	3	27.5	1.5	0.625	27.5	0.454	109.5	0.556	0.762	1.32	0.051	0.109	1.226	1.226	0.079	0.079	0.196	4.04	5.01	563.7	163.8
8th F	3	24.5	1.5	0.611	26.884	0.434	106.3	0.548	0.754	1.26	0.049	0.106	1.218	1.218	0.080	0.080	0.196	4.00	4.96	532.3	154.7
7th F	3	21.5	1.5	0.594	26.136	0.410	102.9	0.539	0.744	1.20	0.047	0.102	1.213	1.213	0.080	0.080	0.196	3.94	4.89	496.5	144.4
6th F	3	18.5	1.5	0.575	25.3	0.384	99.1	0.529	0.734	1.15	0.045	0.098	1.207	1.207	0.080	0.080	0.196	3.89	4.83	458.5	133.5
5th F	3	15.5	1.5	0.553	24.332	0.355	94.8	0.517	0.721	1.10	0.042	0.093	1.201	1.201	0.080	0.080	0.196	3.82	4.76	417.1	121.6
4th F	3	12.5	1.5	0.525	23.1	0.320	89.9	0.503	0.706	1.07	0.039	0.086	1.198	1.198	0.081	0.081	0.197	3.76	4.68	369.3	108.0
3rd F	3	9.5	1.5	0.49	21.56	0.279	83.9	0.485	0.687	1.04	0.035	0.078	1.199	1.199	0.081	0.081	0.197	3.66	4.58	313.7	92.0
2nd F	3	6.5	1.5	0.442	19.448	0.227	76.3	0.460	0.662	1.02	0.030	0.067	1.209	1.209	0.080	0.080	0.197	3.53	4.45	246.4	72.7
1st F	3.5	3.5	1.75	0.364	16.016	0.154	65.4	0.421	0.621	1.01	0.022	0.050	1.257	1.257	0.078	0.078	0.193	3.30	4.20	182.0	54.3

B	128
D	48
H	48.5
CFx=	0.8
CFy=	0.5
terrain 1 and 2 gv= 3	
terrain 3 and 4 gv= 4	
gv=	3
Etabs	0.308

Fig. 12: Rectangular plan with across wind effect in EXCEL



Floor	h (m)	hi (m)	h/2 (m)	K2	Vz	Pz	Mcx	Mcy	X orey She	Y orey Shear
16th F	3	48.5	1.5	0.697	30.668	0.56432	3565221	1056958	4546.99	1348.02
15th F	3	45.5	1.5	0.689	30.316	0.55144	3483849.1	1032834	4168.37	1235.77
14th F	3	42.5	1.5	0.681	29.964	0.5387	3403416.7	1008989	3803.65	1127.64
13th F	3	39.5	1.5	0.671	29.524	0.523	3304197	979574	3432.09	1017.49
12th F	3	36.5	1.5	0.661	29.084	0.50753	3206445.2	950594	3077.6	912.397
11th F	3	33.5	1.5	0.65	28.6	0.49078	3100613.3	919219	2731.42	809.766
10th F	3	30.5	1.5	0.639	28.116	0.47431	2996557.5	888370	2403.36	712.508
9th F	3	27.5	1.5	0.625	27.5	0.45375	2866691.3	849869	2073.05	614.584
8th F	3	24.5	1.5	0.611	26.884	0.43365	2739701.9	812222	1765.08	523.283
7th F	3	21.5	1.5	0.594	26.136	0.40985	2589368.1	767653	1463.96	434.01
6th F	3	18.5	1.5	0.575	25.3	0.38405	2426367.5	719329	1180.39	349.942
5th F	3	15.5	1.5	0.553	24.332	0.35523	2244249.6	665338	914.743	271.188
4th F	3	12.5	1.5	0.525	23.1	0.32017	2022737.4	599668	664.884	197.114
3rd F	3	9.5	1.5	0.49	21.56	0.2789	1762029	522377	440.182	130.498
2nd F	3	6.5	1.5	0.442	19.448	0.22693	1433723.6	425047	245.061	72.6518
1st F	3.5	3.5	1.75	0.364	16.016	0.15391	972352.34	288267	89.4927	26.5313

B	128
D	48
H	48.5
etabs F	0.308
Cfx	0.8
Cfy	0.5

6. RESULTS

6.1 Story Displacement :

Fig. 13: Story Displacement Graph

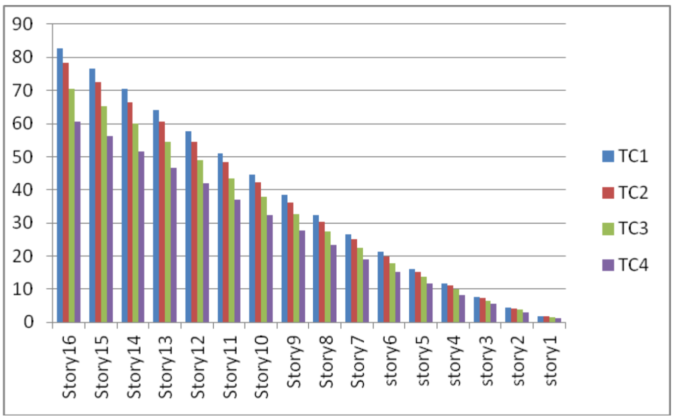


Table 6 – Story Displacement

Story	TC1	TC2	TC3	TC4
Story16	82.737	78.21	70.471	60.674
Story15	76.651	72.451	65.275	56.156
Story14	70.392	66.528	59.93	51.502
Story13	64.008	60.486	54.477	46.753
Story12	57.544	54.369	48.957	41.948
Story11	51.063	48.235	43.423	37.135
Story10	44.635	42.152	37.936	32.374
Story9	38.341	36.198	32.567	27.728
Story8	32.273	30.46	27.394	23.269
Story7	26.534	25.036	22.506	19.077
story6	21.178	19.977	17.95	15.185
story5	16.192	15.269	13.712	11.577
story4	11.678	11.008	9.88	8.325
story3	7.721	7.275	6.526	5.486
story2	4.413	4.156	3.725	3.123
story1	1.829	1.722	1.542	1.288

6.2 Story Drift :

Table 7 – Story Drift

Story	TC1	TC2	TC3	TC4
Story16	0.00202	0.00192	0.00173	0.00150
Story15	0.00208	0.00197	0.00178	0.00155
Story14	0.00212	0.00201	0.00181	0.00158
Story13	0.00215	0.00203	0.0018	0.00160
Story12	0.0021	0.00204	0.0018	0.00160
Story11	0.00214	0.00202	0.00182	0.00158
Story10	0.00209	0.00198	0.0017	0.00154
Story9	0.00202	0.00191	0.00172	0.00148
Story8	0.00191	0.00180	0.00162	0.00139
Story7	0.00178	0.00168	0.00151	0.00129
story6	0.00166	0.00156	0.0014	0.00120
story5	0.00150	0.0014	0.00127	0.0010
story4	0.00131	0.0012	0.00111	0.00094
story3	0.00110	0.0010	0.00093	0.00078
story2	0.00086	0.00081	0.00072	0.00061
story1	0.00052	0.00049	0.00044	0.00036

Fig. 14: Story Drift Graph

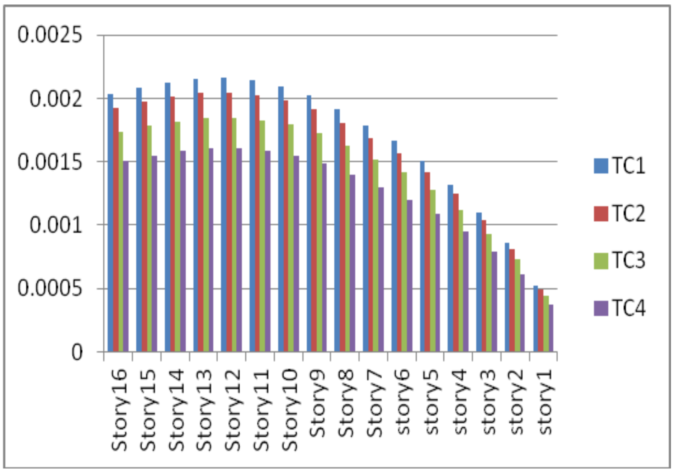
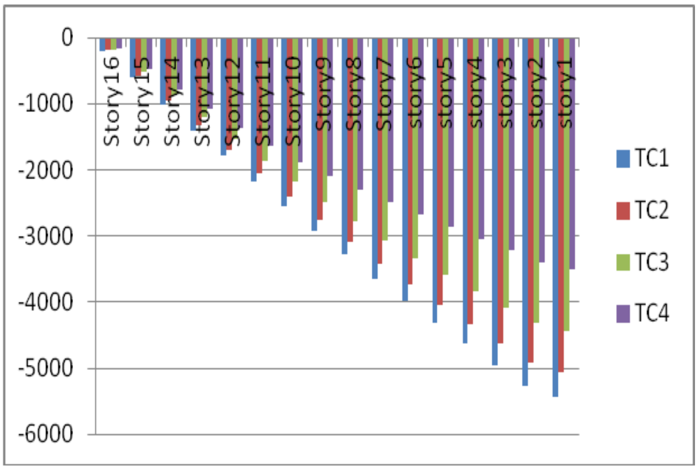


Fig. 15: Story shear Graph



6.3 Story shear :

Table 8 – Story shear

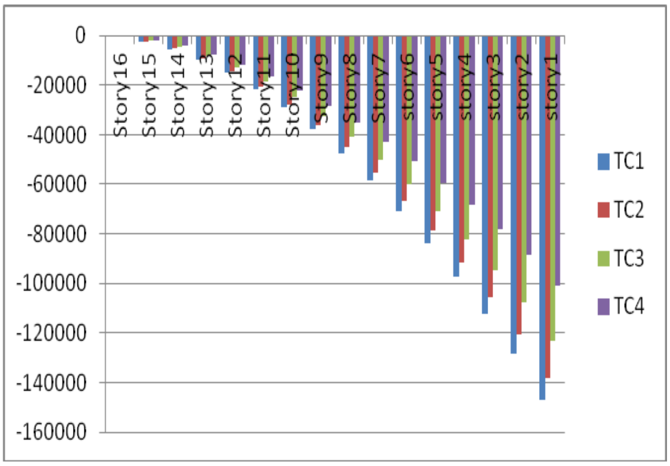
Story	TC1	TC2	TC3	TC4
Story16	-203.567	-193.39	-176.049	-163.194
Story15	-607.275	-576.832	-524.328	-481.649
Story14	-1005.87	-955.289	-866.91	-788.365
Story13	-1399.38	-1328.79	-1203.84	-1083.56
Story12	-1787.84	-1697.38	-1535.17	-1367.46
Story11	-2171.11	-2060.27	-1860.34	-1637.37
Story10	-2548.58	-2414.3	-2176.97	-1882.37
Story9	-2920.11	-2758.78	-2484.57	-2100.94
Story8	-3285.48	-3093.94	-2783.02	-2295.75
Story7	-3641.4	-3420.96	-3069.48	-2481.46
story6	-3985.26	-3738.81	-3341.2	-2667.01
story5	-4314.85	-4040.61	-3594.31	-2852.57
story4	-4635.23	-4331.41	-3835.35	-3038.13
story3	-4954.88	-4621.34	-4075.44	-3223.69
story2	-5274.53	-4911.28	-4315.54	-3409.25
story1	-5434.36	-5056.25	-4435.59	-3502.03

6.4 Overturning moment :

Table 9 – Overturning moment

Story	TC1	TC2	TC3	TC4
Story16	-610.7	-580.17	-528.146	-489.581
Story15	-2432.5	-2310.67	-2101.13	-1934.53
Story14	-5450.1	-5176.53	-4701.86	-4299.62
Story13	-9648.2	-9162.92	-8313.39	-7550.31
Story12	-15011.	-14255.1	-12918.9	-11652.7
Story11	-21525.	-20435.9	-18499.9	-16564.8
Story10	-29170.	-27678.7	-25030.8	-22211.9
Story9	-37931.	-35955.1	-32484.5	-28514.7
Story8	-47787.	-45236.9	-40833.6	-35402
Story7	-58711.	-55499.8	-50042	-42846.3
story6	-70667.	-66716.2	-60065.6	-50847.4
story5	-83612.	-78838	-70848.5	-59405.1
story4	-97517.	-91832.3	-82354.6	-68519.5
story3	-112382	-105696	-94580.9	-78190.6
story2	-128206	-120430	-107528	-88418.3
story1	-147226	-138127	-123052	-100675

Fig. 16: Overturning moment Graph



7. CONCLUSIONS :

- As the height of the structure increases, deflection on top storey also increases.
- It is maximum at top Story and goes on lower and becomes zero at the base of the structure for with Gust factor for square and rectangle plan.
- The Displacement and story drift of terrain category-1 is more as compared to terrain category-2,3 &4 for both square and rectangular plan.
- The maximum values of story shear and overturning moments are obtained at terrain category 1. For the above conclusions the maximum values are obtained at terrain category 1 in all cases and minimum values are obtained in terrain category 4.
- From this it was concluded that there is low wind effect on buildings which are in terrain category 4 compare to other terrain categories.

8. REFERENCES :

1. Miss. Homeshwari V. Gedam , Mrs. Gitadevi B. Bhaskar , (IJRASET) Effect of Wind Load on High Rise Buildings Considering Aspect Ratio ISSN: 2321-9653; Volume 6 Issue VI, June 2018.

2. Is 875-part3 (2015) Indian standard code of practice for design wind load.

3. IS 1893- part1(2016) Indian standard code of practice for Earthquake.

4. Numerical analyses of aerodynamic characteristics of integrated L -shaped high-rise building

5. IS: 875:1987 (part-1 and part2) "Indian Standard Code of practice for design loads", Bureau of Indian Standards, New Delhi.

6. IS: 875:1987 (part-3) "Indian Standard Code of practice for design Wind loads", Bureau of Indian Standards, New Delhi

7. Suraj Nayak U, Dr. Ananthayya M.B , (IJMER) Effect of Static and Dynamic Wind Forces on RC Tall Structures at different Height, in different Zones and in different Terrain Category using Gust Factor Method As Per Is: 875 (Part 3) 1987 ISSN: 2249–6645 Vol. 6 Issue. 3 March 2016 .

8. Minhaj Sania, G K Shankar Lingegowda, Akshaya Kumar H S , (IJRASET) EFFECT OF WIND LOAD ON TALL BUILDINGS IN DIFFERENT TERRAIN CATEGORY Volume: 06 Issue: 08 | Aug 2019 .
9. Mohammed Asim Ahmed , Moid Amir , Savita Komur , Vaijainath Halhalli , (IJRASET) EFFECT OF WIND LOAD ON TALL BUILDINGS IN DIFFERENT TERRAIN CATEGORY Volume: 04 Issue: 06 | June-2015 .
10. Ranjitha K. P, Khalid Nayaz Khan , Dr. N.S. Kumar, Syed Ahamed Raza , (IJRASET) Effect of Wind Pressure on R.C Tall Buildings using Gust Factor Method ISSN: 2278-0181 Vol. 3 Issue 7, July - 2014 .
11. B.Shobha1, Dr.H.SudarsanaRao2, Dr.Vaishali.G.Ghorpade3, (IJTIMES) EFFECT OF WIND LOAD ON LOW, MEDIUM, HIGH RISE BUILDINGS IN DIFFERENT TERRAIN CATEGORY e-ISSN: 2455-2585 Volume 4, Issue 02, February-2018.