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A Seismic Study on Shear Wall Positions for High Rise Structures in Different Zones

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Abstract: This study presents the procedure for seismic performance estimation of high-rise buildings based on a concept of the capacity spectrum method.. Many reinforced concrete buildings in urban regions lying in active seismic zone may suffer moderate to severe damages during future ground motion. Therefore it is essential to mitigate unacceptable hazards to property and life of occupant. In this study, 3d analytical model of thirty storied buildings have been generated for symmetric buildings Models and analyzed using structural analysis tool ETABS Various important components are considered in the model building that influences the mass, strength, stiffness and deformability of the structure. To debate the outcome of the shear wall and core wall at dissimilar location during earthquakes seismic analysis using linear static (equivalent static method) and linear dynamic (response spectrum method) have been performed .The deflections at each storey level has been compared by performing Equivalent static and response spectrum method.

Keywords: Shear wall, Equivalent static method, Response spectrum method, storey drift ,displacement, Base shear Zone 2 3 4 5.

I. INTRODUCTION

Earthquake calamity had continuously been one of the terrific usual tragedies conviction upon the manhood considering the fact that stage immemorial and fetching in its awaken indefinable despairs and trouble towards the human beings disturbed.

In a country like India whose population is growing rapidly the design of tall buildings is mandatory because the available topographic land is very less compare to the available population hence tall buildings are preferred in these region.For the design of tall buildings the effect of wind forces and earthquake forces should be taken into account separately during selection of load combination. Apart from these vertical walls called shear walls are to be designed in such a way that they should resist the lateral and gravity loads from the walls and columns.

Structures designed permitting towards present seismic codes afford least protection to hold lifespan and in a huge seismic activity, they guarantee minimum gravity load bearing factors of non-vital amenities will nevertheless feature and offer certain verge of protection. Conversely, amenability by usual ensures no such enactment. They commonly do not cope with presentation of non-structural components neither offers changes in presentation between dissimilar structural systems. This is for the reason that it cannot correctly evaluate the inelastic strength and deformation of every associate because of linear elastic analysis**.**

II. OBJECTIVES

To carry out lateral load evaluation on dissimilar building models according to the code. To study the impact of providing shear wall in a structure which is subjected to horizontal forces in different seismic zones. To study the impact of concrete shear wall provided in different positions (at centre, corners in different direction) of the building.

To evaluate story drift and deflection at separate stories using different seismic analysis method.

III. ANALYTICAL MODELLING

1) *Model 1:* Bare frame
2) *Model 2:* Bare frame with shear walls at corners
3) *Model 3:* Bare frame with and core wall at centre
4) *Model 4:* Bare frame with core wall at centre and shear walls at corners
5) *Model 5:* Bare frame with core walls at corners
6) *Model 6:* Bare frame with core wall at centre and core walls at corners

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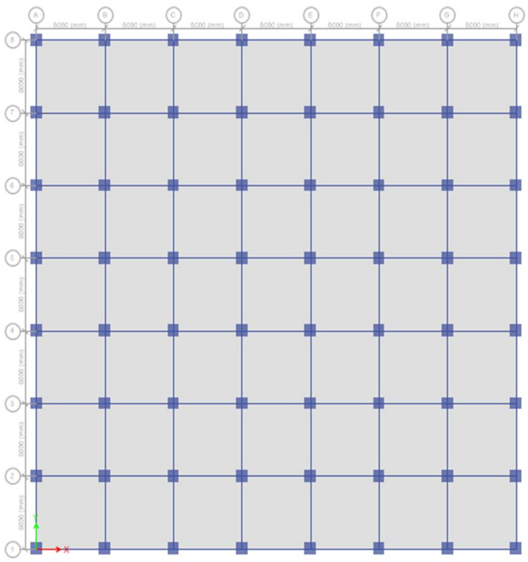
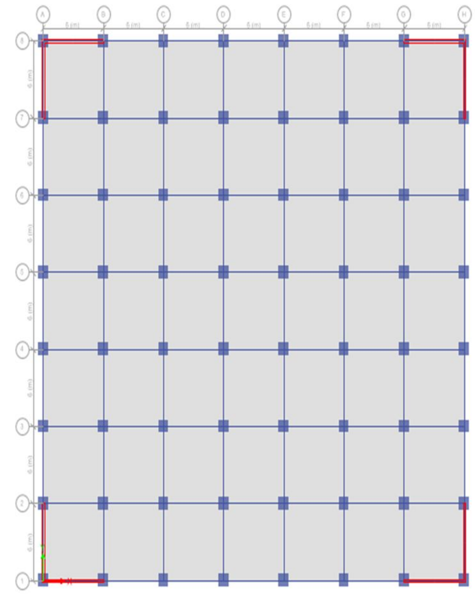


Model 1



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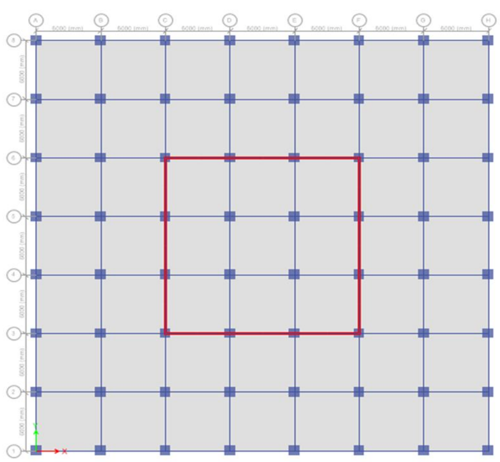

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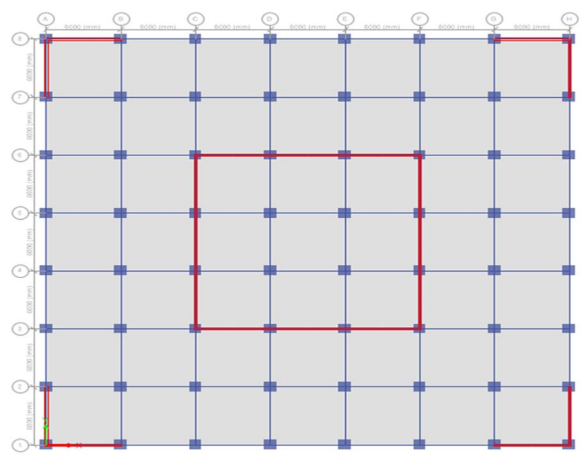
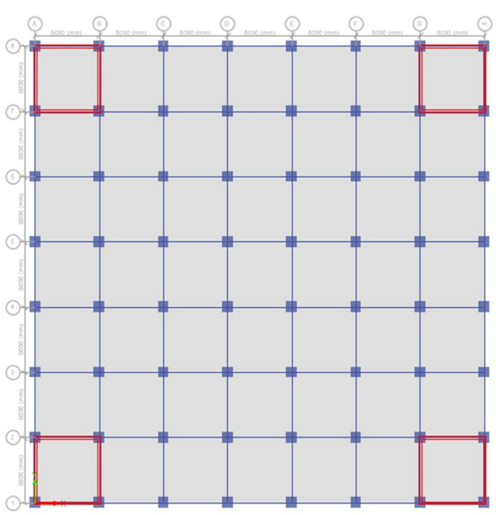
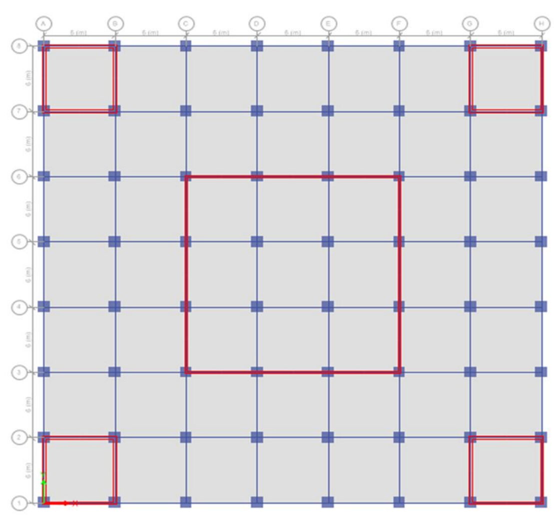


model 4



Model 5



Model 6

A. Design Data

Material Properties:
Young's modulus of (M40) concrete, E = 31.63×10^6 kN/m²
Density of Reinforced Concrete = 25kN/m³
Assumed Dead load intensities
Floor finishes = 1.5kN/m²

B. Live Load Intensities

Imposed loads = 3.0KN/ m

C. Member Properties

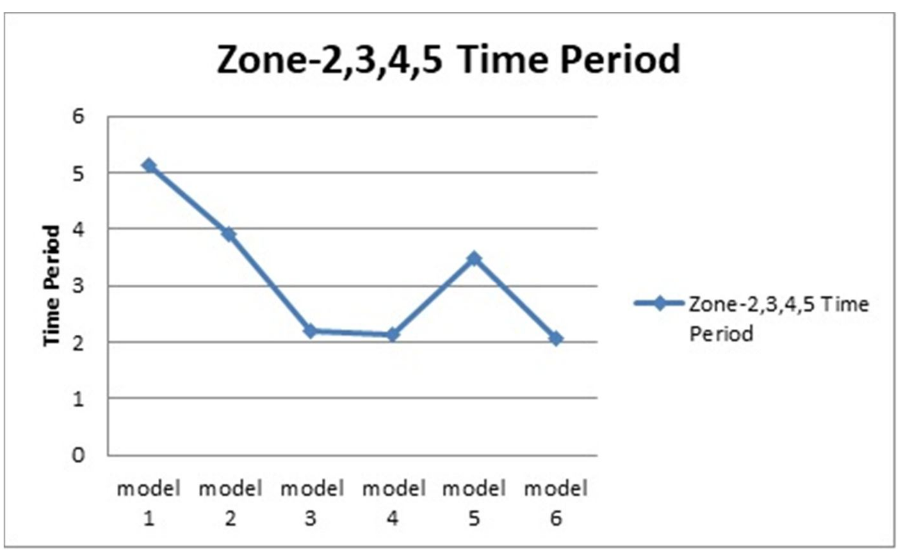
Thickness of Slab = 0.150m
Column size: = (0.10m x 0.10m)
Beam size: = (0.3m x 0.6m)
Thickness of concrete wall = 0.25m
Design Spectrum

1) Eq zones-2 3 4 5
2) Importance factor-1
3) Response reduction factor-5

IV. RESULTS AND CONCLUSIONS

The results of displacement ,drift, time period and base shear are obtained by equivalent static and response spectrum method.
Time Period for Zone-2,3,4,5

Zone-2,3,4,5	
Time Period in sec	
model 1	5.133
model 2	3.917
model 3	2.199
model 4	2.12
model 5	3.494
model 6	2.061



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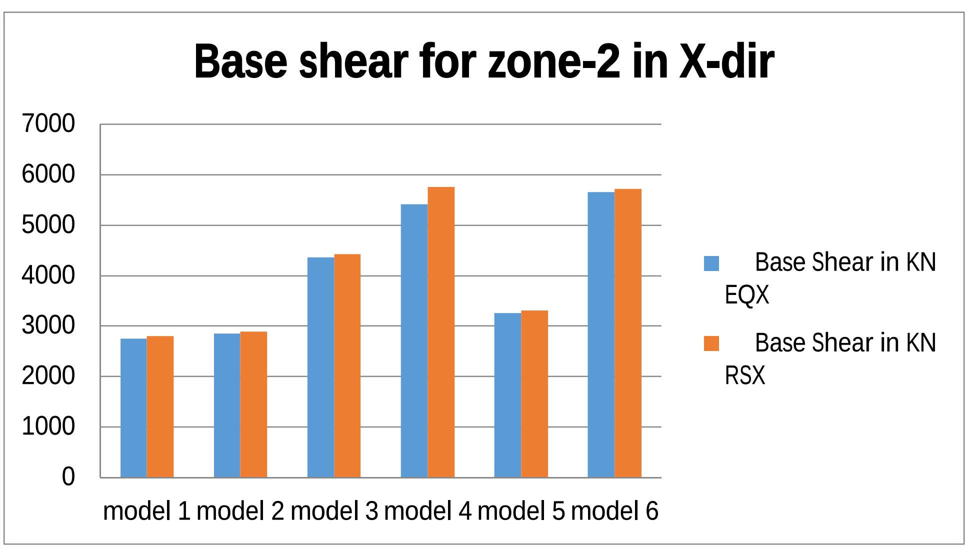
A. *Base Shear*

Comparison of base shear by Equivalent Static Method and Response Spectrum Method for various models.

		Equivalent static method		Response spectrum Method	
		X-dir	Y-dir	X-dir	Y-dir
Zone-2	model 1	2746.169	2746.169	2796.857	2796.857
	model 2	2854.208	2854.208	2895.01	2900.48
	model 3	4367.01	4367.012	4433.76	4433.76
	model 4	5414.01	5414.01	5764.57	5764.57
	model 5	3256.2	3256.203	3306.97	3306.97
	model 6	5664.37	5664.97	5724.62	5742.62
Zone-3	model 7	4397.87	4397.87	4474.97	4474.97
	model 8	4566.733	4566.733	4632.02	4640.72
	model 9	8206.467	8206.467	8358.13	8358.13
	model 10	8662.417	8662.417	8743.31	8743.31
	model 11	5209.924	5209.924	5291.16	5291.16
	model 12	9063.952	9036.952	9159.4	9154.4
Zone-4	model 13	6590.8	6590.8	6712.45	6712.45
	model 14	6580.09	6580.09	6948.04	6961.15
	model 15	12309.69	12309.69	12537.2	12537.2
	model 16	12993.62	12993.62	13114.96	13114.97
	model 17	7814.886	7814.886	7814.88	7814.88
	model 18	13595.92	13595.92	13739.1	13739.1
Zone-5	model 19	9886.2	9886.2	10068.68	10068.68
	model 20	10275.14	10275.14	10422.06	10337.31
	model 21	18464.54	18464.54	18805.8	18805.8
	model 22	19490.43	19490.43	19672.45	19672.45
	model 23	11722.32	11722.32	11905.11	11905.11
	model 24	20393.89	20393.89	20608.65	20608.65



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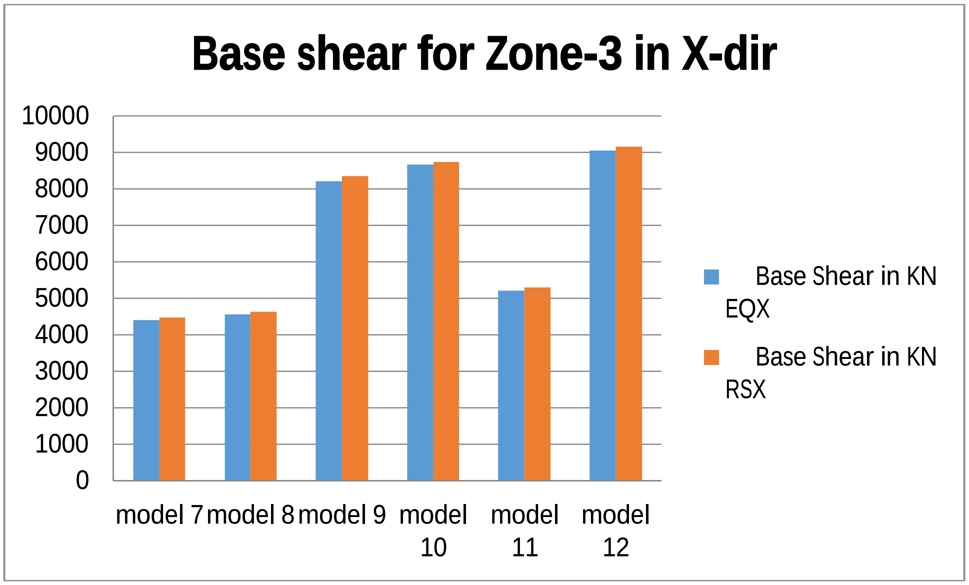
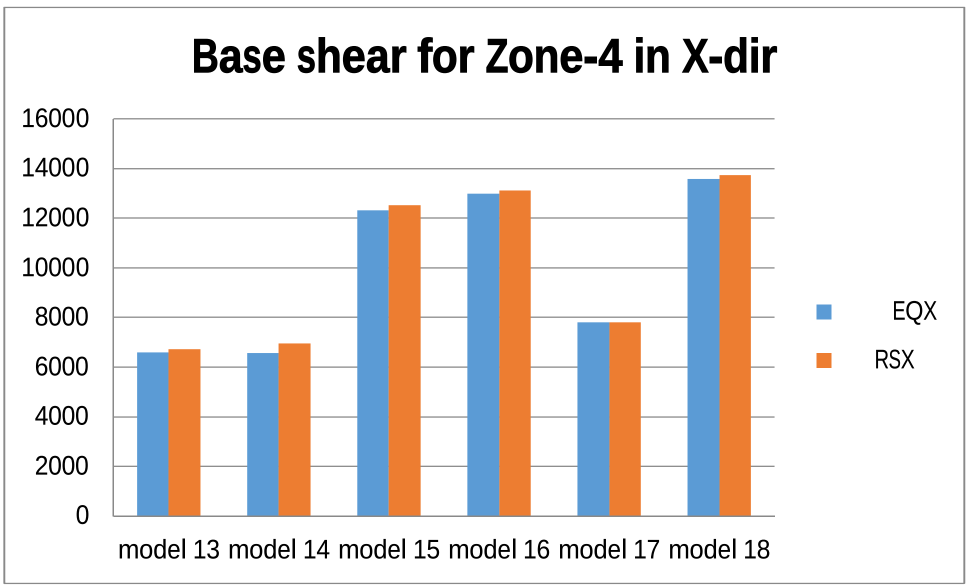
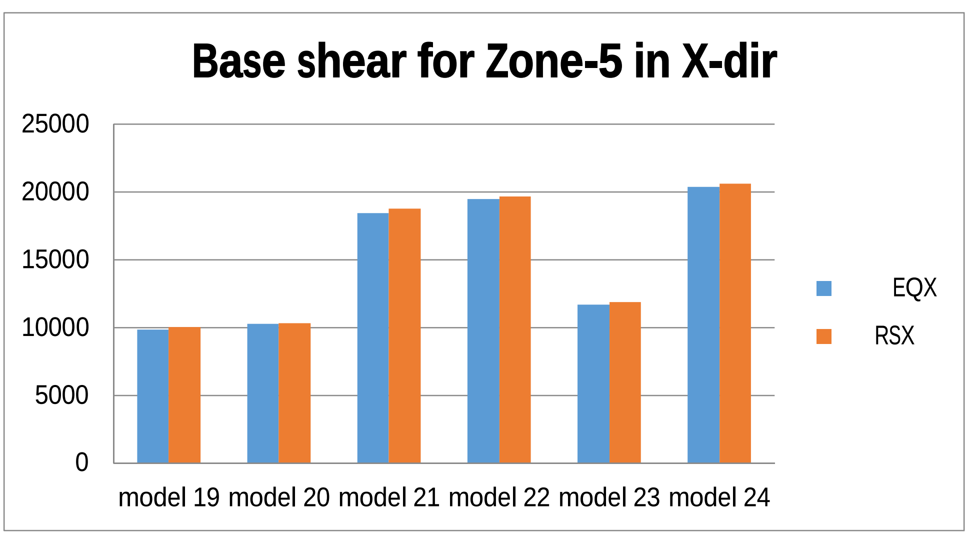
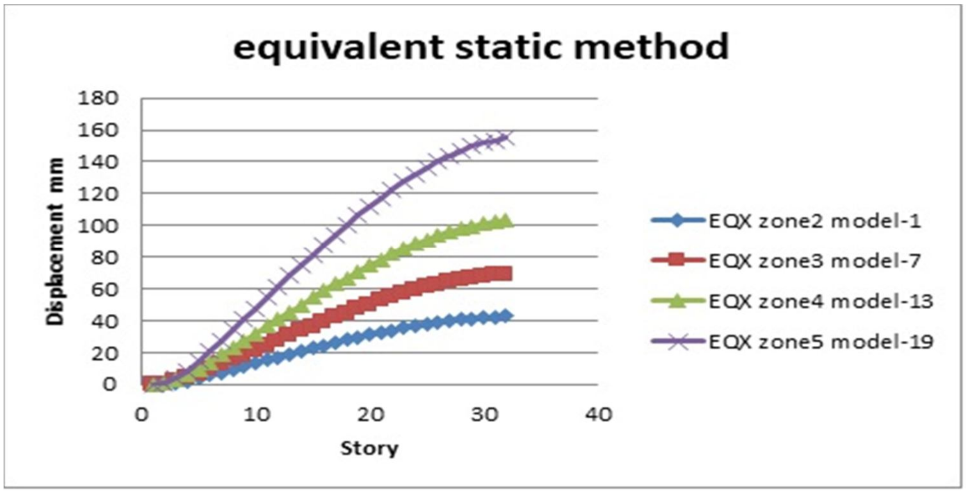
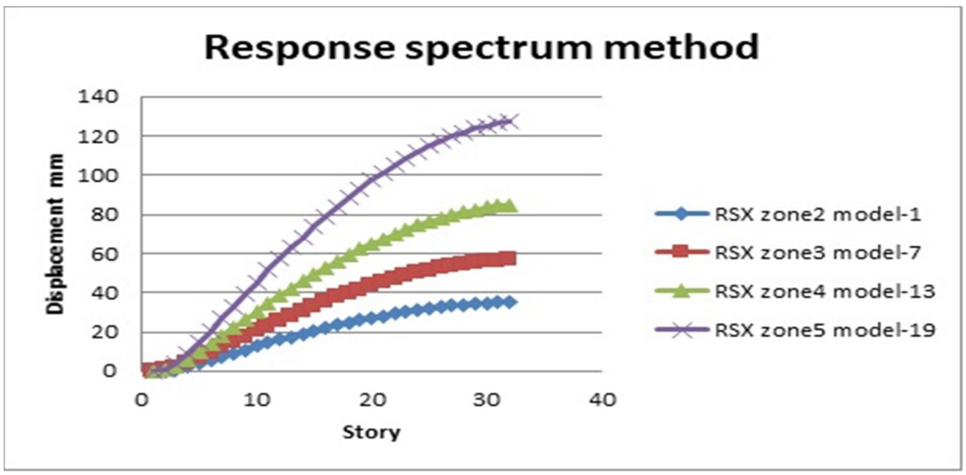




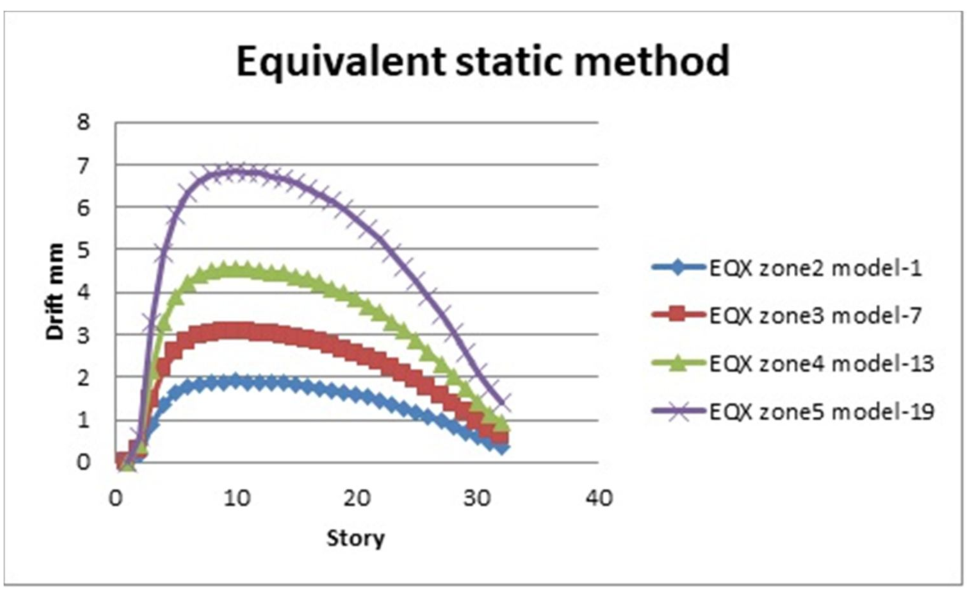


B. Displacement





C. Drift



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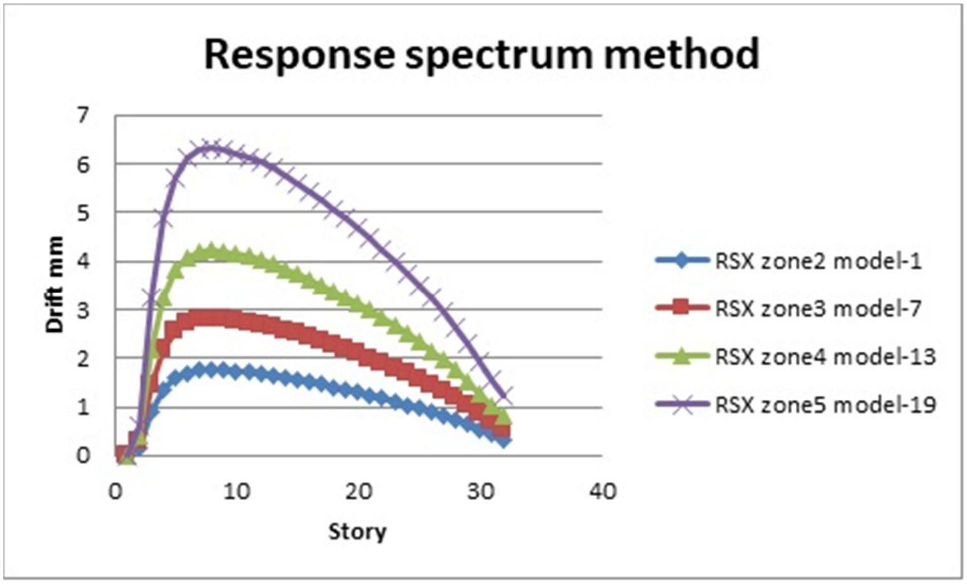

V. CONCLUSIONS

A. The natural period decreases while consequence concrete core wall is taken at centre and at corners
B. Storey drifts are initiated inside the boundary as indicated by code (IS 1893-2002 Part-1) in linear dynamic and static analysis.
C. The dynamic response of a structure is decreased efficiently by using bay wide and story height shear wall.
D. The displacement in model with corewall at centre is less than the model with base frame in Zone-2 in Equivalent static method.
E. The displacement in model with corewalls at centre and corner is less than the model with bare frame in Zone-3,4,5 in Equivalent Static method as well as response spectrum method.
F. The drift in model with Bare frame is less as compared to remaining models in Zone-2,3,4,5.
G. The time period in model with corewall at centre and shear wall at corners is less than all remaining models in all zones
H. The base shear in model with core wall at centre and corners is less than all models in Zone-2, 3, 4, 5.
I. The base shear values obtained from response spectrum method is more than that of equivalent static method.

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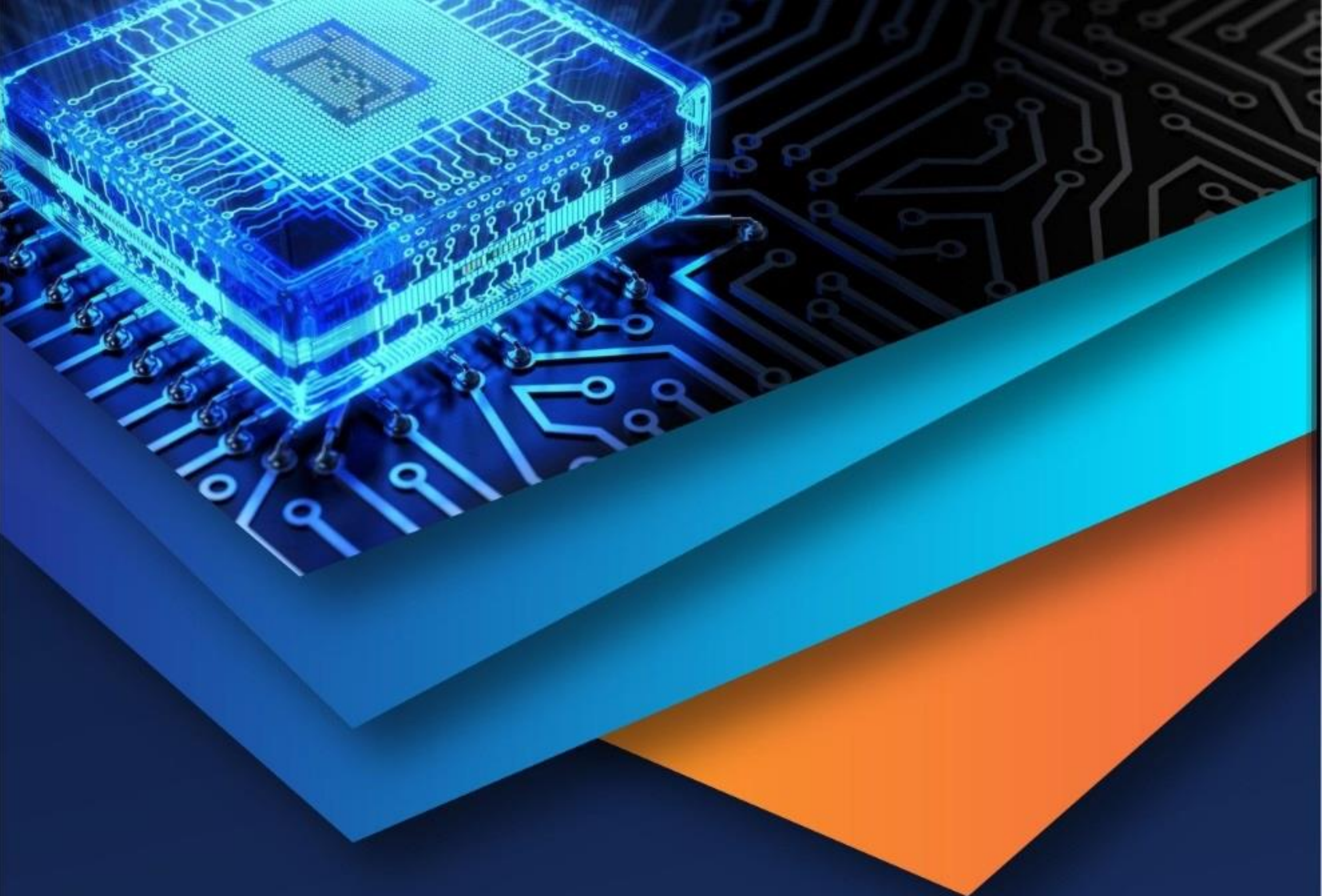

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