Seismic Behaviour of Reinforced Concrete Buildings Under Dynamic Frequency Pattern by Using Etabs For (G+10) Sections 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, Disasters

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, ten 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.

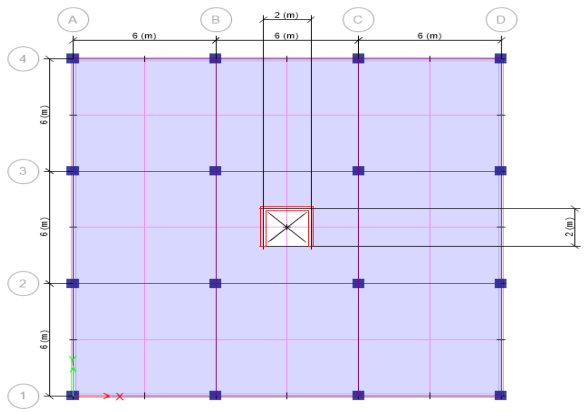
II. METHODS AND MATERIAL

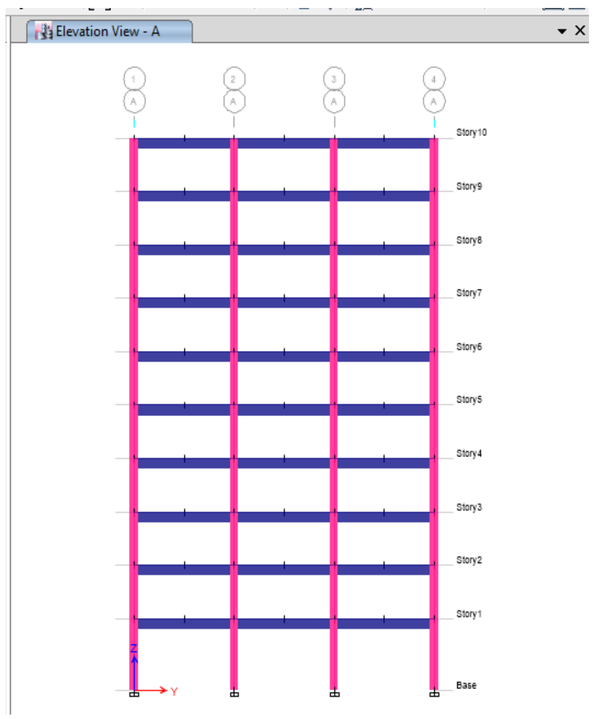
In the present study, firstly analysis of low, mid, and high-rise regular three-dimension RC buildings in most severe zone earthquake forces is carried out. 3D model is prepared for low, mid, and high-rise regular RC buildings having shear wall in its core using ETABS 16.2.1.

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.

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

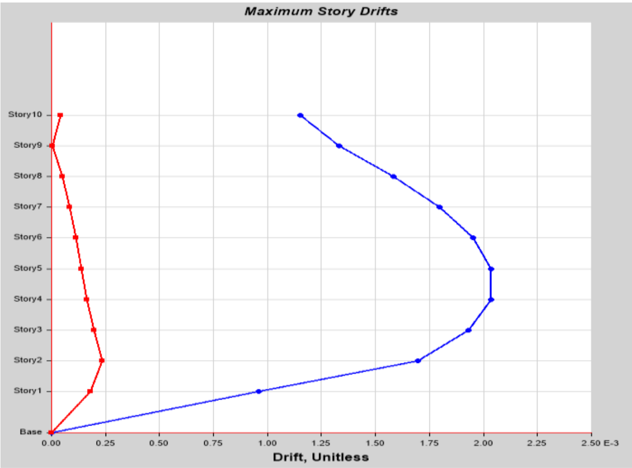
In this chapter, the results of ten, and story regular reinforced concrete buildings in terms of maximum

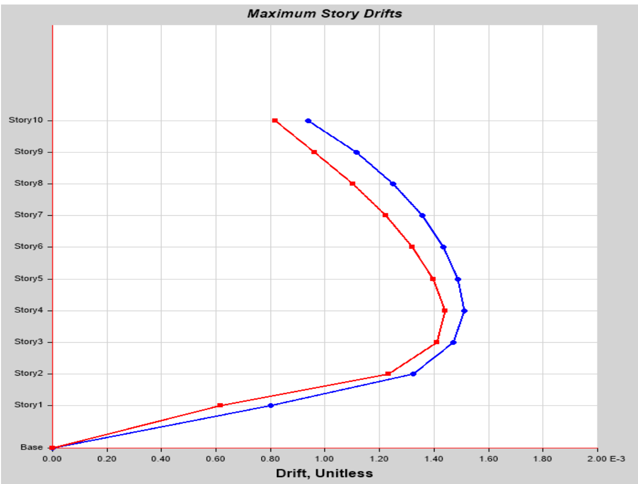
Story displacement, maximum story drift, story acceleration, and base shear are presented in (x)

Ttransverse 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+10), regular RC building, the maximum story drifts due to earthquake load, response spectrum function (as per IS:1893-2016)

RESULTS OF G+10 BUILDING IN? *(X-DIRECTION)*





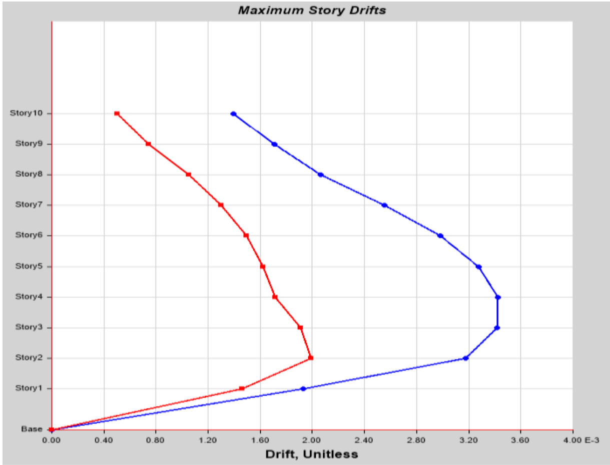


Table 1. Story Response Values (G+10 : EQx)

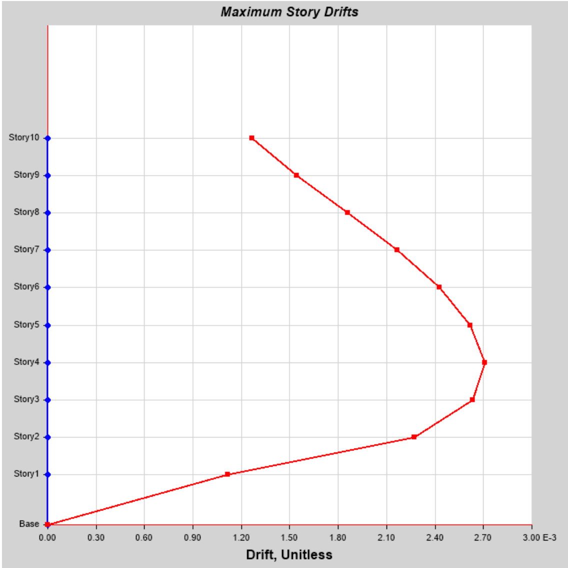
Story	Elevation(m)	Location	X-Dir	Y-Dir
Story10	31	Top	0.00115	0.000043
Story9	28	Top	0.00133	0.000004
Story8	25	Top	0.001583	0.000051
Story7	22	Top	0.001796	0.000086
Story6	19	Top	0.00195	0.000113
Story5	16	Top	0.002033	0.000137
Story4	13	Top	0.002034	0.000165
Story3	10	Top	0.001932	0.000198
Story2	7	Top	0.001697	0.000235
Story1	4	Top	0.000958	0.000179
Base	0	Top	0	0

Table 2. Story Response Values (G+10 : RSAx)

Story	Elevation m	Location	X-Dir	Y-Dir
Story10	31	Top	0.000939	0.000818
Story9	28	Top	0.001115	0.000962
Story8	25	Top	0.00125	0.001102
Story7	22	Top	0.001356	0.001222
Story6	19	Top	0.001434	0.00132
Story5	16	Top	0.001488	0.001397
Story4	13	Top	0.001511	0.00144
Story3	10	Top	0.001472	0.001411
Story2	7	Top	0.001324	0.001234
Story1	4	Top	0.000802	0.000616
Base	0	Top	0	0

Table 3. Story Response Values (G+10 : THx)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story10	31	Top	0.001393	0.000501
Story9	28	Top	0.001708	0.000742
Story8	25	Top	0.002063	0.001049
Story7	22	Top	0.002553	0.001303
Story6	19	Top	0.002979	0.001493
Story5	16	Top	0.003274	0.001621
Story4	13	Top	0.003427	0.001718
Story3	10	Top	0.003414	0.001913
Story2	7	Top	0.003176	0.001991
Story1	4	Top	0.001932	0.001459
Base	0	Top	0	0



RESULTS OF G+10 BUILDING IN(Y-DIRECTION)

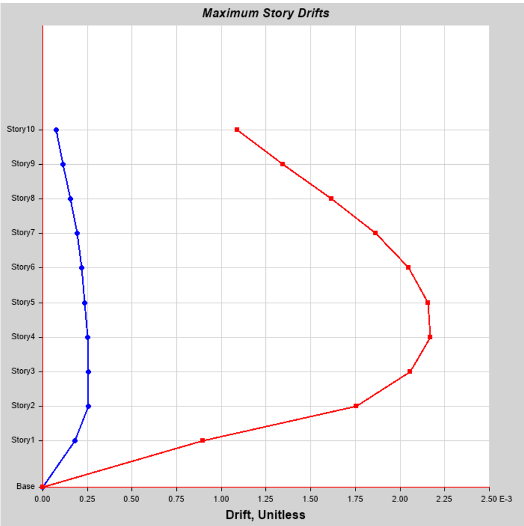


Table 4. Story Response Values (G+10 : EQy)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story10	31	Top	0.000073	0.00109
Story9	28	Top	0.000112	0.001344
Story8	25	Top	0.000156	0.001618
Story7	22	Top	0.000191	0.001862
Story6	19	Top	0.000217	0.002048
Story5	16	Top	0.000236	0.002157
Story4	13	Top	0.00025	0.00217
Story3	10	Top	0.000257	0.002057
Story2	7	Top	0.000256	0.001753
Story1	4	Top	0.000182	0.000895
Base	0	Top	0	0

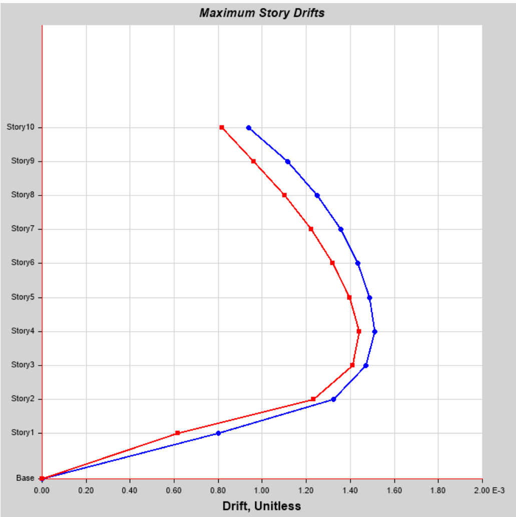


Table 5. Story Response Values (G+10 : RSAy)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story10	31	Top	0.000939	0.000818
Story9	28	Top	0.001115	0.000962
Story8	25	Top	0.00125	0.001102
Story7	22	Top	0.001356	0.001222
Story6	19	Top	0.001434	0.00132
Story5	16	Top	0.001488	0.001397
Story4	13	Top	0.001511	0.00144

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story3	10	Top	0.001472	0.001411
Story2	7	Top	0.001324	0.001234
Story1	4	Top	0.000802	0.000616
Base	0	Top	0	0

Table 6. Story Response Values (G+10 : THy)

Story	Elevation	Location	X-Dir	Y-Dir
	m			
Story10	31	Top	0	0.001266
Story9	28	Top	0	0.00154
Story8	25	Top	0	0.00186
Story7	22	Top	0	0.002167
Story6	19	Top	0	0.002427
Story5	16	Top	0	0.002619
Story4	13	Top	0	0.002709
Story3	10	Top	0	0.002633
Story2	7	Top	0	0.002269
Story1	4	Top	0	0.001115
Base	0	Top	0	0

TABLE 5.20: Base Reactions (G+10) 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	60443.8739	543864.8001	-543994.865	0	0	0	0
Live	0	0	9600	86400	-86400	0	0	0	0
EQxA	-1643.4743	0	0	0	-39896.7716	14786.5719	0	0	0
EQyA	0	-1561.9523	0	37917.7538	0	-15463.328	0	0	0
RSAx Max	1404.6297	1441.3147	0	27341.9831	26022.0012	18890.6708	0	0	0
RSAy Max	1404.6297	1441.3147	0	27341.9831	26022.0012	18890.6708	0	0	0
THX Max	4172.556	0.0002	0	0.0002	93792.8363	26127.6812	0	0	0
THX Min	-2874.2962	-0.0001	0	-0.0004	-56269.8831	-33896.1074	0	0	0
THY Max	0.000003827	4038.8206	0	52976.8976	0.0001	36349.3859	0	0	0
THY Min	-0.000005216	-2502.3117	0	-80201.1101	-0.0001	-22520.8057	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.

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