DYNAMIC ANALYSIS OF G + 20 RESIDENTIAL BUILDING IN ZONE2 AND ZONE5 BY USING ETABS

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ABSTRACT: In the present scenario of construction industry, the buildings that are being constructed are gaining significance, in general, those with best possible outcomes with reference to optimal sizing and reinforcing of the structural elements, mainly beam and column members in multi-bay and multi–storey RC structures. Optimal sizing incorporates optimal stiffness co-relation among structural members and results in cost savings over the typical state-of-the practice design solutions. "Optimization" means making things the best.

The race towards new heights and architecture has not been without challenges. When the building increases in height, the stiffness of the structure becomes more important. Tall structures have continued to climb higher and higher facing strange loading effects and very high loading values due to dominating lateral loads. The design criteria for tall buildings are strength, serviceability, stability and human comfort. Thus the effects of lateral loads like wind loads, earthquake forces are attaining increasing importance and almost every designer is faced with the problem of providing adequate strength and stability against lateral loads.

Effect of lateral load on moments, axial forces, shear force, base shear, maximum storey drift and tensile forces on structural system are studied and also comparing the results of zone 2 and zone 5.

INTRODUCTION:

Natural disasters are inevitable and it is not possible to get full control over them. The history of human civilization reveals that man has been combating with natural disasters from its origin but natural disasters like floods, cyclones, earthquakes, volcanic eruptions have various times not only disturbed the normal life pattern but also caused huge losses to life and property and interrupted the process of development. With the technological advancement, man tried to combating with these natural disasters through various ways like developing early warning systems for disasters, adopting new prevention measures, proper relief and rescue measures. But unfortunately it is not true for all natural disasters. Earthquakes are one in all such disasters that's connected with in progress tectonic process; it suddenly comes for seconds and causes nice loss of life and property. So earthquake disaster prevention and reduction strategy is a global concern today. Hazard maps indicating seismic zones in seismic code are revised from time to time which leads to additional base shear demand on existing buildings.

Building construction is that engineering offers with the development of constructing akin to residential buildings in a really effortless constructing will probably be outline as an enclose area via partitions with proof, food, fabric and accordingly the basic desires of contributors. Inside the early earlier interval people lived in caves, over bushes or beneath bushes, to safeguard themselves from wild animals, rain, sun etc. because the handed as people being started dwelling in huts created from trees branches. The shelters of these previous are developed at the moment into wonderful residences. Rich individuals reside in sophisticated houses.

Structures are the primary indicator of social growth of the country. Every human has wished to posses cozy houses on an average most commonly one spends his two-third life occasions within the houses. The protection civic feel of the responsibility, these are the few motives which are accountable that the man or woman do utmost effort and pay tough-earned saving in owing houses.

INDIAN SEISMIC CODE IS 1893

"IS: 1893-2002 (Part-1) recommendations for earthquake resistant design of structures are initial disclosed in 1962 for the design of buildings in earthquake prone areas. The code was revised for five times in 1966, 1970, 1975, 1984 and 2002 (Part-1) that, this normal is meant for the earthquake resistant design of traditional structures and for the earthquake resistant design of special structures viz., dams, long-span bridges, major industrial projects etc, site-specific elaborated investigation ought to be undertaken. The traditional approach to unstable design has been based mostly upon providing a mix of strength and ductility to resist the obligatory loads.

Statement of the Project:

Salient features:

The design data shall be as follows:

1. Utility of buildings : Residential Building
2. No. of Storey : G+20
3. Shape of the building : Square
4. No. of Staircases : Four
5. No. of Lifts : Two
6. Types of Walls : Brick wall
7. Geometric details
   a. Ground Floor : 3m
   b. Floor-To-Floor Height: 3.3m
8. Material Details
   a. Concrete Grade : M30, M25
   b. All steel grades : HYSD reinforcement of Fe415
   c. Bearing capacity of soil : 200 KN/m^2
9. Type of construction : R.C.C Framed structure

Objectives of the study:

i. To study irregularities in structures analyze and design of G+20 storied structure as per code (IS1893:2002) provision.
ii. Analyze the buildings in Etabs software to carry out the storey deflection, storey drift, storey shear force and base shear of regular and irregular structures using response spectrum analysis and compare the results of different structure
iii. Time history analysis subjected to intermediate frequency ground motion for the response of regular buildings and compare with response spectrum analysis.
iv. Ductility-based earthquake-resistant design as per IS 13920.

Basic terms in Etabs:

a) Story.
b) Story shear
c) Story drift
d) Center of mass
e) Center of rigidity

Importance of G+20 storey building and its study

Population of India is increasing at alarming rate. This large population not only needs job but also needs housing and infrastructure facilities. With the advent of Industrial Policy most industries are coming in middle level cities and large cities. Hence, large population is migrating to these cities. Thus, the number of structures and buildings required for them is very large in these cities. This massive population increase will put great pressure on agriculture land near big and middle level cities. Medium or high rise would be the only answer to this urbanization .Land will become scarce and therefore, there will be the urgent need to build multi-storey structures in greater number in middle level cities also. At present these cities are expanding horizontally in mix manners but with the scarcity of land there is need for vertical expansion. This is especially needed for saving the agriculture land for growing food items. Hence, the concept of multistoried buildings or high-rise buildings comes into existence.

LITERATURE REVIEW

Mahesh N. Patil, Yogesh N. Sonawane was this paper provides complete guide line for manual as well s software analysis of seismic coefficient method. The effective design and the construction of earthquake resistant structures have much greater importance in all over the world. In this paper, the earthquake response of symmetric multistoried building is studied by manual calculation and with the help of ETABS 9.7.1 software. The method includes seismic coefficient method as recommended by IS 1893:2002. The responses obtained by manual analysis as well as by soft computing are compared.

The paper concludes that there is a gradual increase in the value of lateral forces from bottom floor to top floor in both manual as well as software analysis. Calculation of seismic weight by both manual analysis as well as software analysis gives exactly same result. There is slight variation in the values of base shear in manual analysis as well as software analysis. Base shear values obtained by manual analysis are slightly higher than software analysis. Results as compared and approximately same mathematical values are obtained for 8-story building. Complete guideline for the use of ETABS 7.1 for seismic coefficient analysis is made available by this paper. To conclude a complete design involving several parameters so as to result the earthquake has been done and 3D prospective is shown for easy understanding and use.

M. Jeevanathan, J.P. Annie Sweetlin provides the present day scenario witnesses a series of natural calamities like earthquakes, tsunamis, floods etc. Of these the most damaging and recurrent phenomena is the earthquake. The Effective design and the construction of Earthquake resistant structure have gained greater importance all over the world. In this paper the earthquake resistance of a G+20 multi-storey building is analyzed using Equivalent static method with the help of E-TABS 9.7.4 software. The method includes seismic coefficient method as recommended by IS 1893:2002. The parameters studied were displacement, storey drift and storey shears.

There is increase in displacement value from bottom floor to top floor. In this type of model wind displacement is within the limits and earthquake displacement are beyond the permissible limits of the building (h/500 = 135mm). Drift is within the limits for the building (0.004 times of the height of the storey) 0.004x3.2 = 12.8mm. Earthquake Base shear is greater than Wind Base shear. Complete guideline for the use of E-TABS 9.7.4 for seismic coefficient analysis is made available by this paper.

Syed Fahad Ali and S.A. Bhalchandra was Present work on seismic analysis of RCC and steel concrete composite structure. The modeling and analysis of RCC and composite buildings has done by finite element based software ETABS 2015 and also buildings are categorized with number of stories. In addition, they also presented the cost comparison of RCC and composite structure with different support condition. From overall view of analysis and result, they suggest that the composite structures are more economical than RCC structure and the composite structures are better option for multi story buildings to resist the seismic loads.

D.R. Panchal and P.M Marathe are presented the comparative study of RCC, steel and composite (G+30) stories structures under the seismic effect. For the analysis equivalent static method has been used and modeling of structures has done by ETABS. And also the result has computed from ETABS. From this study they conclude that the steel structures are better than RCC structures for low rise buildings but for high rise buildings the composite option is best suited among all three options. In addition, the reduction in self weight of steel structure is 32% less than RCC structures and the self weight of composite structure is 30% less than RCC structures. And also they suggest that, in steel structure the bending moment of secondary beam increased by average 83.3% and reduced by 48% in composite structure as compare to RCC.

MODELLING AND METHODS OF ANALYSIS OF STRUCTURE

In the present study, analysis of G+20 multi-story building in most severs zone for wind and earth quake forces is carried out.3D model is prepared for G+20 multi-story building is in ETABS.

Methods of analysis of structure:

The seismic analysis should be carried out for the buildings that have lack of resistance to earthquake forces. Seismic analysis will consider dynamic effects hence the exact analysis sometimes become complex. However for simple regular structures equivalent linear static analysis is sufficient one. This type of analysis will be carried out for regular and low rise buildings and this method will give good results for this type of buildings. Dynamic analysis will be carried out for the building as specified by code IS 1893-2002 (part1). Dynamic analysis will be carried out either by Response spectrum method or site specific Time history method. Following methods are adopted to carry out the analysis procedure.

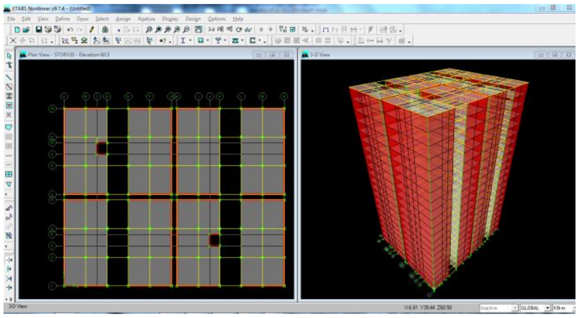
a. Equivalent Static Analysis
b. Linear Dynamic Analysis
c. Response Spectrum Method
d. Time History Analysis
e. Pushover Analysis
f. Non Linear Static Analysis
g. Non Linear Dynamic Analysis

LOADS ACTING ON MULTI-STOREY G+20 BUILIDING

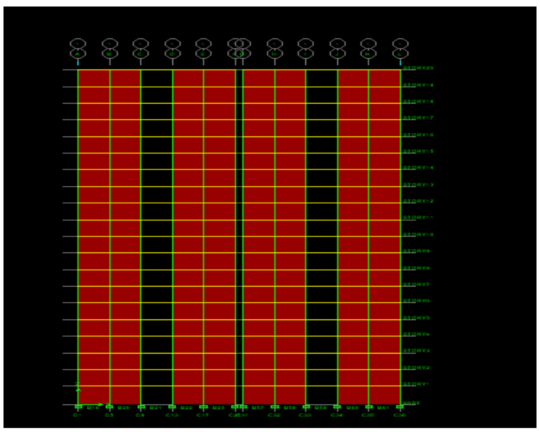
Loading on tall buildings is different from low-rise buildings in many ways such as large accumulation of gravity loads on the floors from top to bottom, increased significance of wind loading and greater importance of dynamic effects. Thus, multi-storied structures need correct assessment of loads for safe and economical design. Except dead loads, the assessment of loads cannot be done accurately. Live loads can be anticipated approximately from a combination of experience and the previous field observations. Wind and earthquake loads are random in nature and it is difficult to predict them. They are estimated based on a probabilistic approach. The following discussion describes some of the most common kinds of loads on multi-storied structures.

a. Dead loads
b. Live loads
c. Gravity loads
d. Wind loads
e. Earthquake loads

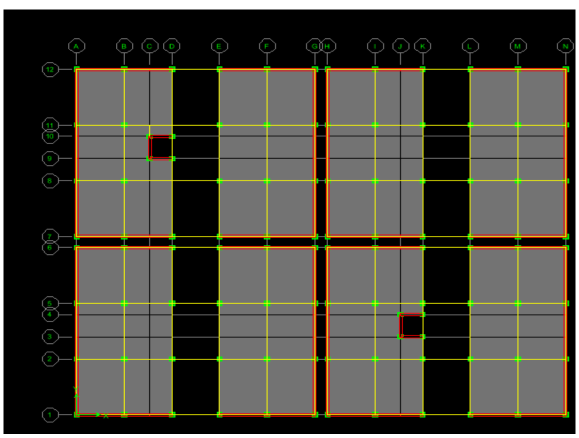
Plan and Elevation of G+20 Building:



G+20 building design in E-tabs



Elevation of G+20 Building



Plan of G+20 Building

ANALYSIS AND RESULTS

Zone 2 Results:

Story drift

Table1: Story drift in x direction for top 5 floors

Story	load	Drift x
STORY 20	EQX	0.000293
STORY 20	SPEC1	0.000020
STORY19	EQX	0.000299
STORY19	SPEC1	0.000020
STORY 18	EQX	0.000304
STORY 18	SPEC1	0.000021
STORY17	EQX	0.000309
STORY17	SPEC1	0.000021
STORY16	EQX	0.000313
STORY16	SPEC1	0.000021

Graph: story drift in x direction

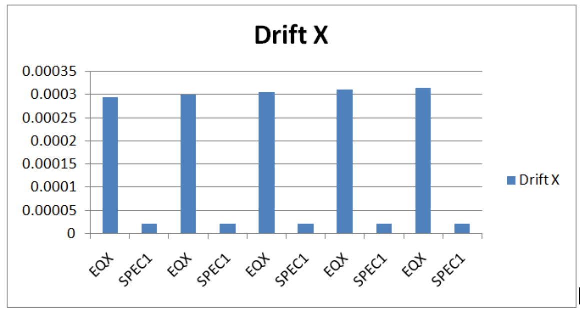
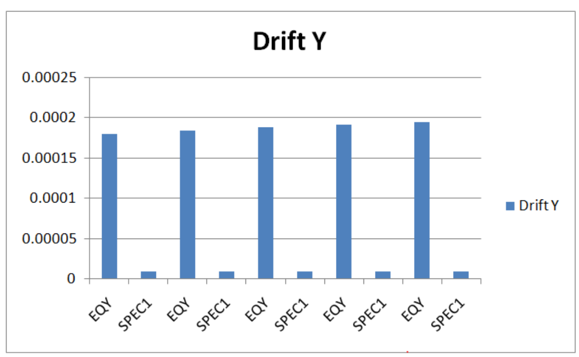


Table 2: story drift in y direction:

Story	Load	DRIFT Y
STORY 20	EQY	0.000179
STORY 20	SPEC1	0.000008
STORY19	EQY	0.000184
STORY19	SPEC1	0.000008
STORY 18	EQY	0.000188
STORY 18	SPEC1	0.000008
STORY17	EQY	0.000191
STORY17	SPEC1	0.000008
STORY16	EQY	0.000194
STORY16	SPEC1	0.000008

Graph: Story drift in y direction:



Story shear:

Table 3: Story shear for Vx and Vy

Story	Load	Vx	Vy
STORY 20	EQX	-99.44	0
STORY 20	EQY	0	-158.5
STORY 20	SPEC1	6.83	6.7
STORY 20	HIST1 MAX	2935.97	24066.6
STORY 19	EQX	-204.44	0
STORY 19	EQY	0	-325.85
STORY 19	SPEC1	13.97	13.86
STORY 19	HIST1 MAX	3698.45	48013.09
STORY 18	EQX	-298.73	0
STORY 18	EQY	0	-476.13
STORY 18	SPEC1	20.3	20.3
STORY 18	HIST1 MAX	1569.55	66913.19
STORY 17	EQX	-382.88	0
STORY 17	EQY	0	-610.27
STORY 17	SPEC1	25.93	26.07
STORY 17	HIST1 MAX	0	80807.17
STORY 17	HIST1MINI	-3064.63	0
STORY 16	EQX	-457.49	0
STORY 16	EQY	0	-729.18
STORY 16	SPEC1	30.97	31.23
STORY 16	HIST1 MAX	-9236.12	0
STORY 16	HIST1MINI	-9236.12	0

Graph: story shear for Vx and Vy:

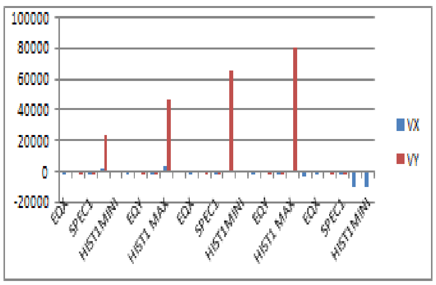
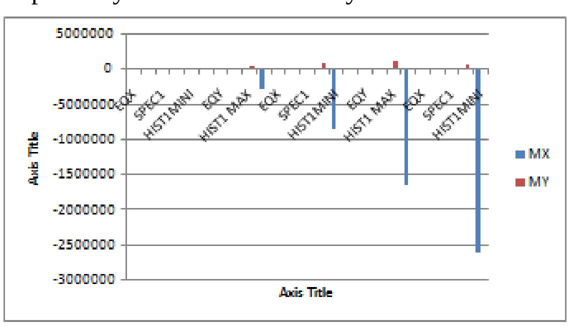


Table 4: Story shear for moments for top stories

Story	Load	Mx	My
STORY 20	EQX	0	0.063
STORY 20	EQY	-0.1	0
STORY 20	SPEC1	18720.2	0
STORY 20	HIST1 MAX	15.255	0
story 20	HIST1MINI	0	-1.861
STORY 19	EQX	0	-11745
STORY 19	EQY	18720.1	0
STORY 19	SPEC1	791.85	806.463
STORY 19	HIST1 MAX	0	346765.3
STORY 19	HIST1MINI	-2842482	0
STORY 18	EQX	0	-35891
STORY 18	EQY	57205.98	0
STORY 18	SPEC1	2427.955	2455.112
STORY 18	HIST1 MAX	0	783591.3
STORY 18	HIST1MINI	-8513309	0
STORY 17	EQX	0	-71173.5
STORY 17	EQY	113442	0
STORY 17	SPEC1	4823.664	4849.015
STORY 17	HIST1 MAX	0	968974
STORY 17	HIST1MINI	-1.6E+07	0
STORY 16	EQX	0	-116396
STORY 16	EQY	185521.1	0
STORY 16	SPEC1	7896.336	7900.486
STORY 16	HIST1 MAX	0	607012.7
STORY 16	HIST1MINI	-2.6E+07	0

Graph: story shear for Mx and My



Support reaction:

Table 6: Support reactions for shear force

LOAD	FX	FY	FZ
EQX	-15.95	-6.54	-148.06
EQY	-8.58	-34.45	-210.46
SPEC1	1.29	1.75	14.4
HIST1MAX	1334.87	4278.84	27389.89
HIST1MIN	0	0	0

Graph: support reaction for each force

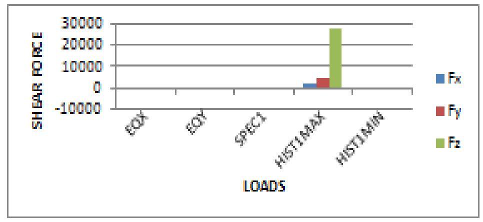
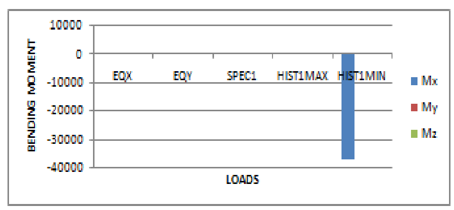


Table 7: Support reactions for bending moment

Load	Mx	My	Mz
EQX	-7.851	-256.411	0.325
EQY	299.971	22.929	-0.347
SPEC1	14.92	19.665	0.03
HIST1MAX	0	128.167	41.015
HIST1MIN	-37422.8	0	0

Graph: Support reactions for bending moment



For Summation:

Table 8: Support reactions for shear force (summation)

Load	Fx	Fy	Fz
EQX	-821.33	0	0
EQY	0	-1309.11	0

Graph: Support reactions for shear force (summation)

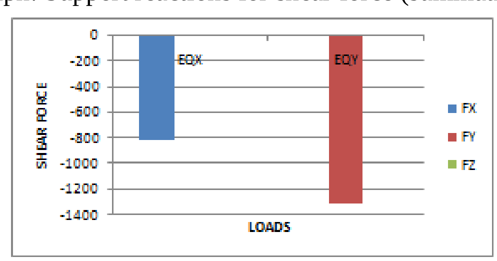
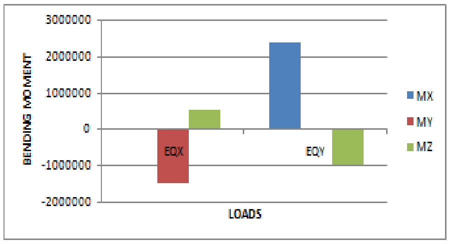


Table 9: Support reactions for bending moment (summation)

Load	Fx	Fy	Fz
EQX	0	-1488609	501207.2
EQY	2372662	0	-992137

Graph: Support reaction for bending moment (summation)

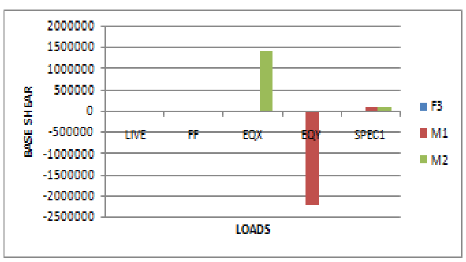


Section cut forces:

Table 10: section cut forces

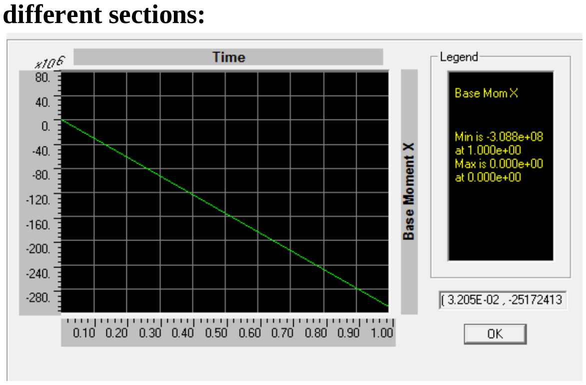
Section	Load	F3	M1	M2
SCUT1	LIVE	-9762.33	0	0
SCUT1	FF	-4046.56	0	0
SCUT1	EQX	0	0	1381900
SCUT1	EQY	0	-2202581	0
SCUT1	SPEC1	0	99232.27	98005.97

Graph: section cut forces

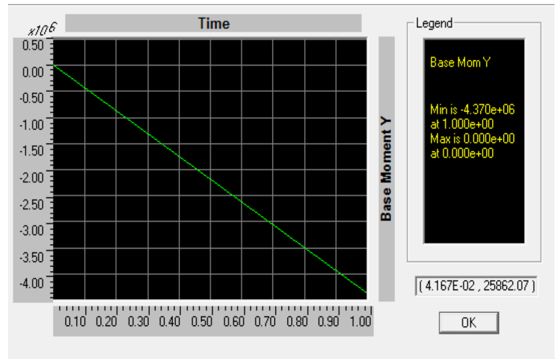


Time History Analysis:

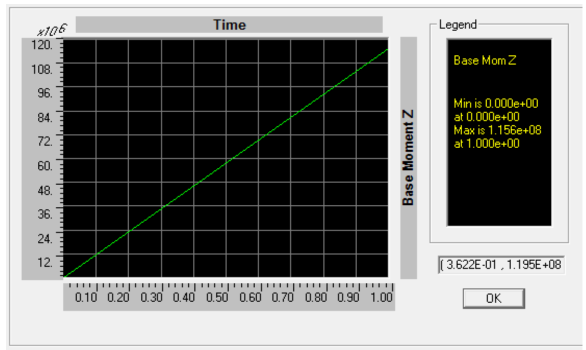
Base moments and shears of the structure at different sections:



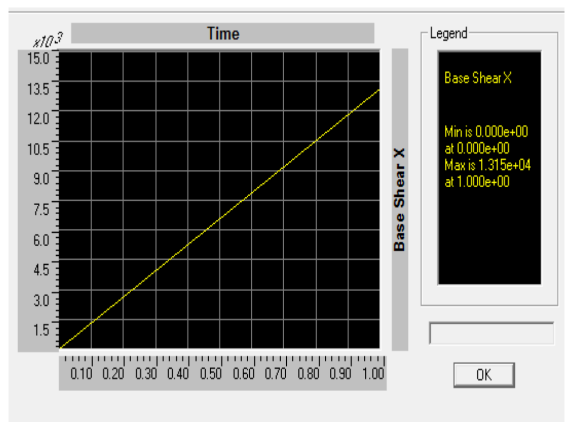
Base moment in x



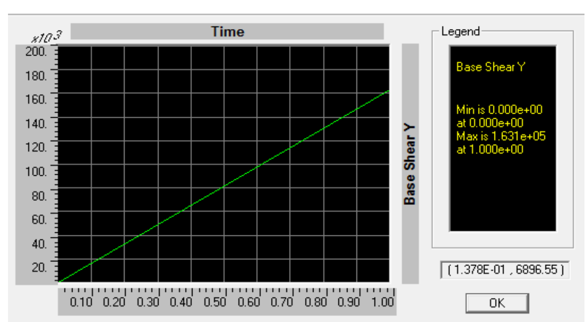
Base moment in Y



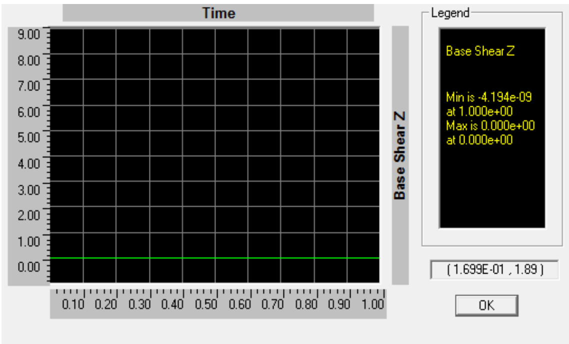
Base moment in z



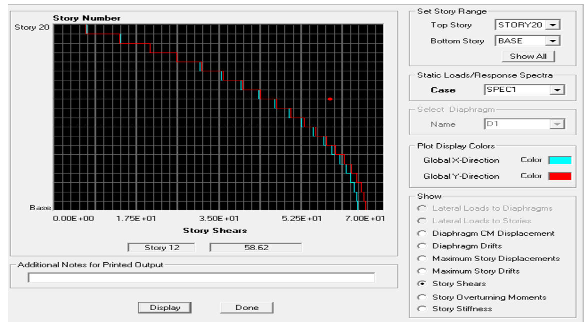
Base shear in x



Base shear in y

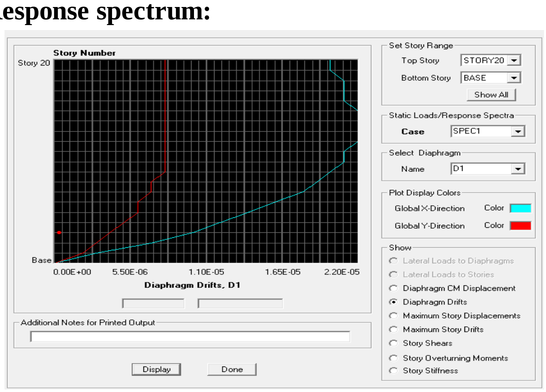


Base shear in z

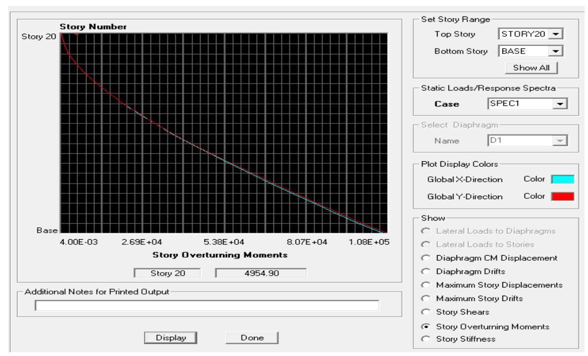


Story shear

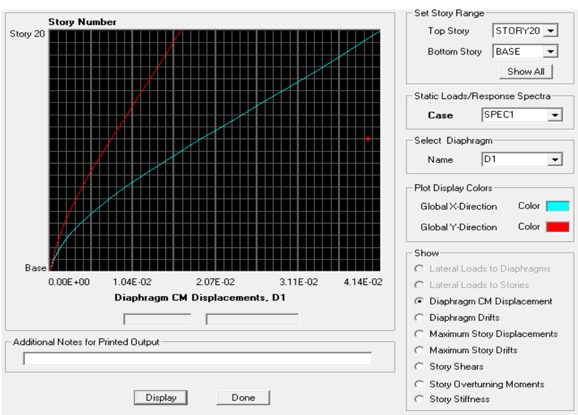
Response spectrum:



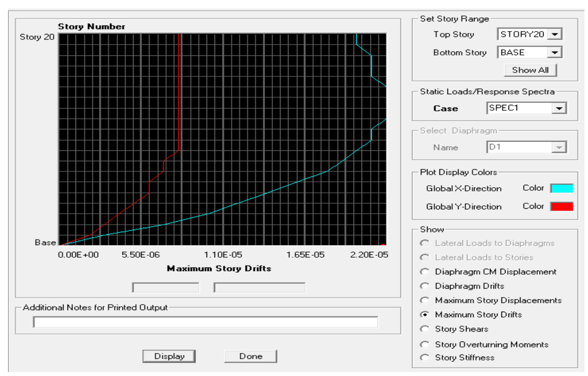
Diaphragm Drift



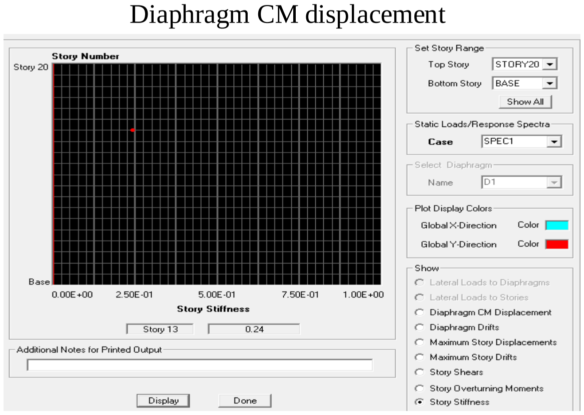
Story overturning moment



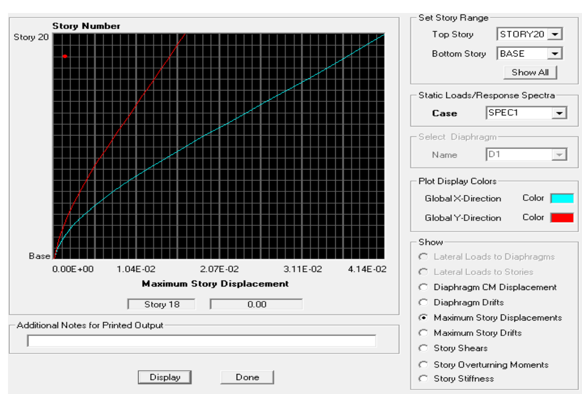
Diaphragm CM displacement



Maximum story drift



Story stifffness



Maximum story displacement

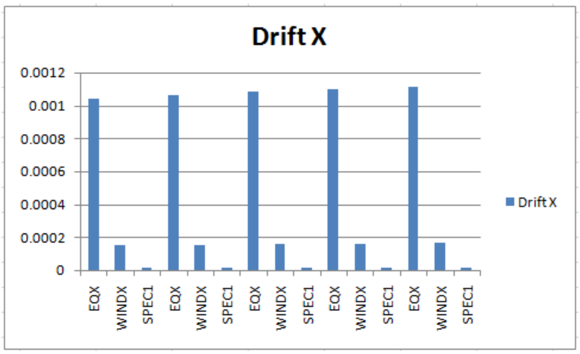
ZONE 5 RESULTS:

Story Drift in x direction:

Table 11: Story drift in x direction

Story	Load	Drift x
story 20	EQX	0.001043
story 20	WINDX	0.000151
story 20	SPEC1	0.000017
story 19	EQX	0.001063
story 19	WINDX	0.000154
story 19	SPEC1	0.000017
story 18	EQX	0.001081
story 18	WINDX	0.000157
story 18	SPEC1	0.000018
story 17	EQX	0.001098
story 17	WINDX	0.00016
story 17	SPEC1	0.000018
story 16	EQX	0.001112
story 16	WINDX	0.000163
story 16	SPEC1	0.000018

Graph: story drift in x direction

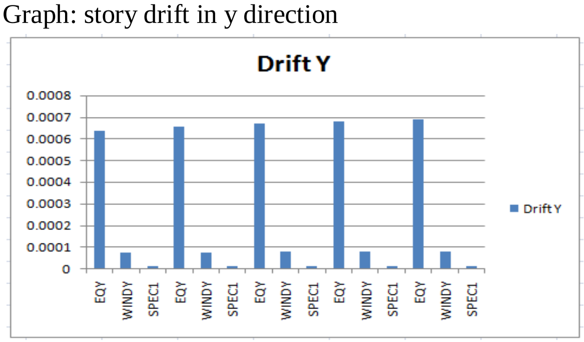


Story drift in y direction:

Table 12: story drift in y direction

Story	Load	Drift y
story 20	EQY	0.000638
story 20	WINDY	0.000073
story 20	SPEC1	0.000009
story 19	EQY	0.000654
story 19	WINDY	0.000074
story 19	SPEC1	0.00001
story 18	EQY	0.000669
story 18	WINDY	0.000076
story 18	SPEC1	0.00001
story 17	EQY	0.00068
story 17	WINDY	0.000077
story 17	SPEC1	0.00001
story 16	EQY	0.000688
story 16	WINDY	0.000079
story 16	SPEC1	0.00001

Graph: story drift in y direction



Story shear

Table 13: Story shear for Vx and Vy

Load	Vx	Vy
EQX	-355.97	0
EQY	0	-567.37
WINDX	-21.35	0
WINDY	0	-26.52
SPEC1	10.61	10.71
EQX	-727.56	0
EQY	0	-1159.65
WINDX	-63.85	0
WINDY	0	-79.3
SPEC1	20.14	21.36
EQX	-1062.58	0
EQY	0	-1693.62
WINDX	-106.04	0
WINDY	0	-131.7
SPEC1	27.05	30.2
EQX	-1361.59	0
EQY	0	-2170.23
WINDX	-147.92	0
WINDY	0	-183.71
SPEC1	31.7	37.31
EQX	-1626.66	0
EQY	0	-2592.72
WINDX	-189.36	0
WINDY	0	-235.18
SPEC1	34.67	42.98

Graph: Story shear for Vx and Vy

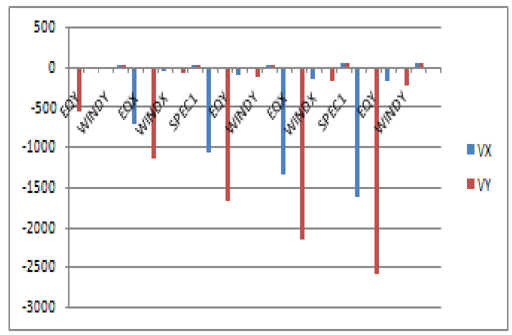
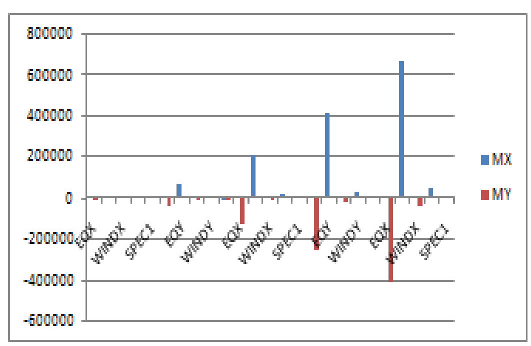


Table 14: Story shear for Mx and My

Load	Mx	My
EQX	0	0.226
EQY	-0.36	0
WINDX	0	0.014
WINDY	-0.017	0
SPEC1	0.007	0.007
EQX	0	-42042.9
EQY	67011.64	0
WINDX	0	-2521.86
WINDY	3131.985	0
SPEC1	1265.392	1252.953
EQX	0	-127975
EQY	203978	0
WINDX	0	-10063.3
WINDY	12497.99	0
SPEC1	3786.58	3629.522
EQX	0	-253476
EQY	404012.4	0
WINDX	0	-22588.1
WINDY	28052.91	0
SPEC1	7346.243	6811.973
EQX	0	-414295
EQY	660338.4	0
WINDX	0	-40059.1
WINDY	49750.79	0
SPEC1	11729.46	10513.47

Graph: story shear for Mx and My



Support reactions:

Table 15: Support reactions for shear forces

Load	Fx	Fy	Fz
EQX	-56.71	-23.24	-526.36
EQY	-30.52	-122.45	-748.2
WINDX	-13.49	-3.67	-98.63
WINDY	-3.76	-22.18	-108.35
SPEC1	1.37	2.26	14.79
EQX	-0.64	11.48	-554.05
EQY	0.06	-166.1	-277.58
WINDX	-0.16	2.79	-96.34
WINDY	0.01	-33.78	-38.59
SPEC1	0.02	3.42	10
EQX	-0.64	-11.48	-554.05
EQY	-0.06	-166.1	277.58
WINDX	-0.16	-2.79	-96.34
WINDY	-0.01	-33.78	38.59
SPEC1	0.02	3.42	10

Graph: support reactions for shear force

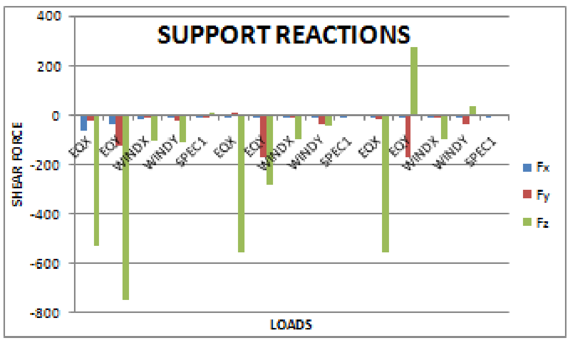


Table 16: Support reaction for bending moment

Load	Mx	My	Mz
EQX	-27.906	-911.44	1.155
EQY	1066.271	81.5	-1.233
WINDX	-6.849	-211.821	0.251
WINDY	199.163	15.093	-0.223
SPEC1	19.975	20.117	0.032
EQX	-29.132	-62.062	0
EQY	2441.215	2.406	0
WINDX	-7.15	-14.225	0
WINDY	455.772	0.359	0
SPEC1	45.72	1.342	0
EQX	29.133	-62.062	0
EQY	2441.215	-2.406	0
WINDX	7.15	-14.225	0
WINDY	455.772	-0.359	0
SPEC1	45.72	1.342	0

Graph: support reactions for bending moment

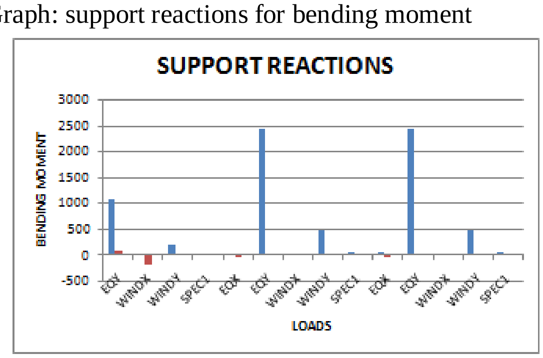


Table 17: Support reaction for shear force (summation)

Load	Fx	Fy	Fz
EQX	-2919.42	0	0
EQY	0	-4653.22	0
WINDX	-726.62	0	0
WINDY	0	-902.41	0

Graph: support reactions for shear force

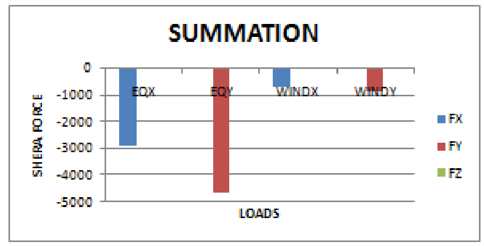
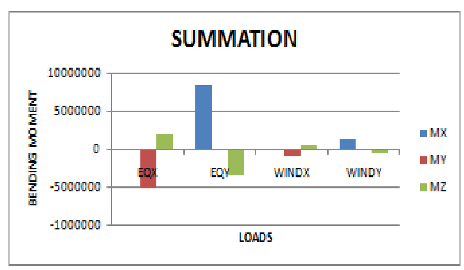


Table 18: Support reactions for bending moment (summation)

Load	Mx	My	Mz
EQX	0	-5292118	1781535
EQY	8435034	0	-3526555
WINDX	0	-941275	443408.4
WINDY	1169003	0	-683915

Graph: support reaction or bending moment (summation)

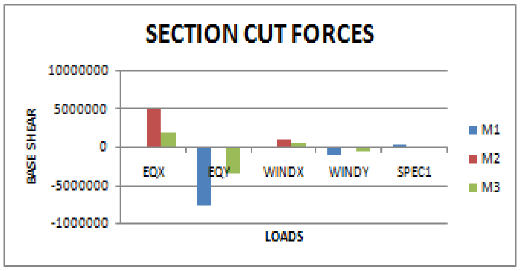


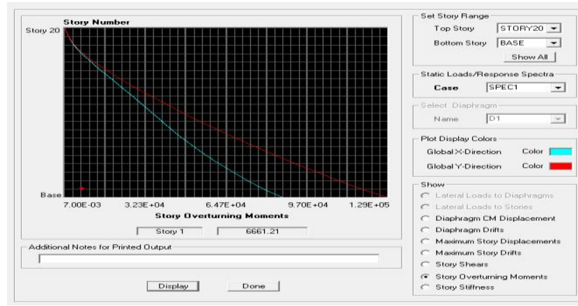
Section cut forces:

Table 19: section cut forces

Section	Load	M1	M2	M3
SCUT2	EQX	0	4912824	1781535
SCUT2	EQY	-7830482	0	-3526556
SCUT2	WINDX	0	846872.4	443408.4
SCUT2	WINDY	-1051761	0	-683915
SCUT2	SPEC1	118954.6	79675.72	81195.54

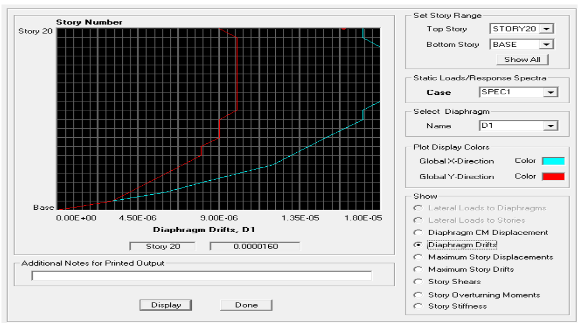
Graph: section cut forces



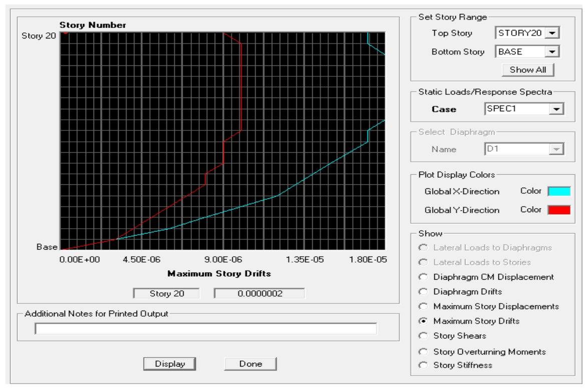


Story overturning moment

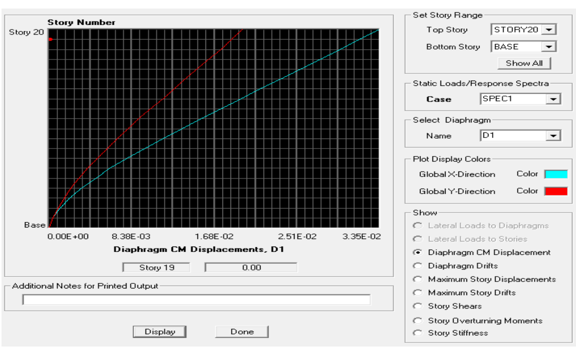
Response spectrum:



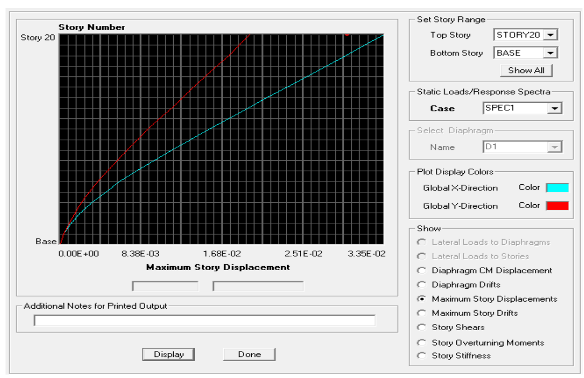
Diaphragm drift



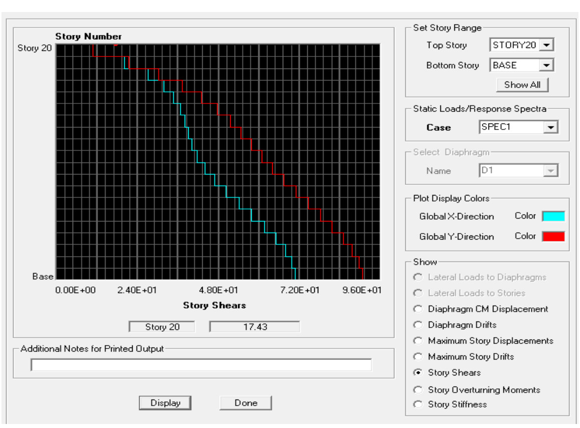
Maximum story drift



Diaphragm CM displacement

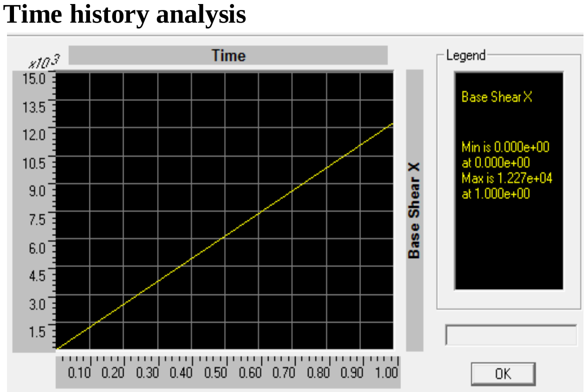


Maximum story displacement

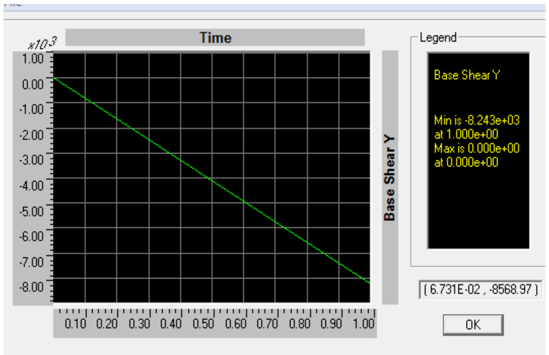


Story shear

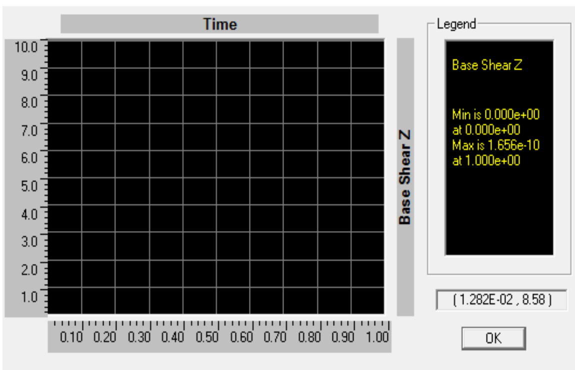
Time history analysis



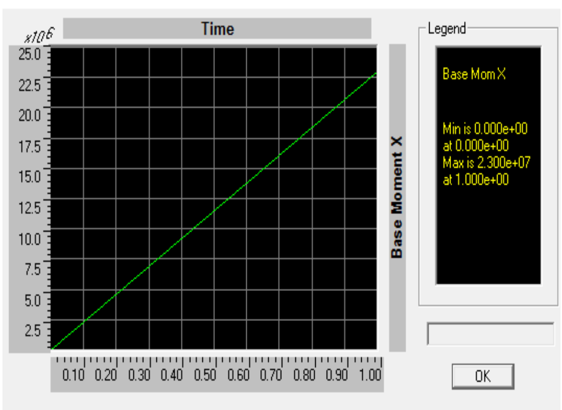
Base shear x



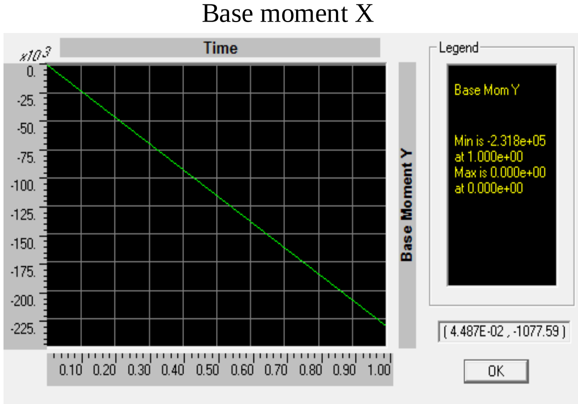
Base shear Y



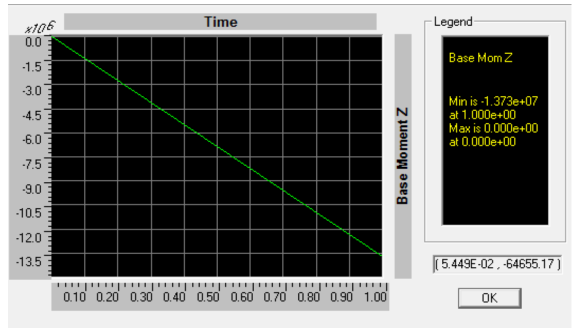
Base shear Z



Base moment X



Base moment Y



Base moment z

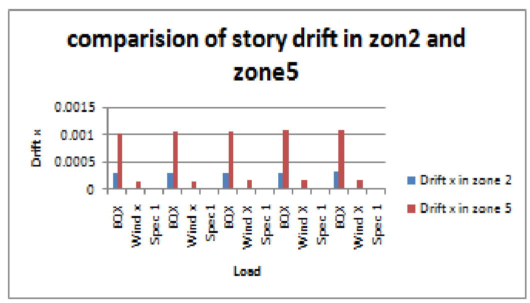
Comparison between zone 2 and zone 5

Story drift in x-direction

Table 20: story drift in x direction

Story	Load	Drift in zone 2	Drift x in zone5
Story 20	EQX	0.000293	0.001043
Story 20	Wind x	0	0.000151
Story 20	Spec 1	0.00002	0.000017
Story 19	EQX	0.000299	0.001063
Story 19	Wind x	0	0.000154
Story 19	Spec1	0.00002	0.000017
Story 18	EQX	0.000304	0.001081
Story 18	Wind X	0	0.000157
Story 18	Spec 1	0.000021	0.000018
Story 17	EQX	0.000309	0.001098
Story 17	Wind X	0	0.00016
Story 17	Spec 1	0.000021	0.000018
Story 16	EQX	0.00033	0.001112
Story 16	Wind X	0	0.000163
Story 16	Spec 1	0.000021	0.000018

Graph: story drift in x direction

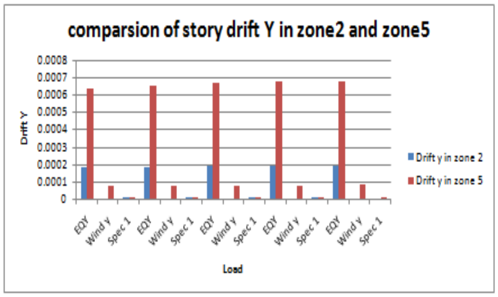


Story drift in y direction

Table 21: story drift in y direction

Story	Load	Drift y in zone 2	Drift y in zone 5
Story 20	EQY	0.000179	0.000638
Story 20	Wind y	0	0.000073
Story 20	Spec 1	0.000008	0.000009
Story 19	EQY	0.000184	0.000654
Story 19	Wind y	0	0.000074
Story 19	Spec 1	0.000008	0.00001
Story 18	EQY	0.000188	0.000669
Story 18	Wind y	0	0.000076
Story 18	Spec 1	0.000008	0.00001
Story 17	EQY	0.000191	0.00068
Story 17	Wind y	0	0.000077
Story 17	Spec 1	0.000008	0.00001
Story 16	EQY	0.000194	0.00068
Story 16	Wind y	0	0.000079
Story 16	Spec 1	0.0000008	0.00001

Graph: story drift in y direction

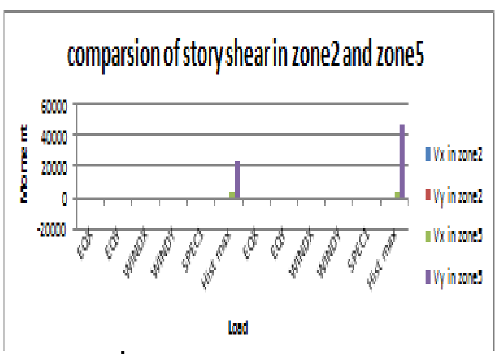


Story shear:

Table 21: story shear in zone2 and zone5

Story	Load	Vx in zone2	Vy in zone2	Vx in zone5	Vy in zone5
Story 20	EQX	-355.97	0	-99.44	0
Story 20	EQY	0	-567.37	0	-158.5
Story 20	WINDX	-21.35	0	0	0
Story 20	WINDY	0	-26.52	0	0
Story 20	SPEC1	10.61	10.71	6.83	6.7
Story 20	Hist max	0	0	2935.97	24066.6
Story 19	EQX	-727.56	0	-204.44	0
Story 19	EQY	0	-1159.65	0	-325.85
Story 19	WINDX	-63.85	0	0	0
Story 19	WINDY	0	-79.3	0	0
Story 19	SPEC1	20.14	21.36	13.97	13.86
Story 19	Hist max	0	0	3698.45	48013.09
Story 18	EQX	-1062.58	0	-298.73	0
Story 18	EQY	0	-1693.62	0	-476.13
Story 18	WINDX	-106.04	0	0	0
Story 18	WINDY	0	-131.7	0	0
Story 18	SPEC1	27.05	30.2	20.3	20.3
Story 18	Hist max	0	0	1569.55	66913.19
Story 17	EQX	-1361.59	0	-382.88	0
Story 17	EQY	0	-2170.23	0	-610.27
Story 17	WINDX	-147.92	0	0	0
Story 17	WINDY	0	-183.71	0	0
Story 17	SPEC1	31.7	37.31	25.93	26.07
Story 17	Hist max	0	0	0	80807.17
Story 16	EQX	-1626.66	0	-457.49	0
Story 16	EQY	0	-2592.72	0	-729.18
Story 16	WINDX	-189.36	0	0	0
Story 16	WINDY	0	-235.18	0	0
Story 16	SPEC1	34.67	42.98	30.97	31.23
Story 16	Hist max	0	0	-9236.12	0

Graph: comparison story shear in zone2 and zone5

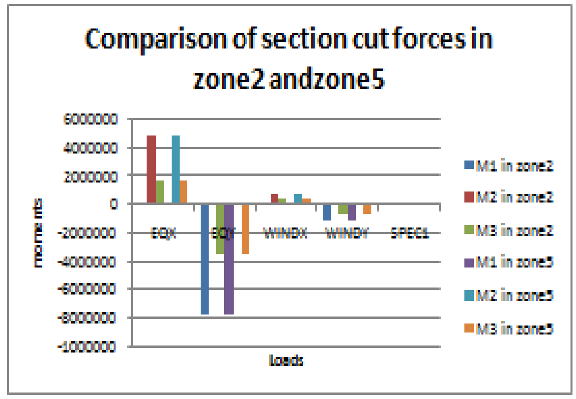


Comparison of section cut forces:

Table 22: comparison of section cut forces

Section	Load	M1 in zone2	M2 in zone2	M3 in zone2	M1 in zone5	M2 in zone5	M3 in zone5
SCUT2	EQX	0	4912824	1781535	0	4912824	1781535
SCUT2	EQY	-7830482	0	-3526556	-7830482	0	-3526556
SCUT2	WINDX	0	846872.4	443408.4	0	846872.4	443408.4
SCUT2	WINDY	-1051761	0	-683915	-1051761	0	-683915
SCUT2	SPEC1	118954.6	79675.72	81195.54	118954.6	79675.72	81195.54

Graph: section cut forces in zone2 and zone3

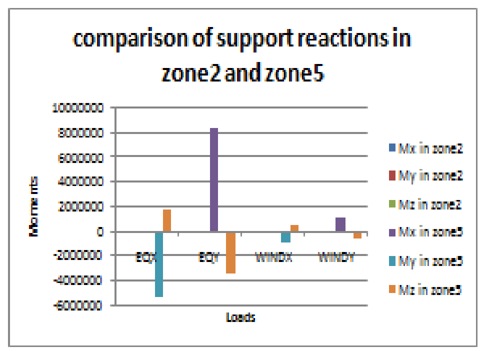


Comparison of support reactions in zone2 and zone5

Table 23: support reactions of zone2 and zone5

Load	Mx in zone2	My in zone2	Mz in zone2	Mx in zone5	My in zone5	Mz in zone5
EQX	-27.906	-911.44	1.155	0	-5292118	1781535
EQY	1066.271	81.5	-1.233	8435034	0	-3526555
WINDX	-6.849	-211.821	0.251	0	-941275	443408.4
WINDY	199.163	15.093	-0.223	1169003	0	-683915

Graph: support reaction in zone2 and zone5



CONCLUSIONS

The behavior of high rise structure for both the scheme is studied in present paper. In this paper we got the results from mathematical model for models. The graph clearly shows the story drift, lateral displacement and time period. It is also observed that the results are more conservative in Static analysis as compared to the dynamic method resulting uneconomical structure. Because of the Box effect of modular type scheme, it is increasing overall stiffness of the building thus, reducing the sway problem in the structure. As building is in irregular the behaviour in both directions is not similar. Further, the comparison between regular and modular type indicates the overall feasibility of the scheme without affecting its stability in gravity as well as lateral loads.

i. In zone2 soils from the table2, graph1 and table3, graph2 it clearly shows that the story drift x and story drift y are higher in earthquake than spectrum
ii. As we compare zone2 and zone5, graph19 and table21, graph20 the story drift is higher in zone5 than zone2.
iii. From table22, graph21 and table23, graph22 the story shear is higher in zone5 than zone2
iv. Designing of each and every member will be obtained by Etabs.
v. All the list of unsuccessful beams will be obtained and conjointly higher section is given by the software.
vi. Accuracy is improved by using software.

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