Desirable Building Shape To Withstand Wind Load In Cyclonic Region

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Abstract- *In the last two decades, the development of skyscrapers taller than 150 metres has increased dramatically and at an almost exponential pace. In the Middle East and Asia, a substantial number of these structures have been completed, and many more are either planned or under construction. The structural and geotechnical design of "super-tall" structures above 300 metres in height create new difficulties for engineers. Wind analysis is essential for tall structures. Wind is a dynamic phenomenon with random variation, therefore a graph of wind velocity vs time will often be obtained. The topic's objective is to examine the behaviour of tall buildings exposed to along-wind stresses. Each high-rise structure is one-of-a-kind and influenced by a variety of circumstances that impact the design decisions. Before constructing tall buildings, it is recommended that an alternative design process be used by developing a new computational workbench for designing wind-resistant high-rise structures. The conclusion is that the structure with a square form is more effective and less impacted by wind load owing to its smooth surface, which creates less friction between the wind load and the surface itself as a result of wind excitation.*

I. INTRODUCTION

In India, in recent decades, the application of wind engineering to civil engineering structures has become popular and the state-of-the-art has improved considerably, Wind engineering requires a multifaceted approach to provide solutions to various wind sensitive problems. It involves various fields such as

(1) Fluid dynamics (I) Probability and statistics and (iii) Structural dynamics. Wind, in general, has two main effects on tall buildings: First, it exerts forces and moments on the structure and its cladding, and second, it distributes air in and around the building, mainly termed as wind pressure. Wind pressures on buildings are influenced by the building geometry, angle of wind incidence, surroundings and wind flow characteristics. There are many situations where available database, codes/standards and analytical methods cannot be used to estimates the wind pressure coefficients and wind loads on the claddings and supporting system of buildings, for example, the aerodynamic shape of the building is uncommon.
Wind load/pressure information (I) does not account the aerodynamic effect of the actual shape of the structure since they are based on box like buildings and (ii) do not allow for any detailed directional effects and assume that the design wind speed will always occur from the aerodynamically severe wind direction.

High-rise buildings are generally wind sensitive structures. Their dynamic response dominates the total response, which affects the structural design with regard to both structural safety and serviceability. In addition to this, because of their height, cladding loads are substantial. The wind flow around the high-rise buildings also affects the comfort of pedestrians in the

Structure of wind

- Wind is randomly varying dynamic phenomenon and a trace of velocity verses time for wind will be typically as The wind velocity V can be seen as a mean plus a fluctuating component responsible for creating 'gustiness. Within the earth's boundary layer, both components not only vary with height, but also depend upon the approach terrain and topography.

Effects of wind on structures

- A mean wind force acts on a building. This mean wind force is derived from the mean wind speed and the fluctuating wind force produced by the fluctuating flow field The effect of the fluctuating wind force on the building or part there of depends not only on the characteristics of the fluctuating wind force but also on the size and vibration characteristics of the building or part thereof. Therefore, in order to estimate the design wind load, it is necessary to evaluate the characteristics of fluctuating wind forces and the dynamic characteristics of the building.

Need for the present study

- From various experimental investigations, it is observed that plan shape and dimensions of buildings significantly affects the wind pressure distributions on different faces of the buildings.
- This study shows that certain shapes are prone to wind phenomena which can generate high dynamic loads and govern the design.
- This study will ignite an interest on the use of aerodynamic shapes and the consideration of building shape in terms of wind performance, early in design process.
- This study will explore the sensitivity of various shapes to the static and dynamic properties of structure.
- It would be useful in showing the importance of gust effectiveness factor method to make the tall structures susceptible even in the heavy storms.

Scope of the present study

- The scope of the present work included the study of the wind load estimation on tall buildings for the structural design purpose with the analytical approach given by Davenport's gust factor approach as well as equivalent static method in IS 875: part 3 1987 and the analysis of the buildings had been done by using ETABS 2013 software and the performance was analyzed by varying the shape of structure.
- Height of the building considered was 150 m/50 storied
- Different shapes of the building studied were:
- Square
- Rectangular
- C shape
- T shape
- L shape
- Hollow Rectangular

Objectives of the present study

- To study the behavior of tall structures when subjected to along wind loads.
- To study the effect of shape of the building in plan on the behavior of the structure.
- To determine the effect of wind load on various parameters like storey drifts, lateral displacements in the building.
- To define the most efficient shape for high rise buildings which can provide sound wind loading by observing the comparative studies.
- To show the importance of gust factor method for safe design of high rise buildings against wind loadings.

II. LITERATURE REVIEW

1. J.A. Amin and A.K. Ahuja[1]

- Has studied wind-induced pressures on buildings of various geometries. The experimental investigation of wind pressure distributions on models of typical plan shape buildings over an extended range of wind incidence angles of 0 to 180° at an interval of 15. Two L-shaped and two T-shaped models of same plan area and height but having the different dimensions were tested in a closed circuit wind tunnel under boundary layer flow. The models were made from Perspex sheets at a geometrical scale of 1:300. Fluctuating values of wind pressures are measured at pressure points on all the sides of the models and mean, maximum, minimum values of pressure coefficients were evaluated from pressure records. It is observed that plan shape and dimensions of models significantly affects the wind pressure distributions on different faces of the models. The location and magnitude of the measured peak pressure coefficient vary considerably with wind direction. The influence of shifting the upstream block from edge of the downstream block

2. Sarita Singla, Taranjeet Kaur, Megha Kalra and Sanket Sharma[2]

- Has studied Behaviour of R.C.C. tall buildings having different shapes Subjected to Wind Load. This paper presents the results of analytical studies on various shapes of buildings. In this study a 35 storeyed building of different shapes- Square, Hexagonal and Octagonal, having equal plan area and equal stiffness of the columns has been analysed. Based upon the study, it is concluded that shape of the structure plays an important role in resisting wind loads. Octagonal shaped building performed the best followed by shaped and square shaped building.

3. **P. Harikrishna, A. Abraham, S. Arunachalam, S. Selvi Rajan, G. Ramesh Babu and N. Lakshmanan[3]**

- Has studied Pressure measurement studies on a model of a tall building with different plan shapes along the height. This paper describes the experimental details of a wind tunnel study conducted on a 1:300 scale model of a 327 m tall building with different plan shapes along the height. Pressures have been measured on the model at 5 different levels and for various wind angles. Based on the evaluated mean force and torsion coefficients, critical wind angles have been identified.

III. METHODOLOGY

- The methodology worked out to achieve the above-mentioned objectives is as follows:
- Extensive literature survey by referring books, technical papers or research papers carried out to understand basic concept of topic.
- Identification of need of research.
- Formulation of stages in analytical work which is to be carried out.
- Data collection.
- 50 storey building is considered for the analysis.
- The model has prepared on ETABS for the various shapes of the buildings.
- Manual calculation of wind loads for the building according to IS 875(part3)-1987 has done by using the various parameters of the wind.
- Application of calculated wind loads on the modeled buildings is to be done.
- In similar way, another buildings is to be modeled of various shapes and by using Gust factor method, the wind loads is to calculated and applied to the modeled buildings.
- Comparative studies done for axial loads on column, storey shear, lateral story displacement, story drift, wind intensity for the various shapes of buildings and determination of structurally efficient shape of building is to be done.
- Interpretation of results and conclusion.

Problem statement

Name of parameter	Value	Unit
No. of storey	50	**Nos.**
Bottom storey height	3	**m**
Storey height	3	**m**
Soil type	Medium	
Wind zone	I	
Design wind speed	33	**m/sec**
Shape of buildings	Rectangular, square, c shape, L shape, hollow rectangular, T shape	
Plan area	2500	**m2**
Grid size	5x5	**m**
Thickness of slab	125	**mm**
Size of beam	300 X 600	**mm**
Size of column	1000 X 1000	**mm**
Material properties		
Grade of concrete	M40	**N/mm^2**
Grade of steel	Fe500	**N/mm^2**
Dead load intensities		
FF on floors	1.75	**kN/m^2**
FF on roof	2	**kN/m^2**
Live load intensities		
LL on floors	2	**kN/m^2**
LL on roof	**1**	**kN/m^2**

Building models

Models

- Model 1: Square shape building used for linear analysis
- Model 2: Rectangular shape building used for linear analysis
- Model 3: C shape building used for linear analysis
- Model 4: T shape building used for linear analysis
- Model 5: Hollow rectangular used for linear analysis
- Model 6: L shape used for linear analysis

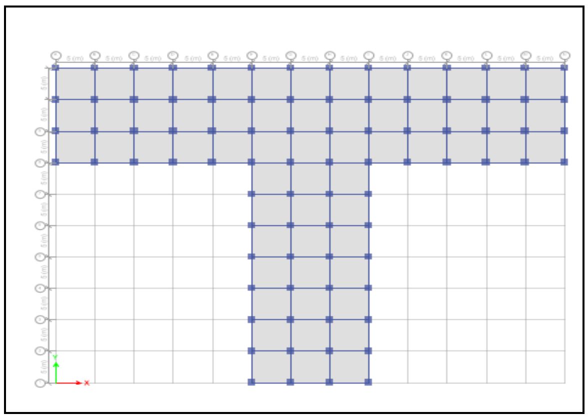


Fig no: T shape plan view

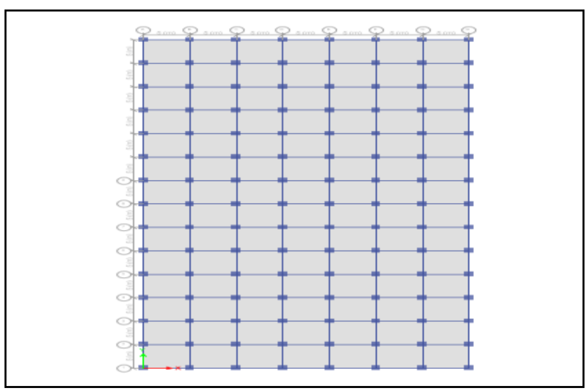


Fig: Rectangle shape plan view

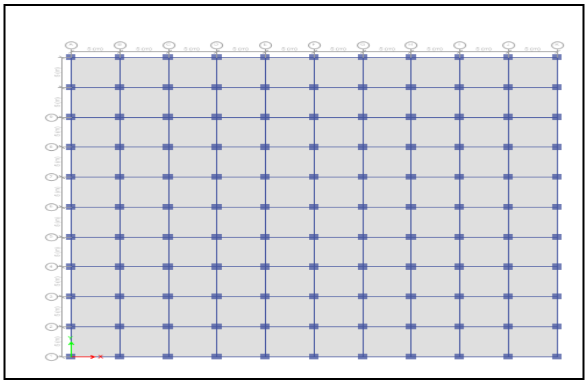


Fig no: square shape plan view

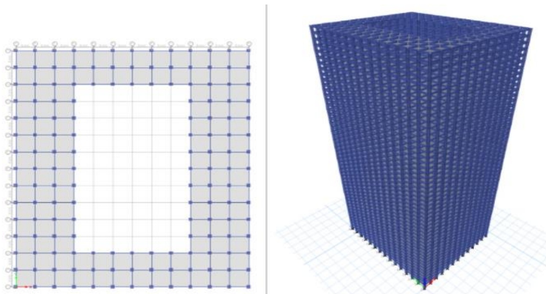


Fig: Hollow shape plan view

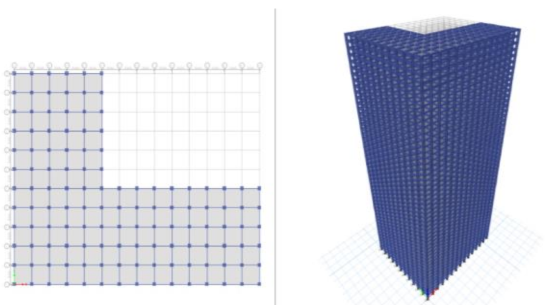


Fig : L shape plan view

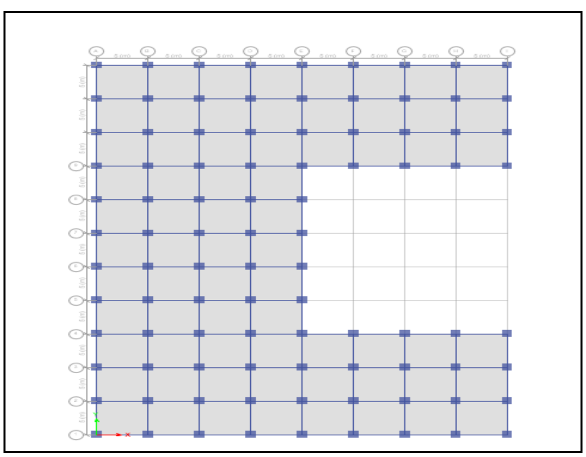


Fig: C shape plan view

IV. RESULT AND DISCUSSION

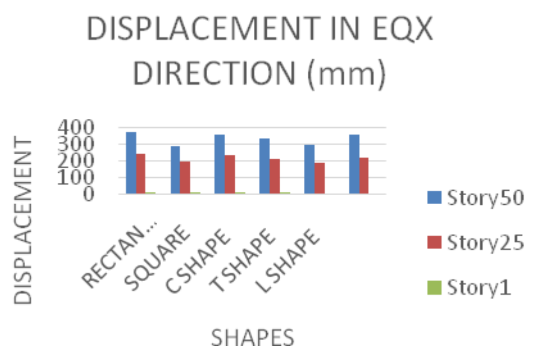
- **Introduction**

This chapter contains the results taken from software after application of loads to the models. After running the models, software shows the table of results. This chapter is divided into three parts i.e. results from linear analysis, and results which shows the effects of shape of buildings. It also contains graphical representation of the comparison of results of various shapes of buildings methods.

	DISPLACEMENT IN EQX DIRECTION					
	RECTANGULAR	SQUARE	C SHAPE	T SHAPE	L SHAPE	HOLLOW RECTANGULAR
Story50	373.504	291.7696	361.818	340.206	294.58	358.931
Story49	371.131	290.3204	359.652	337.362	293.041	355.794
Story48	368.605	288.7651	357.23	334.461	291.374	352.655
Story47	365.822	286.9987	354.549	331.4	289.462	349.4
Story46	362.753	284.992	351.592	328.124	287.279	345.94
Story45	359.389	282.74	348.35	324.612	284.823	342.224
Story44	355.734	280.2442	344.825	320.857	282.099	338.23
Story43	351.792	277.5099	341.022	316.865	279.117	333.956
Story42	347.572	274.5439	336.948	312.642	275.886	329.408
Story41	343.083	271.3522	332.613	308.195	272.415	324.596
Story40	338.333	267.9433	328.025	303.532	268.713	319.53
Story39	333.331	264.3215	323.192	298.66	264.786	314.219
Story38	328.084	260.4929	318.122	293.585	260.64	308.67
Story37	322.599	256.4641	312.82	288.314	256.282	302.892
Story36	316.883	252.2387	307.294	282.852	251.716	296.892
Story35	310.943	247.8226	301.551	277.206	246.947	290.677

Story34	304.785	243.2193	295.596	271.381	241.982	284.253
Story33	298.417	238.4356	289.437	265.385	236.826	277.629
Story32	291.846	233.4766	283.08	259.223	231.485	270.813
Story31	285.078	228.3466	276.533	252.902	225.965	263.812

	DISPLACEMENT IN EQX DIRECTION					
	RECTANGULAR	SQUARE	C SHAPE	T SHAPE	L SHAPE	HOLLOW RECTANGULAR
Story30	278.122	223.0524	269.802	246.429	220.272	256.635
Story29	270.983	217.5975	262.893	239.811	214.412	249.287
Story28	263.668	211.9887	255.814	233.054	208.389	241.775
Story27	256.183	206.2286	248.57	226.163	202.208	234.105
Story26	248.534	200.3214	241.165	219.144	195.871	226.281
Story25	240.725	194.2705	233.604	212	189.38	218.307
Story24	232.76	188.0786	225.891	204.737	182.74	210.188
Story23	224.643	181.7491	218.031	197.358	175.951	201.926
Story22	216.379	175.2844	210.026	189.868	169.017	193.527
Story21	207.972	168.6889	201.882	182.272	161.943	184.996
Story20	199.427	161.9644	193.604	174.573	154.732	176.34
Story19	190.751	155.1167	185.196	166.779	147.389	167.563
Story18	181.949	148.1493	176.665	158.896	139.92	158.674
Story17	173.027	141.0673	168.016	150.93	132.33	149.68
Story16	163.991	133.875	159.256	142.886	124.621	140.585
Story15	154.847	126.5759	150.389	134.771	116.797	131.394
Story14	145.6	119.175	141.421	126.588	108.859	122.111
Story13	136.252	111.6724	132.353	118.341	100.804	112.737
Story12	126.805	104.0697	123.188	110.029	92.631	103.272
Story11	117.261	96.3662	113.925	101.654	84.337	93.718
Story10	107.617	88.5609	104.565	93.211	75.922	84.075
Story9	97.873	80.65301	95.105	84.699	67.388	74.35
Story8	88.026	72.63738	85.542	76.112	58.745	64.557
Story7	78.07	64.51061	75.87	67.445	50.013	54.722
Story6	67.997	56.26413	66.082	58.687	41.233	44.892
Story5	57.785	47.88171	56.156	49.819	32.478	35.153
Story4	47.39	39.32744	46.049	40.8	23.875	25.657
Story3	36.72	30.52265	35.672	31.551	15.662	16.679
Story2	25.573	21.29378	24.847	21.912	8.269	8.708
Story1	13.527	11.28002	13.222	11.563	2.524	2.623
Base	0	0	0	0	0	0



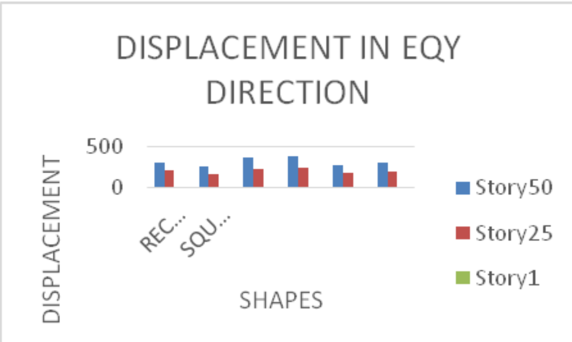
Graph no- Displacement In X –Direction

The above graph shows displacement in X –direction for square ,Rectangular ,C shape,T shape ,L shape, hollow rectangular building. square shape building has lower displacement than the rectangular shape building by 13.20 %, C shape 10.40 % building and T shape building by 4.70 %. L shape by 9.13 %, hollow rectangular by 9.67 %.

	STORY DRIFT IN EQX DIRECTION					
	RECTANGU	SQUARE	C SH	T SH	L SH	HOLLOW

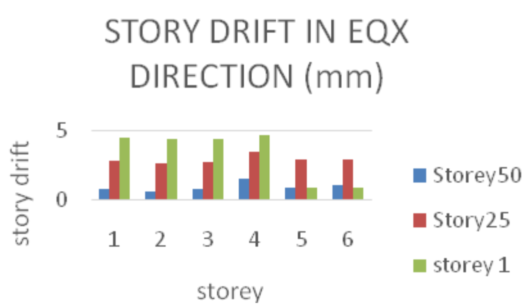
	LAR		APE	APE	APE	RECRANGULAR
Story50	0.871	0.646	0.863	1.528	0.93	1.141
Story49	0.953	0.721	0.928	1.6	1.003	1.171
Story48	1.077	0.848	1.043	1.702	1.117	1.248
Story47	1.214	0.985	1.177	1.821	1.251	1.361
Story46	1.354	1.123	1.313	1.948	1.39	1.49
Story45	1.488	1.255	1.443	2.076	1.526	1.623
Story44	1.613	1.377	1.566	2.201	1.654	1.747
Story43	1.728	1.489	1.679	2.32	1.772	1.86
Story42	1.833	1.591	1.781	2.429	1.878	1.962
Story41	1.929	1.683	1.874	2.53	1.973	2.053
Story40	2.016	1.767	1.959	2.623	2.06	2.136
Story39	2.096	1.844	2.037	2.708	2.14	2.212
Story38	2.171	1.917	2.11	2.787	2.215	2.283
Story37	2.243	1.986	2.179	2.862	2.287	2.351
Story36	2.312	2.054	2.246	2.933	2.357	2.417
Story35	2.379	2.119	2.311	3.002	2.426	2.481
Story34	2.444	2.184	2.373	3.067	2.492	2.543
Story33	2.507	2.247	2.434	3.129	2.556	2.602
Story32	2.567	2.307	2.493	3.188	2.616	2.659
Story31	2.624	2.365	2.548	3.243	2.673	2.711
Story30	2.678	2.42	2.6	3.294	2.725	2.759
Story29	2.728	2.472	2.648	3.34	2.774	2.803
Story28	2.774	2.52	2.693	3.382	2.819	2.843
Story27	2.817	2.565	2.735	3.42	2.86	2.88
Story26	2.858	2.608	2.774	3.454	2.9	2.915
Story25	2.896	2.649	2.811	3.486	2.939	2.949
Story24	**2.933**	**2.69**	**2.847**	**3.515**	**2.977**	**2.982**
Story23	2.97	2.73	2.883	3.543	3.016	3.015
Story22	3.006	2.769	2.917	3.57	3.054	3.048
Story21	3.041	2.809	2.952	3.595	3.092	3.08
Story20	3.075	2.848	2.985	3.618	3.128	3.111
Story19	3.108	2.886	3.018	3.639	3.163	3.139
Story18	3.139	2.922	3.048	3.657	3.195	3.164
Story17	3.168	2.956	3.076	3.672	3.224	3.186
Story16	3.194	2.987	3.101	3.684	3.249	3.205
Story15	3.216	3.016	3.123	3.691	3.272	3.22
Story14	3.236	3.042	3.142	3.695	3.293	3.234
Story13	3.254	3.066	3.16	3.696	3.313	3.246
Story12	3.271	3.09	3.176	3.696	3.332	3.257
Story11	3.287	3.113	3.192	3.694	3.353	3.269
Story10	3.305	3.138	3.21	3.693	3.373	3.281
Story9	3.324	3.165	3.23	3.694	3.392	3.291
Story8	3.348	3.196	3.253	3.699	3.404	3.295
Story7	3.377	3.233	3.282	3.71	3.403	3.286
Story6	3.415	3.279	3.32	3.732	3.376	3.252
Story5	3.471	3.341	3.375	3.773	3.299	3.168
Story4	3.561	3.436	3.462	3.85	3.13	2.994
Story3	3.716	3.599	3.614	3.993	2.794	2.669
Story2	4.015	3.904	3.901	4.269	2.148	2.058

Story1	4.54	4.432	4.408	4.757	0.941	0.909
Base						



Graph 3.2- Displacement In Y –Direction

The above graph shows displacement in Y –direction for square ,Rectangular ,C shape,T shape ,L shape, hollow rectangular building. square shape building has lower defirmation than the rectangular shape building by 0.70 %, C shape 16.39 % building and T shape building by 18.96 %, ,L shape by 11.57 % , hollow rectangular by 0.97 %

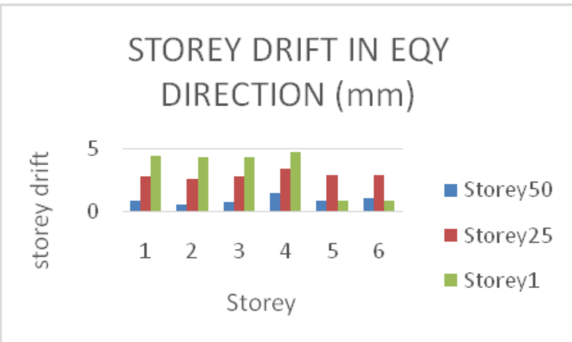


Graph no- Story Drift In X –Direction

The above graph shows story drift in X –direction for square ,Rectangular ,C shape,T shape ,L shape, hollow rectangular building. square shape building has lower story drift than the rectangular shape building by 25.83 %, C shape 25.14 % building and T shape building by 52.72 % L shape by 30.53 % , hollow rectangular 43.38 by %.

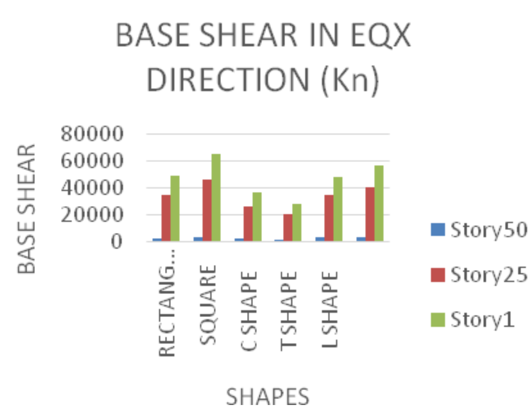
	BASE SHEAR IN EQX DIRECTION					
	RECTANGULAR	SQUARE	C SHAPE	T SHAPE	L SHAPE	HOLLOW RECTANGULAR
Story50	2254.872	2959.197	1649.412	1338.254	2432.932	2852.572
Story49	5024.015	6598.948	3700.65	3006.204	5421.477	6381.84
Story48	7649.772	10060.02	5645.002	4582.175	8237.531	9693.417
Story47	10103.12	13302.03	7460.887	6047.113	10842.33	12746.57
Story46	12359.3	16290.06	9129.818	7384.654	13203.15	15507.77
Story45	14402.26	19000.7	10639.76	8584.096	15299.32	17957.49
Story44	16227.2	21425.53	11987.02	9642.125	17125.76	20094.02
Story43	17841.53	23572.49	13176.99	10563.54	18694.28	21934.79
Story42	19264.39	25465.3	14223.81	11361.07	20032.83	23515.21
Story41	20524.77	27141.17	15148.99	12054.21	21182.83	24885.11
Story40	21658.33	28646.6	15979.07	12667.21	22194.28	26102.95
Story39	22703.19	30031.89	16742.51	13226.26	23119.42	27228.21
Story38	23695.23	31344.93	17466.15	13756.2	24005.6	28313.35
Story37	24663.79	32625.29	18172.01	14277.42	24888.85	29396.77
Story36	25628.4	33899.8	18874.83	14803.46	25789.65	30498.6
Story35	26597.51	35180.63	19581.06	15339.97	26712	31620.31
Story34	27569.17	36466.04	20289.39	15885.18	27645.85	32748.1
Story33	28533.65	37743.65	20992.63	16431.68	28572.14	33858.93

Story32	29477.05	38995.22	21680.45	16969.1	29469.01	34927.63
Story31	30385.22	40201.86	22342.29	17486.88	30317.54	35933.37
Story30	31247.22	41348.69	22969.99	17976.76	31106.31	36864.52
Story2	49080.73	64984.79	36059.9	28260.11	48166.57	57066.83
Story1	49288.3	65261.86	36214.61	28394.97	48227.5	57134.23



Graph 3.4- Storey Drift In Y –Direction

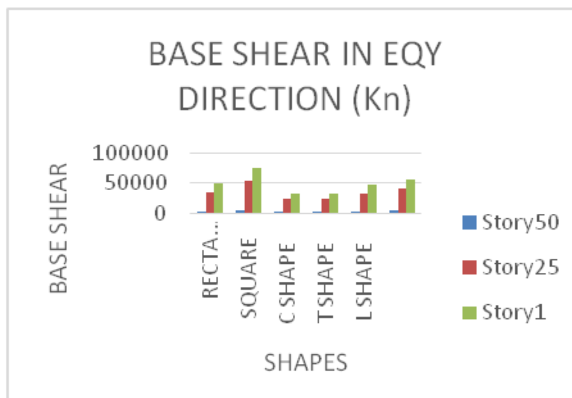
The above graph shows storey drift in Y –direction for square ,Rectangular ,C shape,T shape , L shape, hollow rectangular building. square shape building has lower storey drift than the rectangular shape building by 2.02 %, C shape 54.90 % building and T shape building by 50.66 % , L shape by 49.44 % , hollow rectangular by 25.70 %.



Graph no- Base Shear In X –Direction

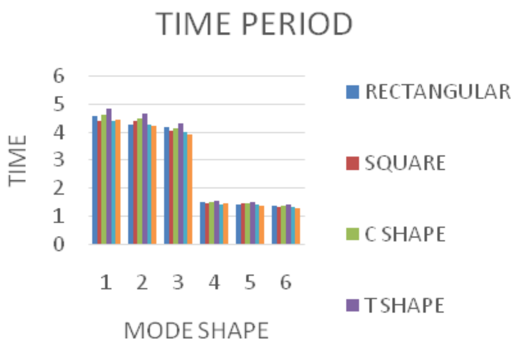
The above graph shows Base shear in X –direction for square ,Rectangular ,C shape,T shape, L shape, hollow rectangular building. square shape building has higher Base shear than the rectangular shape building by 0.94 %, C shape 27.53 % building and T shape building by 41.20 %, L shape by 6.43 % , hollow rectangular by 20.20 %.

	TIME PERIOD (SEC)					
MODE SHAPE	RECTANGULAR	SQUARE	C SHAPE	T SHAPE	L SHAPE	HOLLOW RECTANGULAR
1	4.542	4.372	4.615	4.797	4.39	4.426
2	4.251	4.372	4.472	4.63	4.233	4.187
3	4.17	4.042	4.119	4.276	4.004	3.912
4	1.488	1.438	1.503	1.548	1.421	1.428
5	1.401	1.438	1.464	1.508	1.38	1.366
6	1.374	1.334	1.358	1.405	1.316	1.288



Graph 3.6- Base Shear In Y –Direction

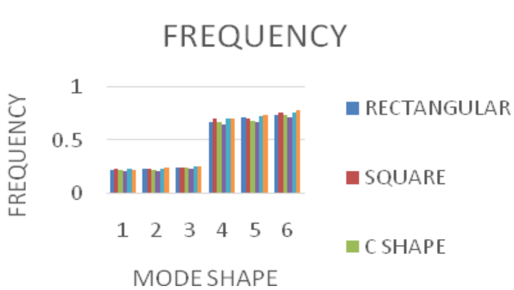
The above graph shows Base shear in Y –direction for square ,Rectangular ,C shape,T shape, L shape, hollow rectangular building. square shape building has higher Base shear t than the rectangular shape building by 16.31 %, C shape 41.47 % building and T shape building by 44.47 %, L shape by 9.87 % , hollow rectangular by 5.78 %.



Graph no- Time Period

The above graph shows Time period in direction for square ,Rectangular ,C shape,T shape , L shape, hollow rectangular building. square shape building has lower Time period t than the rectangular shape building by 3.74 %, C shape 5.26 % building and T shape building by 8.85 % ,L shape by 0.41 % , hollow rectangular by 1.22 %..

	FREQUENCY in Hz					
MODE SHAPE	RECTANGULAR	SQUARE	C SHAPE	T SHAPE	L SHAPE	HOLLOW RECTANGULAR
1	0.22	0.229	0.217	0.208	0.228	0.226
2	0.235	0.229	0.224	0.216	0.236	0.239
3	0.24	0.247	0.243	0.234	0.25	0.256
4	0.672	0.695	0.666	0.646	0.704	0.7
5	0.714	0.695	0.683	0.663	0.725	0.732
6	0.728	0.75	0.737	0.712	0.76	0.776



Graph no- frequency

The above graph shows Frequency in direction for square ,Rectangular ,C sharpest shape, L shape, hollow rectangular building. square shape building has lower frequency t than the rectangular shape building by 3.93 %, C shape 5.24 % building and T shape building by 0.021 % ,L shape by 0.43 % , hollow rectangular by 1.31 %.

V. CONCLUSIONS

- displacement in X –direction for square ,Rectangular ,C shape, T shape ,L shape, hollow rectangular building. square shape building has lower displacement than the rectangular shape building by 13.20 %, C shape 10.40 % building and T shape building by 4.70 %. L shape by 9.13 %, hollow rectangular by 9.67 %.
- displacement in Y –direction for square ,Rectangular ,C shape, T shape ,L shape, hollow rectangular building. square shape building has lower deformation than the rectangular shape building by 0.70 %, C shape 16.39 % building and T shape building by 18.96 %, ,L shape by 11.57 % , hollow rectangular by 0.97 %
- story drift in X –direction for square, Rectangular ,C shape, T shape ,L shape, hollow rectangular building. square shape building has lower story drift than the rectangular shape building by 25.83 %, C shape 25.14 % building and T shape building by 52.72 % L shape by 30.53 % , hollow rectangular 43.38 by %.
- story drift in Y –direction for square, Rectangular, C shape, T shape , L shape, hollow rectangular building. square shape building has lower story drift than the rectangular shape building by 2.02 %, C shape 54.90 % building and T shape building by 50.66 % , L shape by 49.44 % , hollow rectangular by 25.70 %.
- Base shear in X –direction for square ,Rectangular ,C shape, T shape, L shape, hollow rectangular building. square shape building has higher Base shear than the rectangular shape building by 0.94 %, C shape 27.53 % building and T shape building by 41.20 %, L shape by 6.43 % , hollow rectangular by 20.20 %.
- Base shear in Y –direction for square ,Rectangular ,C shape, T shape, L shape, hollow rectangular building. square shape building has higher Base shear t than the rectangular shape building by 16.31 %, C shape 41.47 % building and T shape building by 44.47 %, L shape by 9.87 % , hollow rectangular by 5.78 %.
- Time period in direction for square ,Rectangular ,C shape, T shape , L shape, hollow rectangular

building. square shape building has lower Time period t than the rectangular shape building by 3.74 %, C shape 5.26 % building and T shape building by 8.85 % ,L shape by 0.41 % , hollow rectangular by 1.22 %..

- Frequency in direction for square ,Rectangular ,C shape, T shape, L shape, hollow rectangular building. square shape building has lower frequency t than the rectangular shape building by 3.93 %, C shape 5.24 % building and T shape building by 0.021 % ,L shape by 0.43 % , hollow rectangular by 1.31 %.
- The conclusion of this study has been summarized in following point:
- The shape of the tall buildings playing a major role in reducing the wind load effect in terms of different design parameters that should be taken into consideration before designing any building.
- If the building height increased, the lateral load comes from wind load will increased as well causing the increasing in wind pressure. This is will generate additional stress to the building members. In addition, the storey displacement increased so the structure will have less stability and stiffness.
- The square shape building is more effective and less affected by wind load because of smooth surface that create a less friction between the wind load and the surface itself due to the wind excitation.
- By changing the shape from triangular to circular shape, the storey displacement and drift will reduced by maximum percentage due to reducing the wind pressure affecting the building.
- The building shapes that highly influenced by wind load can be reduced the impact by taking the efficient structural system, lateral bracing and increasing the dimension of beam and columns to have enough stiffness as well as usually shear wall has been used in order to reduce wind load.
- This study is connected to the scholars studies through result getting from this report is matched with the journals and the result of literature review chapter. At the end, I hope my findings in this project are expanded the knowledge in this field as well as contributes to all of us in future and done in required manner.

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