Analysis and Design of Multistory Building with Grid Slab Using ETABS

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ABSTRACT: ***Grid floor systems consisting of beams spaced at regular intervals in perpendicular directions, monolithic with slab. They are generally employed for architectural reasons for large rooms such as auditoriums, vestibules, theatre halls, show rooms of shops where column free space is often the main requirement. The rectangular or square void formed in the ceiling is advantageously utilized for concealed architectural lighting. The sizes of the beams running in perpendicular directions are generally kept the same. Instead of rectangular beam grid a diagonal. In the present problem G+ Building is consider and analysis and design is done for both Gravity and lateral (earth quake and wind) loads. And this is compared with the flat slab.***

I. INTRODUCTION

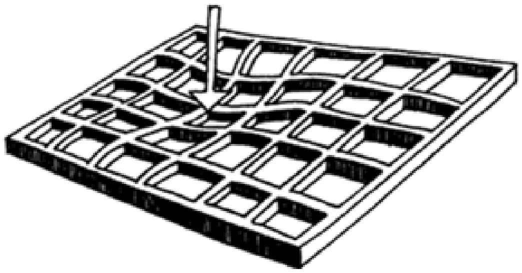
Building construction is the engineering deals with the construction of building such as residential houses. In a simple building can be define as an enclose space by walls with roof, food, cloth and the basic needs of human beings. In the early ancient times humans lived in caves, over trees or under trees, to protect themselves from wild animals, rain, sun, etc. as the times passed as humans being started living in huts made of timber branches. The shelters of those old have been developed nowadays into beautiful houses. Rich people live in sophisticated condition houses.

Grid slab: Interconnected grid systems are being commonly used or supporting building floors bridge decks and overhead water tanks slabs. A grid is a planar structural system composed of continuous members that either intersect or cross each other. Grids are used to cover large column free areas and have been constructed in number of areas in India and abroad. Is subjected to loads applied normally to its plane, the structure is referred as Grid. It is composed of continuous member that either intersect or cross each other. Grids in addition to their aesthetically pleasing appearance provide a number of advantages over the other types of roofing systems.

Grid slab

Structure grids:

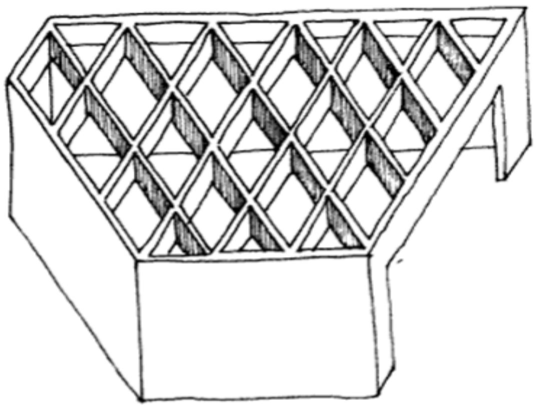
The plank and beam system described above is the simplest system for creating flat, horizontal surfaces. However, greater efficiency can be achieved by designing the flooring as one integral slab and spanning the flooring in two directions supported by a rectilinear grid of beams known as structural grid.



Rectangular structural grid

Skewed Grids:

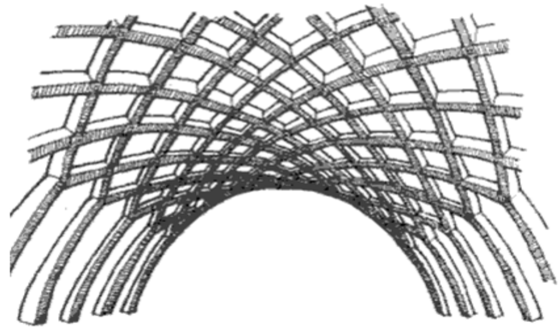
When the overall shape of a structural grid does not approximate a square, structural and economic efficiency can sometimes be gained by employing a skewed grid.



Skewed grid

Curved surface Grids:

The skewed grid can be warped to form a curved surface grid and spans large distances in an efficient manner. The structural concept of the arch is combined with the characteristics of skewed grids to increase efficiency.



Curved surface grid

Advantages of Grid slabs:

i. Grids are very efficient in transferring concentrated loads and in having the entire structure participate in the load carrying action.
ii. Reduce the depth to span ration of rectangular grids.
iii. Reduction in depth, towers, structural and other cost by reducing the height of the building

Uses of Grid slabs

i. Grid slabs can be used as both ceiling and floor slab
ii. Used in the areas where number of columns are provided i.e., it is basically used in the areas which has huge spans.
iii. Used for specialized projects that involves clean rooms, spaces requiring seclusion from low frequency vibration or those needing low floor deflections.
iv. The concrete grid slab is often used for industrial and commercial buildings while wood and metal waffle slabs are used in many other construction sites.
v. This form of construction is used in airports, parking garages, commercial and industrial

buildings, residences and other structures requiring extra stability.

vi. The main purpose of employing this technology is for its strong foundation characteristics of crack and sagging resistance. Grid slab also holds a greater amount of load compared with conventional concrete slabs.

Features of the grid slab

i. They are used on flat sites.
ii. No beam excavation is required.
iii. No controlled or rolled fill is used.
iv. Cardboard slab panel/void formers are used.
v. Slab panels are on 1 meter grids (approximately).
vi. Trench mesh or individual bars can be used.
vii. Slab thickness is 85 – 100 mm.
viii. Internal beams are 110 – 200 mm.
ix. There is minimal concrete volume.
x. No beam down drag from clay (above ground slab) occurs.
xi. Shrinkage of slab is lower than stiffened rafts and footing slabs.
xii. They used 30% less concrete than a stiffened raft.
xiii. They use 20% less steel than a stiffened raft.

II. LITERATURE REVIEW

Chintha Santhosh, Venkatesh Wadki, S.Madan Mohan, S.Sreenatha Reddy were presents Grid floor systems consisting of beams spaced at regular intervals in perpendicular directions, monolithic with slab. They are generally employed for architectural reasons for large rooms such as auditoriums, vestibules, theatre halls, show rooms of shops where column free space is often the main requirement. The rectangular or square void formed in the ceiling is advantageously utilized for concealed architectural lighting. The sizes of the beams running in perpendicular directions are generally kept the same. Instead of rectangular beam grid, a diagonal. In the present problem G+5 Building is consider and analysis and design is done for both Gravity and lateral (earth quake and wind) loads. And this is compared with the flat slab.

S. A. Halkude, C. G. Konapure and S. P. Pasnur are investigating various parameters involved, a solution for optimum structural configuration can be found for the grid floor. The present work includes the parametric investigation in terms of flexural actions such as bending moments and shear force. Spacing of grid beam is one of the important parameters considered for investigations, along with depth of grid beam & depth of periphery beam. Stiffness method is used for analysis which is less time consuming as compare to other analysis methods, where spacing of grid beams i.e. (l/b) is varied for hall size (L/B) with constant ratio. Here the depths of periphery beams (PB) are varied, for considered depth of periphery beams; various depths of grid beams (GB) are varied to arrive at optimum solution.

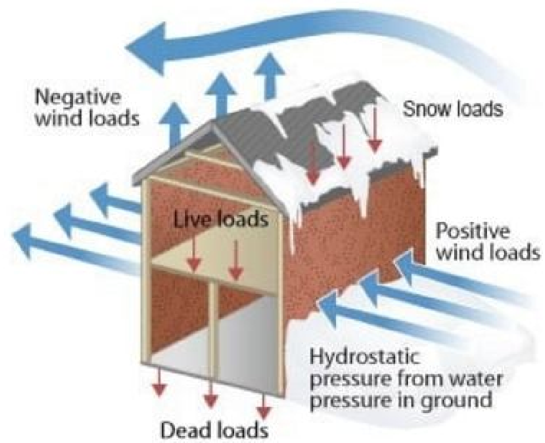
Coronelli, Dario was presented the grid model is proposed for the nonlinear behavior of flat-slab structures. The inelastic response of the structure is concentrated in point hinges introduced into beam finite elements, modeling the response in bending, torsion, and shear. Both concentric punching and failures with unbalanced moments and shear are investigated. Static pushover analysis is used for the effects of gravity and lateral loads. The results are compared to experimental studies on interior, lateral, and corner slab-column connections. The effect of different types and arrangements of transverse reinforcement and the influence of the gravity load level on the drift capacity are shown. The formulation with internal moments, torque, and shear is synthetic and computationally light; three-dimensional (3-D) spatial configurations are considered.

Navjot Kaur Bhatia and Tushar Golait were presented modern slab systems have showed potentials for improvement in the conventional techniques of slab casting. Recent advances in the field of RCC Design are linked to the use of Flat Slabs and Grid Floors. Flat Slabs are highly versatile elements widely used in construction, providing minimum depth, fast construction and allowing flexible column grids. In flat slabs, the beams used in conventional slabs are done away and the slab is made to rest directly over the columns. In case of higher loads, a drop panel or a column head is provided to reduce the intensity of loads. Flat slabs are particularly appropriate for areas where tops of partitions need to be sealed to the slab soffit for acoustic or fire reasons. Grid floor systems consist of beams spaced at regular intervals in perpendicular directions, monolithic with slab. The rectangular or square void formed in the ceiling is advantageously utilized for concealed architectural lighting. They are generally employed for architectural reasons for large rooms such as auditoriums, vestibules, theatre halls, show rooms of shops where column free space is often the main requirement. This paper focuses on studying the behavior of conventional slab, flat slab and grid slab separately. A comparative study was done to identify the best slab system

III. LOADS AND METHODS OF ANALYSIS

LOADS

The types of loads acting on structures for buildings and other structures can be broadly classified as vertical loads, horizontal loads and longitudinal loads. The vertical loads consist of dead loads, live load and impact load. The horizontal loads comprises of wind load and earthquake load. The longitudinal loads i.e. tractive and braking forces are considered in special case of design of bridges, gantry girders etc.



Types of loads acting on the structure are:

- Dead loads
- Imposed loads
- Wind loads
- Snow loads
- Earthquake loads
- Special loads

Other loads and effects acting on structures

As per the clause 19.6 of IS 19.6 of IS 456 – 2000, in addition to above load discussed, account shall be taken of the following forces and effects if they are liable to affect the safety and serviceability of the structure.

a) Foundation movement (see IS 1904)
b) Elastic axial shortening
c) Soil and fluid pressure (see IS 875, part 5)
d) Vibration
e) Fatigue
f) Impact (see IS 875, part5)
g) Impact (see IS 875, part 5)
h) Erection loads (see IS 875, part 2) and
i) Stress concentration effect due to point load and the like.

STIFFNESS METHOD OF STRUCTURAL ANALYSIS

Stiffness method or displacement method is an important approach to the analysis of structures. This is used in its basic form for the analysis of structures that are linear and elastic although it can be adapted to non linear analysis. It is generally used for the analysis of statically determine cases. This method in its basic form considers the nodal displacements of the structures as unknown.

The Direct Stiffness Method is a highly organized, conceptually simple approach for the analysis of all types of structures that is easily implemented in the form of a computer aided analysis procedure using a matrix formation.

Amongst the most far-reaching developments in structural engineering has been the ability to analyze automatically almost all types of structures with a high degree of accuracy and at reasonable cost. The availability of digital computer has made development possible Methods of analysis that could easily be computerized were quickly developed.

Merits:

One basic form of the stiffness method could be applied to a wide range of structures, with only minor adjustments to cope with each variant. The advantages of the method can be summarized as:

i. A general purpose program is easy to write.
ii. It requires a minimum of input data.
iii. It can be made automatic. Its use requires no understanding of structural mechanics.

Demerits:

The method has a major disadvantage in that no account is taken of the degree of indeterminacy and therefore there is little opportunity to benefit from the structural expertise of the operator. Equally this will be seen as an essential concomitant of the advantage listed in above. The time required performing an analysis and the amount of computer storage depends almost entirely on the number of degree of freedom involved. Structures having many degrees of freedom but new degree of static indeterminacy should be much more economically analyzed by the flexibility rather than the stiffness method.

STRUCTURAL COMPONENTS IN BUILDING

Generally, a building can be defined as an enclosed structure intended for human occupancy. However, a building includes the structure itself and nonstructural components (e.g., cladding, roofing, interior walls and ceilings, HVAC systems, electrical systems) permanently attached to and supported by the structure. The scope of the Provisions provides recommended seismic design criteria for all buildings except detached one- and two-family dwellings located in zones of relatively low seismic activity and agricultural structures (e.g., barns and storage sheds) that are only intended to have incidental human occupancy. The Provisions also specifies seismic design criteria for nonstructural components in buildings that can be subjected to intense levels of ground shaking.

Basic components in building

A building consists of following basic components

- Foundation
- Plinth
- Damp proof course (DPC)
- Plinth beam
- Floor
- Walls
- Openings
- Stairs
- Roof
- Surfaces/Finishes

STRUCTURAL SYSTEMS

- Bearing wall systems
- Building frame systems
- Moment – resisting frame systems
- Dual systems
- Cantilever column systems and
- Systems not specifically designed for seismic resistance.

IV INTRODUCTION TO ETABS:

BASIC DEFINITIONS:

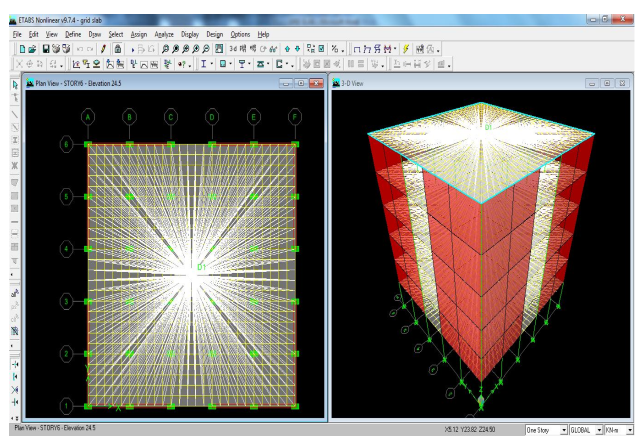
a) Story
b) Story shear
c) Story drift
d) Center of mass
e) Center of rigidity

METHODS OF ANALYSIS OF STRUCTURE IN ETABS:

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.

- Equivalent Static Analysis:
- Linear Dynamic Analysis
- Response spectrum method
- Time history analysis
- Pushover analysis
- Non linear static analysis
- Non linear dynamic analysis

MODEL OF BUILDING



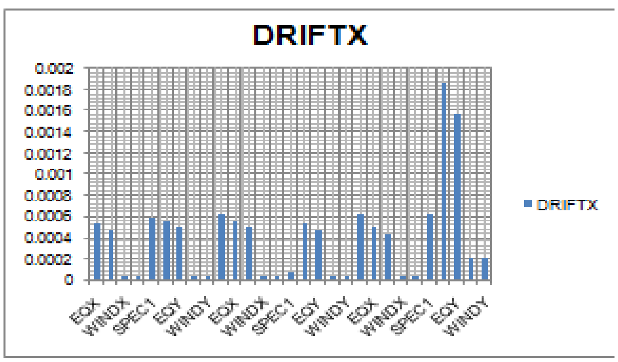
V RESULTS AND ANALYSIS

STORY DRIFT:

DRIFTX

STORY	LOAD	DRIFTX
STORY6	EQX	0.00053
STORY6	EQY	0.000473
STORY6	WINDX	0.000038
STORY6	WINDY	0.000038
STORY6	SPEC1	0.000582
STORY5	EQX	0.000556
STORY5	EQY	0.000495
STORY5	WINDX	0.000041
STORY5	WINDY	0.000041
STORY5	SPEC1	0.000615
STORY4	EQX	0.00056
STORY4	EQY	0.000496
STORY4	WINDX	0.000042
STORY4	WINDY	0.000042
STORY4	SPEC1	0.0000632
STORY3	EQX	0.000531
STORY3	EQY	0.000467
STORY3	WINDX	0.000042
STORY3	WINDY	0.000042
STORY3	SPEC1	0.000617
STORY2	EQX	0.000503
STORY2	EQY	0.000438
STORY2	WINDX	0.000043
STORY2	WINDY	0.000043
STORY2	SPEC1	0.000615
STORY1	EQX	0.001869
STORY1	EQY	0.001569
STORY1	WINDX	0.000208
STORY1	WINDY	0.000208
STORY1	SPEC1	0.005701

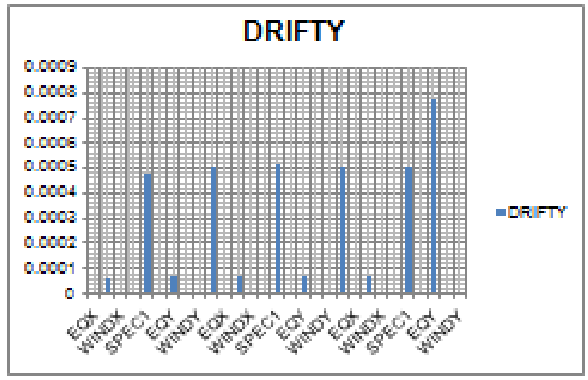
Graph



DRIFTY:

STORY	LOAD	DRIFTY
STORY6	EQX	0
STORY6	EQY	0.000058
STORY6	WINDX	0
STORY6	WINDY	0
STORY6	SPEC1	0.00047
STORY5	EQX	0
STORY5	EQY	0.000062
STORY5	WINDX	0
STORY5	WINDY	0
STORY5	SPEC1	0.000498
STORY4	EQX	0
STORY4	EQY	0.000064
STORY4	WINDX	0
STORY4	WINDY	0
STORY4	SPEC1	0.000513
STORY3	EQX	0
STORY3	EQY	0.000064
STORY3	WINDX	0
STORY3	WINDY	0
STORY3	SPEC1	0.000504
STORY2	EQX	0
STORY2	EQY	0.000065
STORY2	WINDX	0
STORY2	WINDY	0
STORY2	SPEC1	0.000505
STORY1	EQX	0.000001
STORY1	EQY	0.000773
STORY1	WINDX	0
STORY1	WINDY	0
STORY1	SPEC1	0.007004

Graph

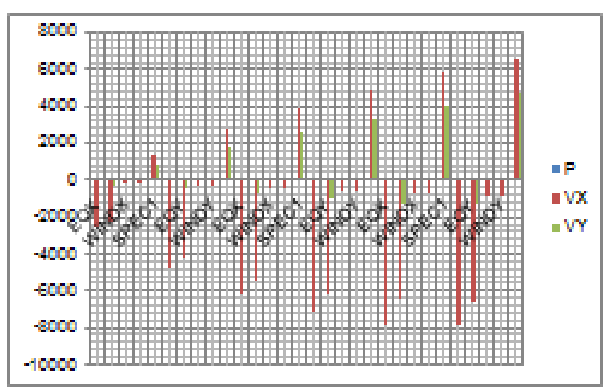


STORY SHEAR (LOCATION: TOP STORY)

FOR FORCES (P, VX, VY)

Story	Load	Loc	P	VX	VY
STORY6	EQX	Top	0	-2265.38	0
STORY6	EQY	Top	0	-2265.38	0
STORY6	WINDX	Top	0	-88.61	0
STORY6	WINDY	Top	0	-88.61	0
STORY6	SPEC1	Top	0	1331.87	820.92
STORY5	EQX	Top	0	-4428.04	0
STORY5	EQY	Top	0	-4172.04	-256
STORY5	WINDX	Top	0	-261.28	0
STORY5	WINDY	Top	0	-261.28	0
STORY5	SPEC1	Top	0	2705.81	1725.34
STORY4	EQX	Top	0	-3919.1	0
STORY4	EQY	Top	0	-3407.1	-512
STORY4	WINDX	Top	0	-426.38	0
STORY4	WINDY	Top	0	-426.38	0
STORY4	SPEC1	Top	0	3870.78	2354.89
STORY3	EQX	Top	0	-6883.92	0
STORY3	EQY	Top	0	-6115.92	-768
STORY3	WINDX	Top	0	-382.46	0
STORY3	WINDY	Top	0	-382.46	0
STORY3	SPEC1	Top	0	4861.83	3321.83
STORY2	EQX	Top	0	-7467.69	0
STORY2	EQY	Top	0	-6443.69	-1024
STORY2	WINDX	Top	0	-732.69	0
STORY2	WINDY	Top	0	-732.69	0
STORY2	SPEC1	Top	0	5723.61	4041.21
STORY1	EQX	Top	0	-7807.2	0
STORY1	EQY	Top	0	-6527.2	-1280
STORY1	WINDX	Top	0	-891.87	0
STORY1	WINDY	Top	0	-891.87	0
STORY1	SPEC1	Top	0	6413.98	4661.1

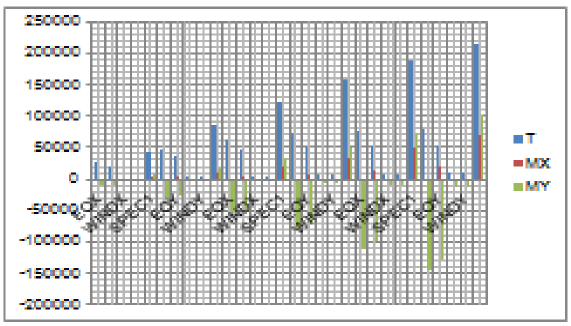
Graph



FOR MOMENT (T MX MY):

Story	Load	Loc	T	MX	MY
STORY6	EQX	Top	22662.46	0	0
STORY6	EQY	Top	22662.46	0	0
STORY6	WINDX	Top	886.084	0	0
STORY6	WINDY	Top	886.084	0	0
STORY6	SPEC1	Top	41760.18	0	0
STORY5	EQX	Top	44291.71	0	-9574.32
STORY5	EQY	Top	39171.71	512	-9062.32
STORY5	WINDX	Top	2612.839	0	-354.434
STORY5	WINDY	Top	2612.839	0	-354.434
STORY5	SPEC1	Top	85303.66	3283.69	5327.477
STORY4	EQX	Top	59205.31	0	-27798.5
STORY4	EQY	Top	48965.31	2048	-25750.5
STORY4	WINDX	Top	4263.752	0	-1399.57
STORY4	WINDY	Top	4263.752	0	-1399.57
STORY4	SPEC1	Top	123100.6	10180.53	16139.69
STORY3	EQX	Top	68855.31	0	-51986.9
STORY3	EQY	Top	53495.31	4608	-47378.9
STORY3	WINDX	Top	5824.648	0	-3105.07
STORY3	WINDY	Top	5824.648	0	-3105.07
STORY3	SPEC1	Top	156661.8	20380.65	31572.05
STORY2	EQX	Top	74693.72	0	-80034.6
STORY2	EQY	Top	54213.72	8192	-71842.6
STORY2	WINDX	Top	7326.867	0	-5434.93
STORY2	WINDY	Top	7326.867	0	-5434.93
STORY2	SPEC1	Top	187591.1	33616.77	50878.85
STORY1	EQX	Top	78089.14	0	-110417
STORY1	EQY	Top	52489.14	12800	-97617.3
STORY1	WINDX	Top	8918.73	0	-8365.68
STORY1	WINDY	Top	8918.73	0	-8365.68
STORY1	SPEC1	Top	213822.5	49678.79	73479.79

Graph

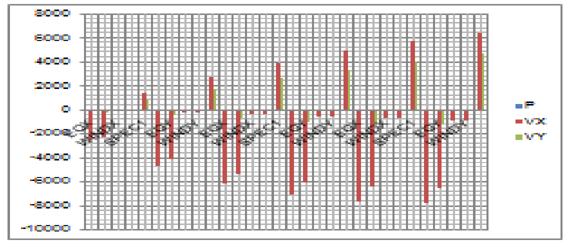


STORY SHEAR (LOCATION: BOTTOM STORY)

FOR FORCES: (P VX VY)

Story	Load	Loc	P	VX	VY
STORY6	EQX	Bottom	0	-2521.38	0
STORY6	EQY	Bottom	0	-2265.38	-256
STORY6	WINDX	Bottom	0	-88.61	0
STORY6	WINDY	Bottom	0	-88.61	0
STORY6	SPEC1	Bottom	0	1331.87	820.92
STORY5	EQX	Bottom	0	-4684.04	0
STORY5	EQY	Bottom	0	-4172.04	-512
STORY5	WINDX	Bottom	0	-261.28	0
STORY5	WINDY	Bottom	0	-261.28	0
STORY5	SPEC1	Bottom	0	2705.81	1725.34
STORY4	EQX	Bottom	0	-6175.1	0
STORY4	EQY	Bottom	0	-5407.1	-768
STORY4	WINDX	Bottom	0	-426.38	0
STORY4	WINDY	Bottom	0	-426.38	0
STORY4	SPEC1	Bottom	0	3870.78	2554.89
STORY3	EQX	Bottom	0	-7139.92	0
STORY3	EQY	Bottom	0	-6115.92	-1024
STORY3	WINDX	Bottom	0	-582.46	0
STORY3	WINDY	Bottom	0	-582.46	0
STORY3	SPEC1	Bottom	0	4861.85	3321.85
STORY2	EQX	Bottom	0	-7723.69	0
STORY2	EQY	Bottom	0	-6443.69	-1280
STORY2	WINDX	Bottom	0	-732.69	0
STORY2	WINDY	Bottom	0	-732.69	0
STORY2	SPEC1	Bottom	0	5723.61	4041.21
STORY1	EQX	Bottom	0	-7807.2	0
STORY1	EQY	Bottom	0	-6527.2	-1280
STORY1	WINDX	Bottom	0	-891.87	0
STORY1	WINDY	Bottom	0	-891.87	0
STORY1	SPEC1	Bottom	0	6413.98	4661.1

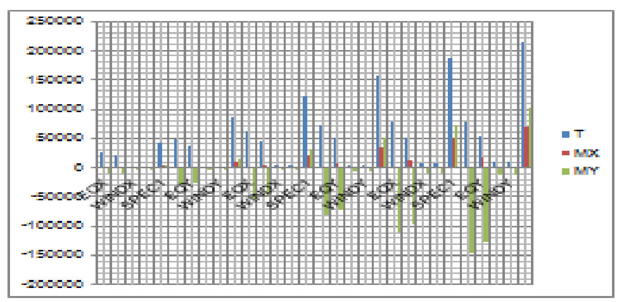
Graph



FOR MOMENTS (T MX MY)

Story	Load	Loc	T	MX	MY
STORY6	EQX	Bottom	25222.46	0	-9574.32
STORY6	EQY	Bottom	20102.46	512	-9062.32
STORY6	WINDX	Bottom	886.084	0	-354.434
STORY6	WINDY	Bottom	886.084	0	-354.434
STORY6	SPEC1	Bottom	41760.18	3283.69	5327.477
STORY5	EQX	Bottom	46851.71	0	-27798.5
STORY5	EQY	Bottom	36611.71	2048	-25750.5
STORY5	WINDX	Bottom	2612.839	0	-1399.57
STORY5	WINDY	Bottom	2612.839	0	-1399.57
STORY5	SPEC1	Bottom	85303.66	10180.53	16139.69
STORY4	EQX	Bottom	61765.31	0	-51986.9
STORY4	EQY	Bottom	46405.31	4608	-47378.9
STORY4	WINDX	Bottom	4263.752	0	-3105.07
STORY4	WINDY	Bottom	4263.752	0	-3105.07
STORY4	SPEC1	Bottom	123100.6	20380.65	31572.05
STORY3	EQX	Bottom	71415.31	0	-80034.6
STORY3	EQY	Bottom	50935.31	8192	-71842.6
STORY3	WINDX	Bottom	5824.648	0	-5434.93
STORY3	WINDY	Bottom	5824.648	0	-5434.93
STORY3	SPEC1	Bottom	156661.8	33616.77	50878.85
STORY2	EQX	Bottom	77253.72	0	-110417
STORY2	EQY	Bottom	51653.72	12800	-97617.3
STORY2	WINDX	Bottom	7326.867	0	-8365.68
STORY2	WINDY	Bottom	7326.867	0	-8365.68
STORY2	SPEC1	Bottom	187591.1	49678.79	73479.79
STORY1	EQX	Bottom	78089.14	0	-145550
STORY1	EQY	Bottom	52489.14	18560	-126990
STORY1	WINDX	Bottom	8918.73	0	-12379.1
STORY1	WINDY	Bottom	8918.73	0	-12379.1
STORY1	SPEC1	Bottom	213822.5	70483.14	101845.4

Graph

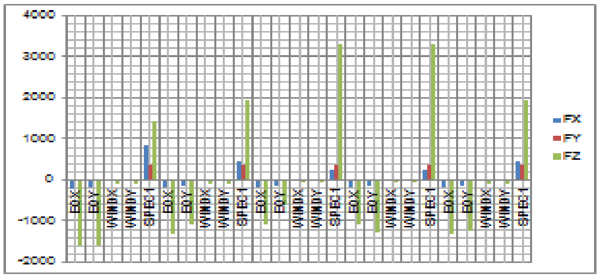


SUPPORT REACTIONS

FOR FX FY FZ

STORY	LOAD	POINT	FX	FY	FZ
BASE	EQX	1	-234.4	0.72	-1599.86
BASE	EQY	1	-212.14	-39.12	-1600.06
BASE	WINDX	1	-29.25	0.08	-132.39
BASE	WINDY	1	-29.25	0.08	-132.39
BASE	SPEC1	1	833.22	362.15	1409.29
BASE	EQX	2	-192.41	0.75	-1332.9
BASE	EQY	2	-160.89	-39.41	-1101.31
BASE	WINDX	2	-22.04	0.07	-105.53
BASE	WINDY	2	-22.04	0.07	-105.53
BASE	SPEC1	2	438.62	365.01	1902.73
BASE	EQX	3	-188.66	0.74	-1092.53
BASE	EQY	3	-158.18	-39.22	-639.61
BASE	WINDX	3	-21.58	0.06	-85.74
BASE	WINDY	3	-21.58	0.06	-85.74
BASE	SPEC1	3	245.96	363.17	3275.55
BASE	EQX	4	-188.68	-0.8	-1093.14
BASE	EQY	4	-157.26	-40.57	-1286.9
BASE	WINDX	4	-21.58	-0.06	-85.74
BASE	WINDY	4	-21.58	-0.06	-85.74
BASE	SPEC1	4	246.03	363.17	3276.25
BASE	EQX	5	-192.48	-0.81	-1333.22
BASE	EQY	5	-160.78	-40.75	-1245.42
BASE	WINDX	5	-22.04	-0.07	-105.53
BASE	WINDY	5	-22.04	-0.07	-105.53
BASE	SPEC1	5	438.83	365.01	1903.4

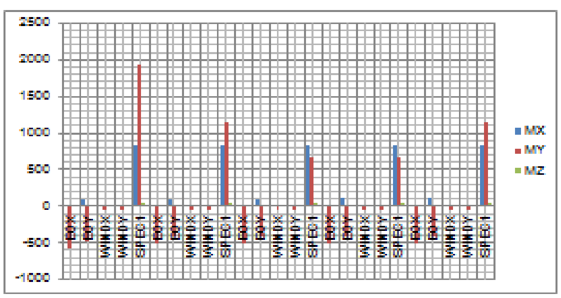
Graph



FOR MX MY MZ

STORY	LOAD	POINT	MX	MY	MZ
BASE	EQX	1	-1.044	-603.917	0.005
BASE	EQY	1	89.872	-504.838	0.005
BASE	WINDX	1	-0.116	-68.645	0
BASE	WINDY	1	-0.116	-68.645	0
BASE	SPEC1	1	825.413	1924.915	41.615
BASE	EQX	2	-1.095	-514.189	0.005
BASE	EQY	2	90.295	-430.673	0.005
BASE	WINDX	2	-0.107	-58.201	0
BASE	WINDY	2	-0.107	-58.201	0
BASE	SPEC1	2	829.657	1142.52	41.615
BASE	EQX	3	-1.082	-508.789	0.005
BASE	EQY	3	90.014	-426.765	0.005
BASE	WINDX	3	-0.092	-57.53	0
BASE	WINDY	3	-0.092	-57.53	0
BASE	SPEC1	3	826.928	652.481	41.615
BASE	EQX	4	1.208	-508.849	0.005
BASE	EQY	4	92.024	-425.472	0.005
BASE	WINDX	4	0.092	-57.53	0
BASE	WINDY	4	0.092	-57.53	0
BASE	SPEC1	4	826.928	652.659	41.615
BASE	EQX	5	1.222	-514.373	0.005
BASE	EQY	5	92.286	-430.59	0.005
BASE	WINDX	5	0.107	-58.201	0
BASE	WINDY	5	0.107	-58.201	0
BASE	SPEC1	5	829.658	1143.06	41.615

Graph

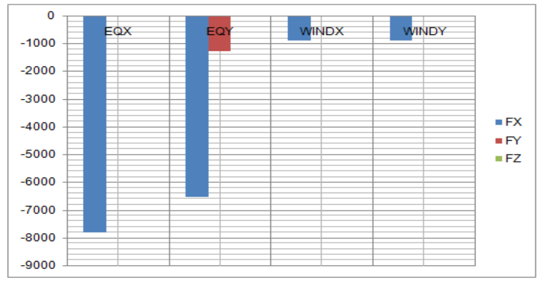


FOR SUMMATION:

FX FY FZ:

STORY	POINT	LOAD	FX	FY	FZ
Summation	0, 0, Base	EQX	-7807.2	0	0
Summation	0, 0, Base	EQY	-6527.2	-1280	0
Summation	0, 0, Base	WINDX	-891.87	0	0
Summation	0, 0, Base	WINDY	-891.87	0	0

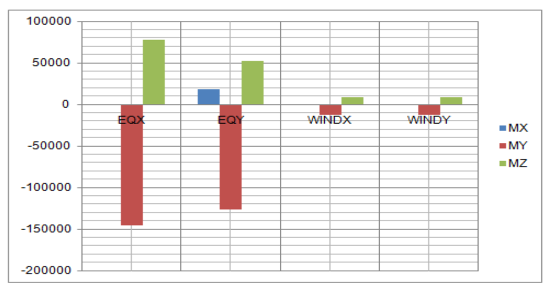
Graph



MX MY MZ

STORY	POINT	LOAD	MX	MY	MZ
Summation	0, 0, Base	EQX	0	-145550	78089.14
Summation	0, 0, Base	EQY	18560	-126990	52489.14
Summation	0, 0, Base	WINDX	0	-12379.1	8918.73
Summation	0, 0, Base	WINDY	0	-12379.1	8918.73

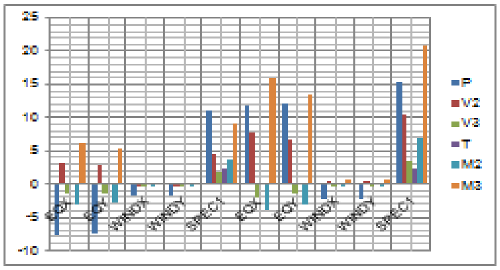
Graph

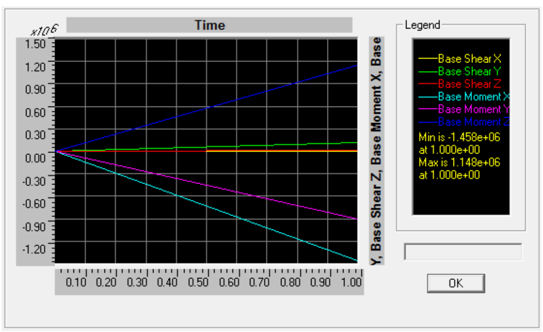


COLUMN FORCES

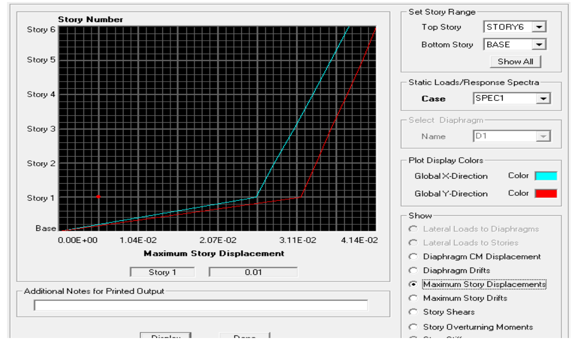
story	column	load	P	V2	V3	T	M2	M3
STORY6	C1	EQX	-7.51	3.25	-1.49	0	-3.065	6.237
STORY6	C1	EQY	-7.38	2.79	-1.32	0	-2.721	5.333
STORY6	C1	WINDX	-1.61	0.08	-0.08	0	-0.177	0.117
STORY6	C1	WINDY	-1.61	0.08	-0.08	0	-0.177	0.117
STORY6	C1	SPEC1	10.92	4.62	1.82	2.348	3.662	9.079
STORY5	C1	EQX	11.74	7.88	-1.85	0	-3.876	15.783
STORY5	C1	EQY	12.04	6.73	-1.44	0	-3.034	13.482
STORY5	C1	WINDX	-2.3	0.44	-0.12	0	-0.259	0.83
STORY5	C1	WINDY	-2.3	0.44	-0.12	0	-0.259	0.83
STORY5	C1	SPEC1	15.33	10.33	3.49	2.504	7.084	20.681
STORY4	C1	EQX	88.54	10.65	-2.27	0	-4.669	22.732
STORY4	C1	EQY	88.97	8.8	-1.61	0	-3.294	18.936
STORY4	C1	WINDX	1.88	0.75	-0.17	0	-0.357	1.531
STORY4	C1	WINDY	1.88	0.75	-0.17	0	-0.357	1.531
STORY4	C1	SPEC1	57.26	14.78	5.02	2.593	10.369	30.559
STORY3	C1	EQX	187.16	12.17	-2.56	0	-5.199	28.057
STORY3	C1	EQY	188.21	9.69	-1.64	0	-3.233	22.717
STORY3	C1	WINDX	8.94	1.01	-0.22	0	-0.453	2.232
STORY3	C1	WINDY	8.94	1.01	-0.22	0	-0.453	2.232
STORY3	C1	SPEC1	138.02	20.27	6.48	2.558	13.981	45.574
STORY2	C1	EQX	320.61	6.25	-2.28	0	-4.278	8.484
STORY2	C1	EQY	321.6	4.37	-1.59	0	-3.231	5.756
STORY2	C1	WINDX	22.25	0.58	-0.22	0	-0.422	0.501
STORY2	C1	WINDY	22.25	0.58	-0.22	0	-0.422	0.501
STORY2	C1	SPEC1	291.83	15.12	4.26	2.599	6.131	45.423
STORY1	C1	EQX	1599.86	254.4	-0.72	-0.005	-1.044	603.917
STORY1	C1	EQY	1600.06	212.14	39.12	-0.005	89.872	504.838
STORY1	C1	WINDX	132.39	29.25	-0.08	0	-0.116	68.645
STORY1	C1	WINDY	132.39	29.25	-0.08	0	-0.116	68.645
STORY1	C1	SPEC1	1409.29	833.22	362.15	41.615	825.413	1924.915

Graph

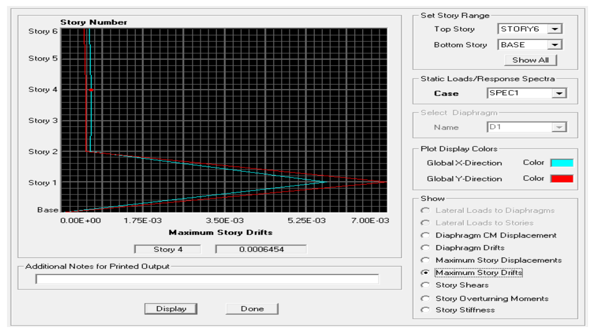




TIME HISTORY

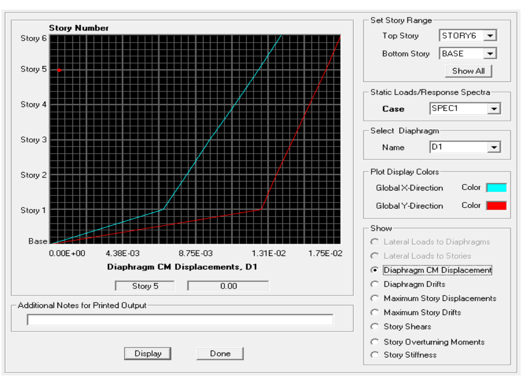


Maximum CM displacement

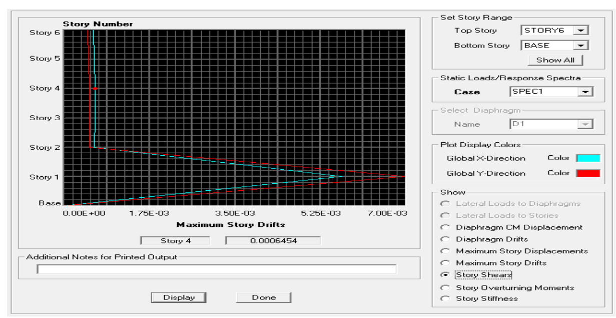


Maximum story Drifts

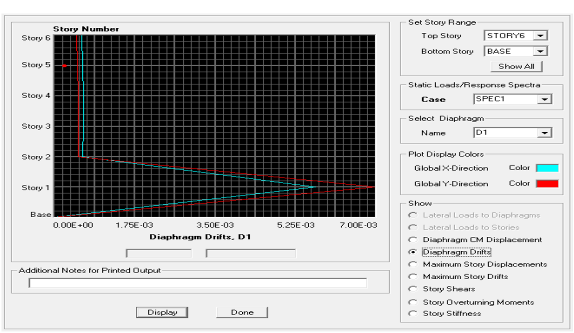
RESPONSE SPECTRUM GRAPHS



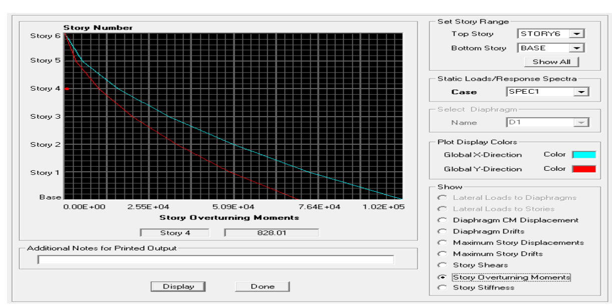
Maximum CM Displacement



Story shear



Diaphragm Drifts



Story overturning moments

VI 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 behavior 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.

1. The story drift values in x and y direction is higher for earth quack load than the wind load.
2. The wind load values of zero intensity for drift Y
3. In the top stories location the story shear is maximum for spectrum loads.
4. The twisting moment increases from top to bottom stories for top stories location.
5. For the bottom stories location the story shear increases from top story to bottom story and will be maximum for bottom story
6. The twist (T) is increases also increase from top story to bottom story in bottom story location.
7. The support reaction values are maximum for Fz.
8. The column forces are maximum for M3
9. Designing by Software's like ETABS reduces ton of your time in design work.
10. Accuracy is improved by using software.

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