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Seismic Behaviour of Reinforced Concrete Buildings Under Dynamic Frequency Pattern by Using Etabs For (G+5) Section In Zone V

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ABSTRACT

Earthquake is the result of sudden release of energy in the earth's crust that generates seismic waves. Ground shaking and burst are the significant impacts produced by tremors. It has social just as monetary outcomes, for example, causing passing and injury of living things particularly individuals and harms that assembled and regular habitat. In order to take precaution for the loss of life and damage of structures due to the ground motion, it is important to understand the characteristics of the ground motion. Earthquakes are one of the greatest natural disasters to human life and properties. Following lessons from previous earthquake disasters, the performance-based seismic design is increasingly accepted by engineers to prevent seismic disasters. In performance-based seismic design, realistic and reliable design response spectra are required to reliably and accurately predict responses of designing structures.

Keywords : Earthquake, Generates Seismic Waves, Seismic Design

I. INTRODUCTION

An earthquake is the result of a rapid release of strain energy stored in the earth's crust that generates seismic waves. A structure is vulnerable to earthquake ground motion and damages the structures. To avoid potential risk for the harm of structures because of the ground movement, it is essential to know the attributes of the ground movement. The main unique attributes of tremor are top ground speeding up (PGA), recurrence substance, and term. These attributes assume transcendent part in considering the conduct of structures under the tremor ground movement.

Severe earthquakes happen rarely. Even though it is technically conceivable to design and build structures for these earthquake events, it is for

the most part considered uneconomical and redundant to do so. The seismic design is performed with the expectation that the severe earthquake would result in some destruction, and a seismic design philosophy on this premise has been created through the years. The objective of the seismic design is to constraint the damage in a structure to a worthy sum. The structures designed in such a way that should have the capacity to resist minor levels of earthquake without damage, withstand moderate levels of earthquake without structural damage, yet probability of some non-structural damage, and withstand significant levels of ground motion without breakdown, yet with some structural and in addition non-structural damage.

In present work, five story regular reinforced concrete (RC) buildings which are modelled as three-dimension and one ground motion of high frequency content is subjected to the corresponding models and non-linear dynamic time-history analysis is performed and compared with linear dynamic response spectrum analysis using ETABS 16.2.1 software.

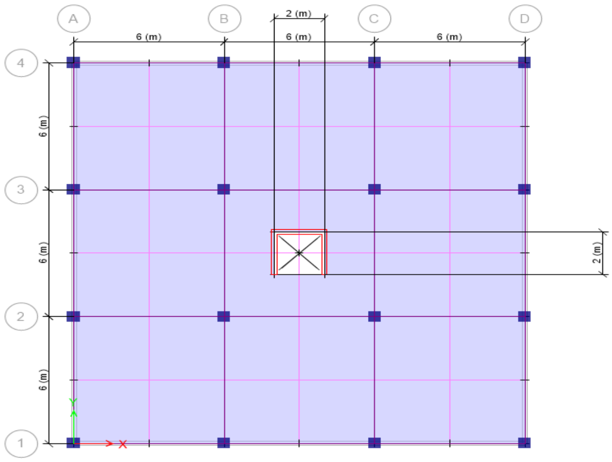
II. METHODS AND MATERIAL

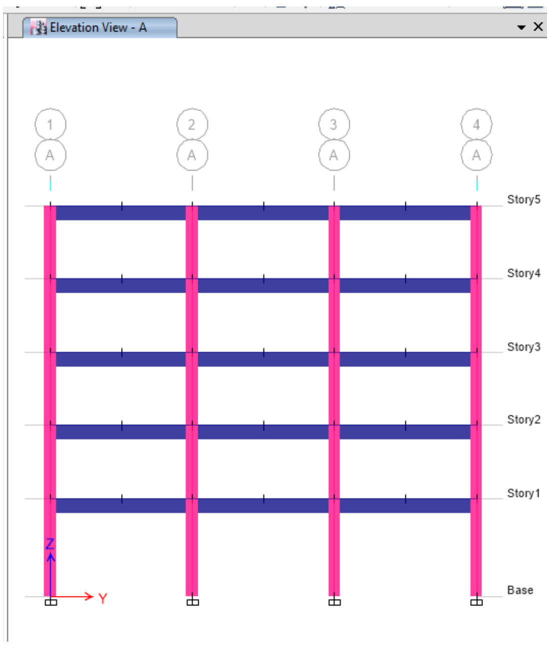
In the present study, firstly analysis of low, mid, and high-rise regular three-dimension RC buildings in most severe zone earthquake forces is carried out. 3D model is prepared for low, mid, and high-rise regular RC buildings having shear wall in its core using ETABS 16.2.1.

Here, the maximum story displacement, maximum story drifts, story acceleration, story stiffness and base shear of low, mid, and high-rise regular reinforced concrete buildings due to the ground motions of high-frequency content is obtained. The methodology, which is conducted, is briefly described as below:

1) Ground motion record is collected and then normalized.
2) Non-Linear time history analysis is performed in ETABS 16.2.1.
3) Building response such as maximum story displacement, maximum story drifts, maximum story acceleration, and base shear are found due to the ground motions.
4) The results of the three regular RC buildings are compared with respect to the two analysis i.e., LDP or Response Spectrum Analysis and NDP or Time History Analysis.

Five, ten, regular reinforced concrete buildings, which are low, mid, and high-rise are considered. The beam length in (x) transverse direction is 6m and in (y) longitudinal direction 6m. Figure 3.1 shows the plan of the three buildings having three bays in x-direction and three bays in y-direction. Base story height of each building is assumed 4.0m and remaining all above story height is 3.0m.

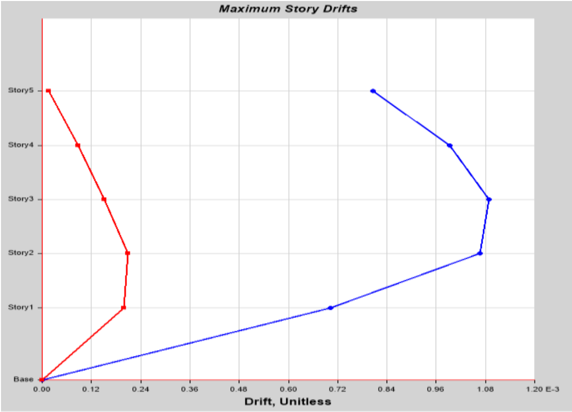


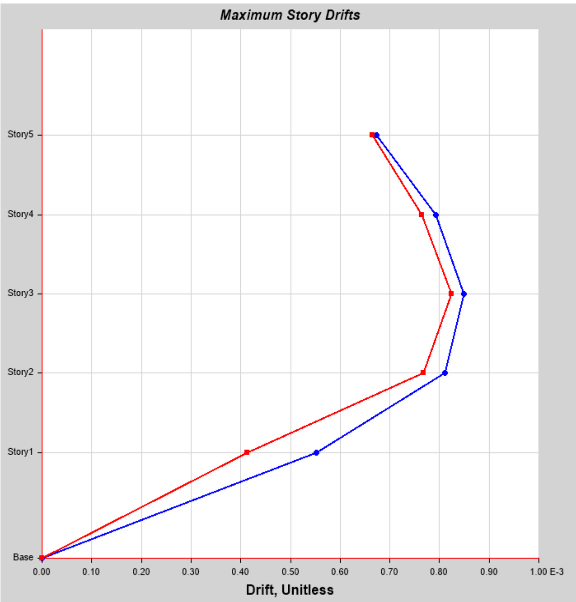


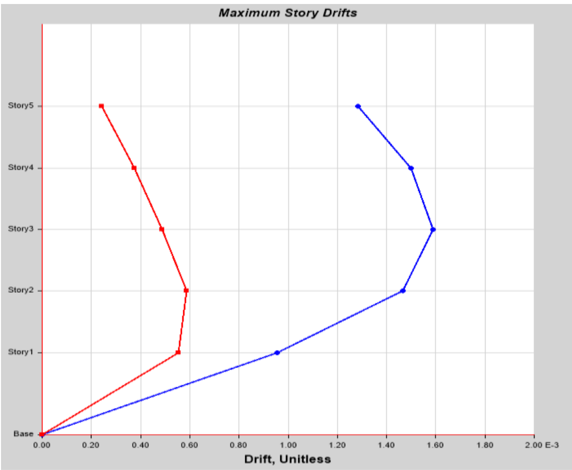
III.RESULTS AND DISCUSSION

In this chapter, the results of five- story regular reinforced concrete buildings in terms of maximum story displacement, maximum story drift, story acceleration, and base shear are presented in (x) transverse and (y) longitudinal direction. The responses of the structures due to the above mentioned ground motions and given LDA and NDA load functions are found.

In section the five(G+5), regular RC building, the maximum story drifts due to earthquake load, response spectrum function (as per IS:1893-2016)







RESULTS OF G+5 BUILDING IN (X-DIRECTION)

Table 1 :- Story Response Values (G+5 : EQx)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story5	16	Top	0.000673	0.000665
Story4	13	Top	0.000792	0.000765
Story3	10	Top	0.000849	0.000824
Story2	7	Top	0.000811	0.000768
Story1	4	Top	0.000551	0.000412
Base	0	Top	0	0

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story5	16	Top	0.001283	0.000242
Story4	13	Top	0.0015	0.000373
Story3	10	Top	0.001587	0.000487
Story2	7	Top	0.001467	0.000587
Story1	4	Top	0.000955	0.000553
Base	0	Top	0	0

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story5	16	Top	0.000673	0.000665
Story4	13	Top	0.000792	0.000765
Story3	10	Top	0.000849	0.000824
Story2	7	Top	0.000811	0.000768
Story1	4	Top	0.000551	0.000412
Base	0	Top	0	0

RESULTS OF G+5 BUILDING IN (Y-DIRECTION)

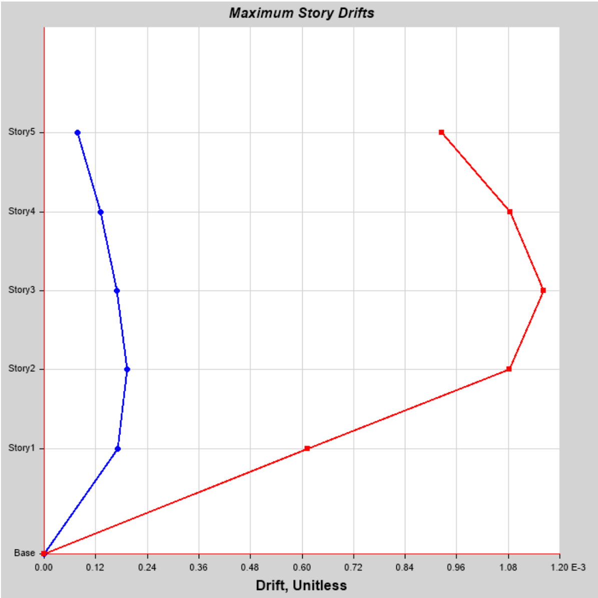


Table 2. Story Response Values (G+5: EQy)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story5	16	Top	0.000077	0.000926
Story4	13	Top	0.000131	0.001085
Story3	10	Top	0.000168	0.001163
Story2	7	Top	0.000192	0.001083
Story1	4	Top	0.000171	0.000614
Base	0	Top	0	0

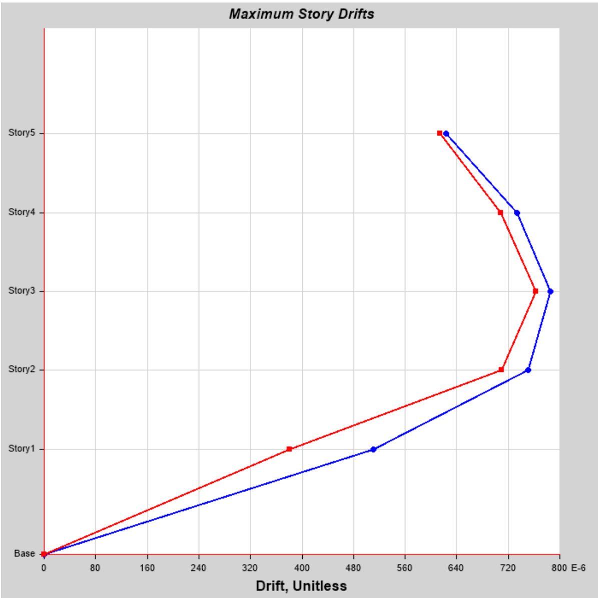


Table 3. Story Response Values (G+5: RSAy)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story5	16	Top	0.000623	0.000615
Story4	13	Top	0.000733	0.000708
Story3	10	Top	0.000785	0.000763
Story2	7	Top	0.00075	0.00071
Story1	4	Top	0.00051	0.000381
Base	0	Top	0	0

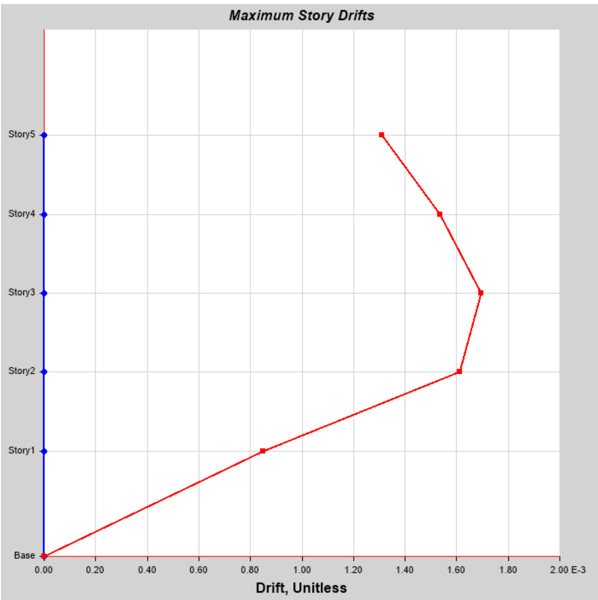


Table 4. Story Response Values (G+5: THy)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story5	16	Top	0	0.001311
Story4	13	Top	0	0.001535
Story3	10	Top	0	0.001694
Story2	7	Top	0	0.001613
Story1	4	Top	0	0.000849
Base	0	Top	0	0

The Base Reactions

TABLE 5 : Base Reactions (G+5) Building

Load Case/Combo	FX	FY	FZ	MX	MY	MZ	X	Y	Z
	kN	kN	kN	kN-m	kN-m	kN-m	m	m	m
Dead	0	0	30266.7237	272340.4795	-272400.5135	0	0	0	0
Live	0	0	4800	43200	-43200	0	0	0	0
EQxA	-974.862	0	0	0	-12600.1266	8780.516	0	0	0
EQyA	0	-939.3728	0	12141.4265	0	-9299.7905	0	0	0
RSAx Max	812.3017	846.4818	0	10021.3148	9567.9542	10997.0301	0	0	0
RSAy Max	751.6408	783.2684	0	9272.9459	8853.4412	10175.797	0	0	0
THX Max	812.8881	0.000002414	0	0.00003195	10386.3004	17336.8961	0	0	0
THX Min	-1614.8661	-0.000002666	0	-0.00002942	-18793.4036	-11330.6489	0	0	0
THY Max	0.000001853	783.2955	0	21149.509	0.00002264	7049.6594	0	0	0
THY Min	-0.000002047	-1875.1831	0	-9134.6631	-0.00002459	-16876.6483	0	0	0

IV. CONCLUSION

LDP or response spectrum analysis are more conservative analysis as compared with building analysed for only earthquake load case and time-history load case. This is due to dynamic response of the building is under-estimated in RSA as Response Spectrum Analysis ignores nonlinearity.

Clearly, there are there are certain types of structure like high-rise structure/tall structures, irregular structures may be like setback buildings (in this project work high-rise building) that require the use of the NDP to obtain a reasonable representation of their seismic response especially in earthquake Zone IV and Zone V as it attempts to fully represent the seismic response of buildings without any of the major simplifying assumptions. Other analysis methods would either provide dangerously inaccurate assessments of these structures, because they ignore the implications of one or more of the structural characteristics that define structural response, or they would be overly conservative, perhaps limiting the ability to make use of innovative design solutions.

V. REFERENCES

[1]. A. Baghchi, Evaluation of the Seismic Performance of Reinforced Concrete Buildings,

Ottawa: Department of Civil and Environmental Engineering, Carleton University, 2001.

[2]. T. Cakir, "Evaluation of the effect of earthquake frequency content on seismic behaviour of cantiliver retaining wall including soil-structure interaction," Soil Dynamics and Earthquake Engineering, vol. 45, pp. 96-111, 2013.

[3]. S. K. Nayak and K. C. Biswal, "Quantification of Seismic Response of Partially Filled Rectangular Liquid Tank with Submerged Block," Journal of Earthquake Engineering, 2013.

[4]. "Pacific Earthquake Engineering Research Center: NGA Database," 2018. [Online]. Available: http://peer.berkeley.edu/nga/data?doi=NGA0185.

[5]. IS 1893 (Part1), Indian Standard CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES PART 1, 6.1 ed., New Delhi 110002: Bureau of Indian Standards, 2002.

[6]. IS 1893 (Part1), Indian Standard CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES PART 1, 6.1 ed., New Delhi 110002: Bureau of Indian Standards, 2016

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