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ANALYSIS AND DESIGN OF G+30 BUILDING USING ETABS IN ZONE IV AND ZONE V

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ABSTRACT

We know that earthquakes cause disasters from ancient times. Modern structures are becoming narrower and more prone to swaying, which negatively impacts them during earthquakes. In the past, engineers and researchers have sought to make the buildings as earthquake resistant as possible. Several practical reports have shown that incorporating lateral load resisting methods into building configurations significantly improves seismic performance (ETABS 9.7.4). The research has focused on specific cases involving shear walls and bracings at very high heights, with a maximum reward gain knowledge of of 93.5m.

Story drift, shear force, building torsion, bending moment, and time period are some of the seismic factors that may be modelled and examined in conjunction with certain heights to determine the impact of unusual situations. As outlined in IS 1893-2002, the acquired information has been applied to Zone IV of Soil Type II, which consists of medium soils.

Seismicity, ETABS 9.7.4, narrative sway, tensile stress, bending moment, duration, and responses from supports.

I. INTRODUCTION

1.1 General:

The number of residential and commercial skyscrapers has been steadily rising in recent years, and the current architectural trend is towards ever-increasing heights. Due to the growing population and limited availability of open space, multi-story buildings are replacing single-story structures. As a result, the analysis of these structures must take into account the dynamic nature of wind and earthquake. Tall buildings are a common sight in both developed and developing economies nowadays. In light of this, the issue of providing sufficient strength and stability against lateral pressures, such as wind loads and seismic forces, is becoming increasingly important for nearly every designer. This is why it's important to consider wind and earthquake loads when designing tall buildings.

According to structural engineers, a tall building, also known as a high upward thrust building (HRB), is defined as a structure that is particularly vulnerable to lateral forces from wind, earthquakes, or both, due to its elevated position. Since the dawn of civilisation, people have grouped together to build tall structures. One of the world's seven wonders, the Egyptian Pyramids were built around 2600 B.C. Amidst such ancient lofty buildings. These constructions were erected for the sake of protection and as symbols of joy. In most cases, while designing tall buildings, it is necessary to take both wind and seismic loads into account. Dynamic analysis standards for earthquake loads differ from those for wind loads.

Specifically, IS 1893(Part1), which is the earthquake load standard established by the Bureau of Indian Standards, states: A dynamic study for earthquake load was required in 2002 because to factors such as the building's height, the seismic zone, vertical and horizontal irregularities, and weak and soft storeys. To determine the distribution of lateral pressures along the building's height, the contribution of the higher mode effects is taken into account. In order to avoid collapse due to wind, a structure must be strong enough to withstand the loads imposed by the wind's positive and negative pressures, as stated in I S 875(Part 3): 1987. The wind pressure is a function of the exposed basic wind speed, topography, building height, internal pressure, and building shape; it is transmitted to the structural system, which in turn transfers the load to the ground through the foundation. The goal of this course is to familiarise students with the many new lateral approaches and the structural behaviour they entail for soil type three (i.e., smooth soil form) in all four recommended zones. At regular intervals, the RCC building model displays various types of bracings to help understand how the programs relate to seismic motions, while other structural members' properties, such as the size of the columns, beams, bracings, and slabs, remain constant. The ETABS 2016 application system has completed the analytical modelling. The primary goal is to evaluate the sideways displacements, follow the current, The Response Spectrum technique, in accordance with IS 1893 (part I): 2002.II, causes base shear and stiffness.

ETABS

The innovative and state-of-the-art ETABS is the gold standard in coordinated programming bundles for auxiliary structure research and outline. Incorporating innovations spanning four decades, the latest ETABS provides users with unparalleled 3D protest-based representation and demonstration tools, lightning-fast linear and nonlinear explanation capabilities, sophisticated and extensive plan capabilities for a wide range of materials, and insightful realistic showcases, reports, and schematic illustrations that facilitate the easy translation and comprehension of exam and configuration results.

At every stage of the building configuration process, ETABS is involved, from the initial design of the outline to the fabrication of the schematic images. Modelling has never been easier, with natural illustration fees factoring in the rapid age of the surrounding floor and climb. It is possible to convert CAD files directly into ETABS models or use them as a basis for adding ETABS components. The top-tier SAPFire 64-bit solver supports nonlinear display processes like development sequencing and temporal effects (e.g., crawl and shrinkage), and it allows for the rapid dissection of extremely large and complicated models.

Like the limit check for steel associations and base plates, it incorporates the outline of steel and solid edges (with mechanised improvement), composite bars, composite segments, steel joists and cement and brick work shear dividers. All results can be shown clearly on the structure, and models may be practically produced. Schematic development drawings of surrounding plans, schedules, subtle elements, and cross-areas may be made for cement and steel structures, and there are extensive and changeable reports available for all configuration and examination yields.

Earthquake:

Analysis techniques for earthquakes that take seismic forces into account. The magnitude of the earthquake determines the intensity of these forces.

Dynamic actions on buildings-wind and earthquake

Structures are subject to dynamic activities when they are in the path of wind or an earthquake. While both wind and earthquake forces must be considered during design, the two are quite different. One aspect of wind design that is in line with the initiative concept of structural design is force-type loading, in which the building is subjected to pressure on its exposed surface area. Nevertheless, when it comes to earthquake design, the structure is subjected to displacement-type loading, which involves the random motion of the ground at its base (Figure 1.1). This motion creates inertia forces in the building, which in turn cause stresses. Another way to illustrate this distinction is by looking at the building's load-deformation curve. In force-

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type loading, caused by wind pressure, the demand on the building is represented by the vertical axis. In displacement-type loading, caused by earthquake shaking, it is represented by the horizontal axis.

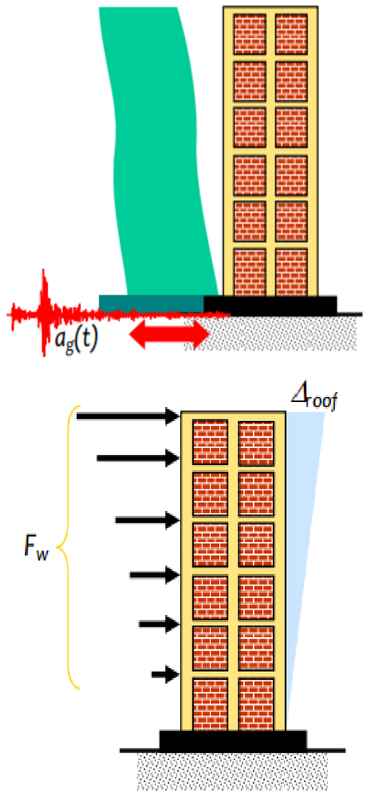

Figure 1.1: Distinction between the effects of earthquake ground movement at the building's foundation and wind pressure on exposed surface as a result of design

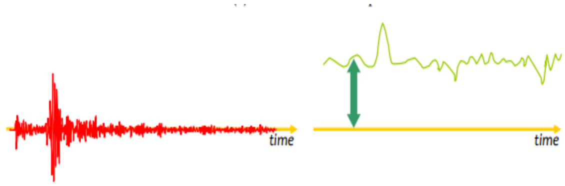

Figure 1.2: Characteristics of temporal changes of design actions: oscillatory, cytic and wind pressure, earthquake ground motion, and zero mean

Buildings are therefore only made to withstand a small portion (around 8–14%) of the force that they would encounter if they were made to be elastic during the anticipated intense ground shaking, allowing for damage. However, it is necessary to guarantee adequate initial stiffness in order to prevent structural damage from small shaking. In order to make the project feasible, seismic design strikes a compromise between acceptable damage and lower costs. This meticulous balance is the result of in-depth post-earthquake damage assessment studies and a great deal of study. Extensive earthquake design provisions are derived from this knowledge. On the other hand, under design wind forces, structural damage is unacceptable. Because of this, designs that mitigate the impacts of earthquakes are referred to as earthquake-resistant designs rather than earthquake-proof designs.

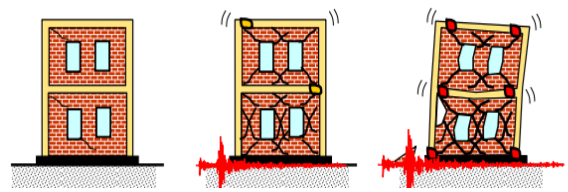

Figure 1.3: Designing to Resist Earthquakes Building philosophy is as follows: moderate shaking causes little structural damage and some non-structural damage, severe (infrequent) shaking causes structural damage but no collapse, and small (frequent) shaking causes little to no damage.

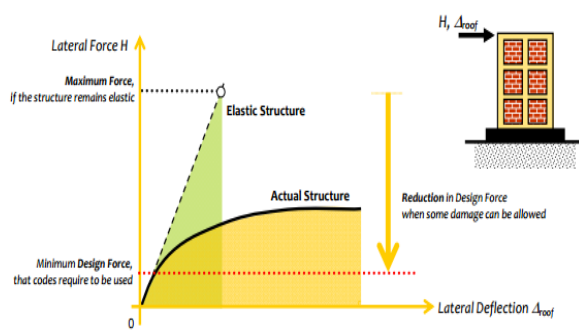

Figure 1.4: Fundamental earthquake design strategy: To get the design forces, compute the maximum elastic forces and subtract one.

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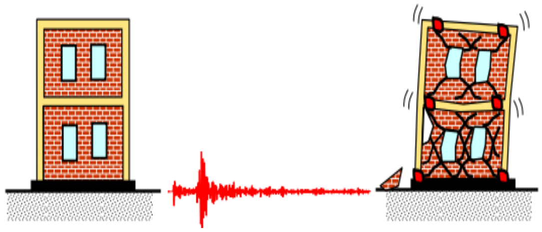

Figure 1.5: Earthquake-resistant but not earthquake-proof: Normal constructions under damaged buildings are susceptible to damage during an earthquake.

OBJECTIVE OF THE STUDY

The goals of the study are as follows:

1. To compare the outcomes of Zones 4 and 5 and use response spectrum analysis to determine the design lateral forces on G+30 story structures.
2. To examine the structure utilising seismic zones Zones 4 and 5.
3. To determine how structures will react to low, middle, and high frequency ground vibrations, among other kinds of ground motions.
4. To conduct research utilising the IS 1893:2002 code.

SUMMARY

The majority of buildings nowadays are characterised by uneven vertical and plan arrangements. A detrimental coupled lateral response may result from irregularities in arrangement and a lack of symmetry, which may indicate important eccentricity between the building mass and stiffness centres (Giordano, Guadagnuolo, and Faella, 2008). Furthermore, it takes a lot of engineering and design work to design and analyse an irregular building, but a bad designer will develop and analyse choices that are easy to understand. To put it another way, those with irregular options suffer more damage than those with regular ones. As a result, irregular structures require a more thorough structural analysis in order to function satisfactorily after a catastrophic earthquake (Herrera, Gonzalez, and Soberon, 2008).

Indian Standard Code (IS 1893) anomalies in elevation and plan: The structure's irregularities may be divided into two categories: plan and vertical. These are frequently distinguished by five different types, such as torsional, re-entrant corners, diaphragm separation, out-of-array offset, and non-parallel systems for plan irregularities, and stiffness (soft storey), mass, vertical geometric, in-plane separation in vertical components resisting lateral force, and separation in capability (weak storey) for vertical irregularities. (Part I of IS 1893: 2002)

The irregularity of the re-entrant corners was described in IS 1893 (Part I): 2002. Every projection of the structural document serves as a template for the re-entrant corner irregularity arrangement seen in a building's lateral force-resisting system. The Journal's website offers the option to download an electronic copy. Please contact the journal publishing committee using the information provided on the journal website if you have any issues about the paper guidelines. The conference website has details on submitting the final paper.

II. LITERATURE REVIEW

R.Master Praveen Kumar, A. Pavan Kumar Reddy, et al. (2017)

We have known since ancient times that earthquakes may cause disasters. These days, buildings are getting narrower and more prone to wobble, which makes them more dangerous during earthquakes. In the past, engineers and researchers have sought to make buildings earthquake-resistant. Using ETABS 9.7.4, it has been demonstrated through numerous functional reports that the use of lateral load resisting techniques in the construction configuration has significantly improved the structure's performance in earthquakes. Work has been done for the unique instances using shear walls and bracings for the exceptional heights, with a maximum top regarded for the reward gain knowledge of being 93.5m. The modelling is finished in order to investigate the effects of certain heights and peculiar conditions on seismic parameters such as base shear, lateral displacements, and lateral drifts. As specified in IS 1893-2002, the information gained has been applied to Zones IV and V in Soil Type II (medium soils).

According to the study's findings, story drift in zones 4 and 5 rises from the top story to the bottom story, with story 31 seeing the most drift in comparison to other stories. When comparing the drift values in zones 4 and 5, we find that zone 5 has a larger drift value. When compared to the forces in all stories for zones 4 and 5, the story shear is at its highest during those moments. When compared to zone 4, the shear value in zone 5 is greater. When compared to X and Y direction support responses in zones 4 and 5, the Z direction force for support reactions has the highest value. When compared to the Y and Z direction moments in zones 4 and 5, the X direction moment for support responses has the highest value.

A. Mounika Vardhan, Narla Mohan, et al. (2017)

When an earthquake occurs, a structure will vibrate in response. The vertical direction (z) and the two horizontal directions (x and y) are the three mutually perpendicular directions that make up an earthquake force. The building shakes or vibrates in all three directions as a result of this motion, with horizontal shaking being the most common direction. When analysing reinforced concrete structures, it is crucial to take into account the effects of lateral stresses caused by earthquakes and wind, particularly for high-rise buildings. Buildings should be able to withstand small earthquakes without suffering damage, according to the fundamental goal of analysis for earthquake-resistant constructions. It may withstand mild earthquakes without suffering structural damage, although occasionally non-structural damage can withstand strong earthquakes without the principal structure collapsing. Only multi-story commercial buildings made of reinforced concrete (RC) with FOUR distinct zones—II, III, IV, and V—are included in this study. ETabs, a program for FEM software, is used to carry out the study. Twenty stories with a constant storey height of three meters make up the study's building model. Four models with varying bay lengths are analysed; for ease, the number of bays and the bay-width along two horizontal directions are maintained constant in each model. Various SEISMIC ZONE FACTOR values are obtained, and the results are evaluated in light of their respective impacts.

This study came to the conclusion that when we move into greater seismic zones, the base shear of the structure rises. ZONE V's base shear value is 2889 KN, while ZONE II's is 802.6 KN for a comparable structure. This indicates that if seismic ZONE shifts from II to V, base shear increases by more than 350%. As earthquake zones expand, so does the displacement of building models. At the base, the displacement is extremely low, and at the ceiling, it is very high. ZONE II has a displacement of 0.1033, whereas ZONE IV has a displacement of 0.372. This indicates that if seismic ZONE shifts from II to V, base shear rises by more than 27%. The more wind pressure there is, the more building models relocate. At the base, the displacement is extremely low, and at the ceiling, it is very high. The displacement is 0.2411 at wind speeds of 39 m/s and 0.3963 at wind speeds of 50 m/s. This indicates that from 39 m/s to 50 m/s, the displacement has increased by more than 50%.

I. Ramaprasad Reddy, J. Chiranjeevi Yadav, et al. (2017)

Buildings with the best results in terms of the best sizing and reinforcing of the structural elements—primarily beam and column members in multi-bay and multi-story RC structures—are becoming more and more important in the current construction industry. In addition to saving money compared to standard state-of-the-art design techniques, optimum sizing takes into account the best stiffness correlation between structural parts. "Optimisation" refers to producing the best possible situation. There have been difficulties in the pursuit of unprecedented heights and architectural designs. The rigidity of the structure becomes increasingly crucial as the building's height grows. Due to dominant lateral loads, tall constructions have been able to ascend higher and higher despite odd loading effects and extremely high loading values. Tall structures must be designed with human comfort, serviceability, strength, and stability in mind. As a result, the impacts of lateral loads, such as wind loads and earthquake forces, are becoming more significant, and nearly all designers must deal with the challenge of offering sufficient strength and stability against lateral loads. In addition to comparing the outcomes of zones 2 and 5, the effects of lateral load on moments, axial forces, shear force, base shear, maximum storey drift, and tensile forces on the structural system are examined.

According to the study's findings, zone 2 soils have larger story drift x and story drift y in earthquakes than spectrum, as shown by table 2, graph 1, and table 3 graph 2. Graph 19 and Table 21 and Graph 20 show that zone 5 has more narrative drift than zone 2. According to table 22, graph 21, and table 23, graph 22, zone 5 has more narrative shear than zone 2. Etabs will get the designs for each and every participant. All of the failed beams will be listed, and the software will also provide a higher section. Software is used to increase accuracy.

K Jaya Prakash, V. Rajesh, and others (2016)

These days, buildings are designed to meet our basic needs and provide better serviceability. Building construction is not a problem in any way; what is crucial is creating an effective structure that will function well for many years to come. "Wind and seismic analysis and design of multi-story buildings" (G+30) is the project's title. The purpose of "BY USING STAAD PRO" is to find a better way to create geometry, define cross sections for columns, beams, etc., create specifications and supports (to define whether a support is fixed or pinned), and then define loads. "Run Analysis" is then used to analyse the model. The results are then reviewed to see if the beam column passed or failed in loads. After that, the design is carried out.

The top beams of a building under wind load combination required more reinforcement than the building under seismic load combination, as can be seen from the comparison of two 30-story buildings with the same beam and column size but different load combinations—for instance, beam number 1951 required five 20 mmØ and six 20 mmØ bars, while the building under seismic load combination required thirteen 10 mmØ and twenty-one 10 mmØ bars. However, compared to seismic, wind load combinations exhibit more deflection and shear bending. However, more strengthening is needed for the wind load combination in lower beams. The area and percentage of steel needed for a column are always higher for wind load combinations than for seismic load combinations. (For instance, column no. 129 Whereas the SL combination requires an Ast of 1911 mm2 and a percentage of steel of 3.43, the WL combination requires an Ast of 8371 mm2 and a percentage of steel of 1.56. Compared to the SL combination, the WL combination has a higher deflection value.

III. METHODOLOGY AND TYPES OF LOADS

3.1 RESPONSE SPECTRUM METHOD:

the illustration of the idealised single-degree-of-freedom system's maximum reaction to ground vibrations during earthquakes, with a certain period and damping. The code IS 1893-2002 (part 1) is followed in the execution of this study. Seismic zone factor and soil type should

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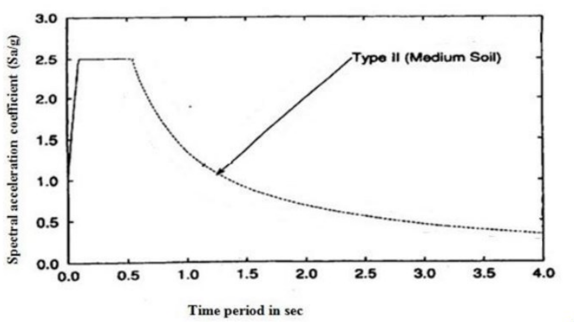
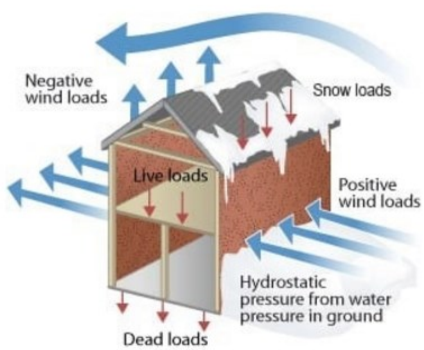
be supplied here using IS 1893-2002 (part 1). The ETABS 2013 program is used to analyse the building using the standard response spectrum for the kind of soil under consideration. The usual response spectrum for medium soil types is displayed in the following diagram, which may be expressed as time period versus spectral acceleration coefficient (Sa/g).



Response spectrum for 5% damping in medium-type soil

3.2 DIFFERENT TYPES OF LOADS ACTING ON THE STRUCTURE

Vertical, horizontal, and longitudinal loads are the three general categories of loads that are applied to buildings and other structures. Dead loads, living loads, and impact loads make up the vertical loads. Wind and seismic loads are included in the horizontal loads. When designing bridges, gantry girders, and other structures, longitudinal loads—that is, tractive and braking forces—are taken into account.

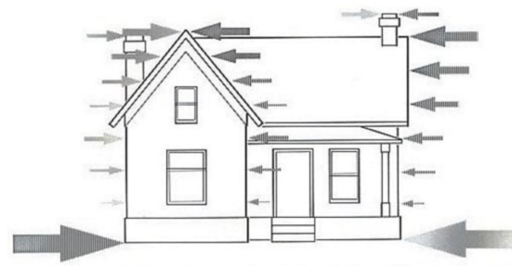


Safety and economics are two important considerations while designing a structure. Economy is impacted if the loads are changed and increased. Safety is jeopardised if economy is taken into account and loads are reduced.

Earthquake loads (EL)

Both vertical and horizontal forces acting on the structure are caused by earthquakes. Three mutually perpendicular directions—typically interpreted as vertical and two horizontal—can be distinguished from the entire vibration induced by an earthquake.

There are no appreciable forces in the superstructure as a result of vertical motions. However, while planning, the building's horizontal displacement during an earthquake must be taken into account.



All parties of a structure experience "whipping" forces as a result of horizontal earthquake forces, or back-and-forth shaking. These pressures have to go from the building's many components to the foundation.

IV. RESULTS AND ANALYSIS

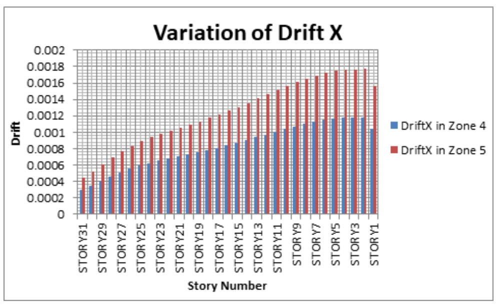
4.1 Story Drift

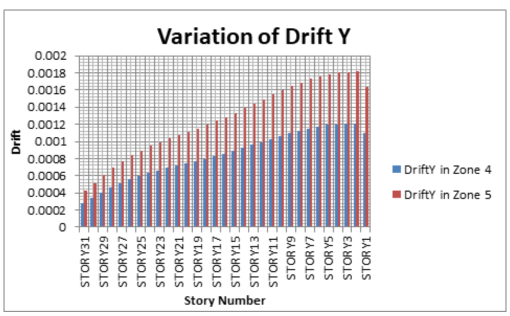
Drift X

Story	DriftX in Zone 4	DriftX in Zone 5
STORY31	0.000294	0.000441
STORY30	0.000351	0.000527
STORY29	0.000409	0.000613
STORY28	0.000463	0.000694
STORY27	0.000511	0.000767
STORY26	0.000555	0.000832
STORY25	0.000593	0.000889
STORY24	0.000626	0.000939
STORY23	0.000655	0.000982
STORY22	0.000681	0.001021
STORY21	0.000706	0.001058
STORY20	0.00073	0.001095
STORY19	0.000755	0.001133
STORY18	0.000782	0.001173
STORY17	0.00081	0.001215
STORY16	0.00084	0.00126
STORY15	0.000872	0.001307
STORY14	0.000905	0.001357
STORY13	0.000938	0.001408
STORY12	0.000973	0.001459
STORY11	0.001007	0.001511
STORY10	0.00104	0.001561
STORY9	0.001072	0.001608
STORY8	0.001101	0.001652
STORY7	0.001127	0.00169
STORY6	0.001148	0.001721
STORY5	0.001163	0.001745
STORY4	0.001173	0.001759
STORY3	0.001176	0.001764
STORY2	0.001179	0.001769
STORY1	0.001045	0.001567

Drift Y

Story	DriftY in Zone 4	DriftY in Zone 5
STORY31	0.000286	0.00043
STORY30	0.000345	0.000518
STORY29	0.000405	0.000608
STORY28	0.000461	0.000692
STORY27	0.000512	0.000768
STORY26	0.000557	0.000836
STORY25	0.000597	0.000896
STORY24	0.000632	0.000948
STORY23	0.000663	0.000994
STORY22	0.000691	0.001036
STORY21	0.000717	0.001075
STORY20	0.000742	0.001114
STORY19	0.000769	0.001153
STORY18	0.000797	0.001195
STORY17	0.000826	0.001239
STORY16	0.000857	0.001286
STORY15	0.00089	0.001335
STORY14	0.000924	0.001386
STORY13	0.000959	0.001438
STORY12	0.000994	0.001491
STORY11	0.00103	0.001544
STORY10	0.001064	0.001596
STORY9	0.001097	0.001645
STORY8	0.001127	0.00169
STORY7	0.001153	0.001729
STORY6	0.001175	0.001762
STORY5	0.001191	0.001786
STORY4	0.001201	0.001801
STORY3	0.001205	0.001807
STORY2	0.001211	0.001817
STORY1	0.001094	0.001641





4.2 SHEAR FORCE

Shear force (Vx)

Story	Shear force (VX) in Zone 4	Shear force (VX) in Zone 5
STORY31	147.77	221.65
STORY30	311.5	467.25
STORY29	462.83	694.25
STORY28	600.46	900.69
STORY27	723.39	1085.08
STORY26	830.97	1246.46
STORY25	922.96	1384.45
STORY24	999.56	1499.34
STORY23	1061.44	1592.16
STORY22	1109.78	1664.67
STORY21	1146.3	1719.46
STORY20	1173.23	1759.85
STORY19	1193.27	1789.9
STORY18	1209.5	1814.24
STORY17	1225.2	1837.8
STORY16	1243.62	1865.44
STORY15	1267.64	1901.46
STORY14	1299.42	1949.13
STORY13	1340.18	2010.27
STORY12	1390.03	2085.04
STORY11	1448.03	2172.05
STORY10	1512.4	2268.6
STORY9	1580.75	2371.13
STORY8	1650.41	2475.61
STORY7	1718.61	2577.91
STORY6	1782.7	2674.05
STORY5	1840.3	2760.45
STORY4	1889.34	2834.02
STORY3	1928.17	2892.25
STORY2	1955.53	2933.3
STORY1	1971.37	2957.06

Shear force (Vy)

Story	Shear force (VY) in Zone 4	Shear force (VY) in Zone 5
STORY31	132.91	199.37
STORY30	280.94	421.41
STORY29	418.56	627.84
STORY28	544.57	816.85
STORY27	658.03	987.04
STORY26	758.3	1137.45
STORY25	845.1	1267.66
STORY24	918.53	1377.79
STORY23	979.08	1468.63
STORY22	1027.72	1541.58
STORY21	1065.83	1598.75
STORY20	1095.26	1642.88
STORY19	1118.22	1677.34
STORY18	1137.29	1705.93
STORY17	1155.17	1732.75
STORY16	1174.57	1761.86
STORY15	1197.93	1796.89
STORY14	1227.13	1840.7
STORY13	1263.33	1895
STORY12	1306.81	1960.22
STORY11	1356.98	2035.47
STORY10	1412.51	2118.76
STORY9	1471.53	2207.29
STORY8	1531.85	2297.77
STORY7	1591.16	2386.75
STORY6	1647.21	2470.81
STORY5	1697.9	2546.85
STORY4	1741.41	2612.11
STORY3	1776.24	2664.36
STORY2	1801.27	2701.91
STORY1	1816.31	2724.46

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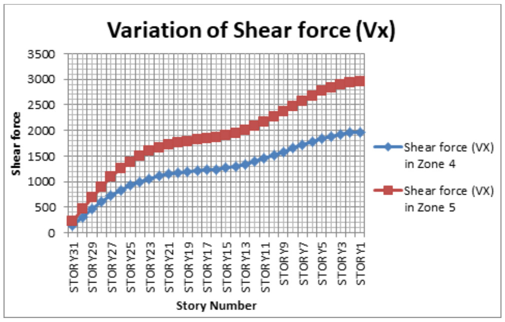
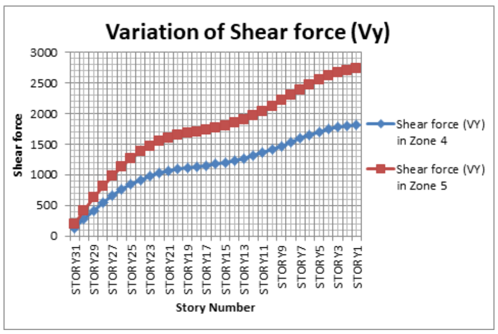




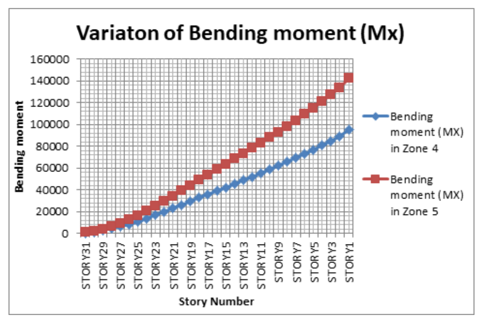
4.3 BENDING MOMENT

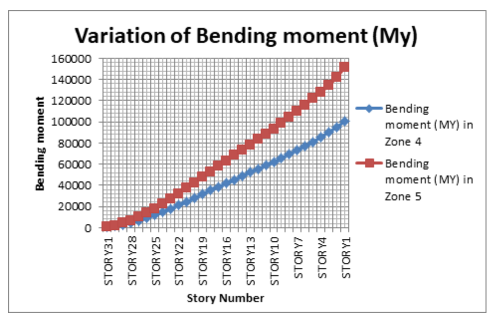
Bending moment (Mx)

Story	Bending moment (MX) in Zone 4	Bending moment (MX) in Zone 5
STORY31	398.732	598.097
STORY30	1241.523	1862.284
STORY29	2497.057	3745.586
STORY28	4130.314	6195.472
STORY27	6103.26	9154.89
STORY26	8375.656	12563.48
STORY25	10905.96	16358.95
STORY24	13652.31	20478.46
STORY23	16573.49	24860.24
STORY22	19630.04	29445.06
STORY21	22785.22	34177.83
STORY20	26006.03	39009.04
STORY19	29264.13	43896.2
STORY18	32536.67	48805
STORY17	35806.87	53710.31
STORY16	39064.56	58596.84
STORY15	42306.27	63459.41
STORY14	45535.19	68302.78
STORY13	48760.66	73141
STORY12	51997.4	77996.11
STORY11	55264.32	82896.48
STORY10	58583.06	87874.59
STORY9	61976.33	92964.49
STORY8	65466.12	98199.18
STORY7	69071.97	103608
STORY6	72809.46	109214.2
STORY5	76688.98	115033.5
STORY4	80714.97	121072.5
STORY3	84885.63	127328.4
STORY2	89193.03	133789.5
STORY1	95124.57	142686.9

Bending moment (My)

Story	Bending moment (MY) in Zone 4	Bending moment (MY) in Zone 5
STORY31	443.301	664.951
STORY30	1377.777	2066.665
STORY29	2766.108	4149.163
STORY28	4566.969	6850.454
STORY27	6735.813	10103.72
STORY26	9225.81	13838.72
STORY25	11988.88	17983.33
STORY24	14976.82	22465.23
STORY23	18142.42	27213.63
STORY22	21440.69	32161.04
STORY21	24830.03	37245.04
STORY20	28273.32	42409.98
STORY19	31739.04	47608.56
STORY18	35202.16	52803.24
STORY17	38644.91	57967.36
STORY16	42057.27	63085.9
STORY15	45437.22	68155.82
STORY14	48790.55	73185.83
STORY13	52130.38	78195.57
STORY12	55476.09	83214.13
STORY11	58851.96	88277.94
STORY10	62285.38	93428.07
STORY9	65804.76	98707.14
STORY8	69437.36	104156
STORY7	73207.18	109810.8
STORY6	77133.13	115699.7
STORY5	81227.55	121841.3
STORY4	85495.43	128243.1
STORY3	89934.02	134901
STORY2	94533.22	141799.8
STORY1	100885.5	151328.2





4.4 Building Torsion (T)

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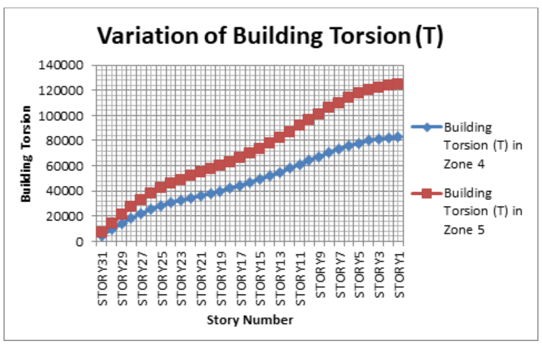
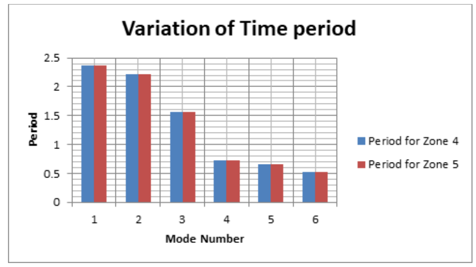
Story	Building Torsion (T) in Zone 4	Building Torsion (T) in Zone 5
STORY31	4448.486	6672.73
STORY30	9382.82	14074.23
STORY29	13950.08	20925.11
STORY28	18114.12	27171.18
STORY27	21850.27	32775.4
STORY26	25149.07	37723.6
STORY25	28020.83	42031.24
STORY24	30501.34	45752.01
STORY23	32657.24	48985.86
STORY22	34585.05	51877.58
STORY21	36396.76	54595.13
STORY20	38196.84	57295.25
STORY19	40067.71	60101.56
STORY18	42068.53	63102.8
STORY17	44239.42	66359.13
STORY16	46604.79	69907.18
STORY15	49174.31	73761.47
STORY14	51942.33	77913.49
STORY13	54887.01	82330.52
STORY12	57970.56	86955.84
STORY11	61140.95	91711.43
STORY10	64335.23	96502.84
STORY9	67483.54	101225.3
STORY8	70513.39	105770.1
STORY7	73353.41	110030.1
STORY6	75936.44	113904.7
STORY5	78201.98	117303
STORY4	80098.03	120147
STORY3	81582.36	122373.5
STORY2	82623.27	123934.9
STORY1	83226.88	124840.3



4.5 Time period:

Mode	Period for Zone 4	Period for Zone 5
1	2.362836	2.362836
2	2.217358	2.217358
3	1.563293	1.563293
4	0.723863	0.723863
5	0.664563	0.664563
6	0.5188	0.5188



V. CONCLUSION

The research mentioned above led to the following results.

1. Seismic zone V has larger values of Drift (Lateral Displacement point of view) in both X and Y directions than Zone IV, and the values of story Drift rise from the top story (the 31st story) to the bottom story (the first story).
2. Shear force values in both the X and Y directions are greater in seismic zone V than in zone IV, and they rise from the top story (the thirty-first story) to the bottom story (the first story).
3. From the top story (the thirty-first story) to the bottom level (the first story), the values of the building moment rise in both the X and Y directions. From the perspective of the bending moment, Seismic Zone V has a greater bending value than Zone IV.
4. The G+30 Story building's time period values in Zones IV and V are identical. This led to the conclusion that seismic zones had no bearing on the duration of a construction.
5. From the perspective of building torsion, Zone V had higher torsion values than Zone IV, and building torsion values increased from the top story (the thirty-first story) to the bottom story (the first story).
6. Because seismic forces occur in both X and Y directions for G+30 story buildings, the values of shear force, bending moment, and building torsion

were found to be larger for Zone V than Zone IV.

7. For G+30 buildings, zone 5 has a higher maximum value for forces and moments than zone 4.
8. Designing using software such as ETABS saves a significant amount of time. Every member's details will be acquired by ETABS.
9. The program will provide a higher section along with a list of all failed beams. Accuracy is increased by software.

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