Comparative Study of Incremental Dynamic Analysis of RC Framed Buildings

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Abstract- *Structures of civil engineering are designed to endure gravity loads as well as environmental factors such as earthquakes. The essence of these powers is random and complex. The structure's reaction is often complex, resulting in hazardous and unpleasant situations. However, increasing kinetic analysis is extremely precise, and it can be used to determine the structure's actual reaction, especially in the event of an earthquake. It is made up of a sequence of nonlinear dynamic analyses that raise the speed of the ground velocity chosen for fall analysis in order to meet the structure's global collapse capacity. The new project would include a more dynamic study of the reinforced concrete G + 12 building. The IDA curve defines building output phases such as yield and decline in relation to the highest earthquake of earthquakes. The building's sensitivity is such that it can tolerate seismicity that is either considered or not considered by IDA. G + 12 buildings are often subjected to a static answer spectrum review. A graph of the maximal displacement is drawn from the base shear based on the static reaction continuum analysis. The building's base shear potential is calculated from the graph. The base shear capacity of two buildings is also determined using IDA, and the base shear capacity curve is compared to the SPA for upper displacement using IDA.*

I. INTRODUCTION

Structural response to earthquakes is a dynamic phenomenon that depends on dynamic characteristics of structures and the intensity, duration, and frequency content of the exciting ground motion. Although the seismic action is dynamic in nature, building codes often recommend equivalent static load analysis for design of earthquake-resistant buildings due to its simplicity. This is done by focusing on the predominant first mode response and developing equivalent

Structural Dynamic Analysis (IDA) has recently emerged as an important instrument for examining the overall behavior of systems, ranging from their elastic reaction to their yield and linear responses, as well as their global dynamic volatility. Increasing kinetic analysis entails performing a sequence of nonlinear kinetic analyses in which the amplitude of the ground velocity chosen for the friction measure is increased incrementally before the structure's global collapse potential is reached. Additionally, it includes plotting the speed of ground motion (peak ground acceleration) against a reaction metric, such as the peak inter-story drift ratio. The yield curve is considered as the slope of the IDA curve varies from linear to nonlinear. When the IDA curve is very smooth or when the nonlinear slope is less than 20% of the elastic slope, the shape is called compressed (Vamvatsikos D and Cornell A, 2002). Different ground motions (i.e., ground motions with varying frequency content and durations) may result in varying intensities toward response plots, making it difficult to achieve meaningful statistical averages under different ground motions. The research is performed once more. IDA serves as a foundation for assessing comparative performance-based seismic engineering (PBEE). The initial step of the RC system will be based on nanzero dynamic analysis of selected seismic data. Displacement, inter-story drift, foundation shear, and trail IDA are all statistically tracked.

A. OBJECTIVES

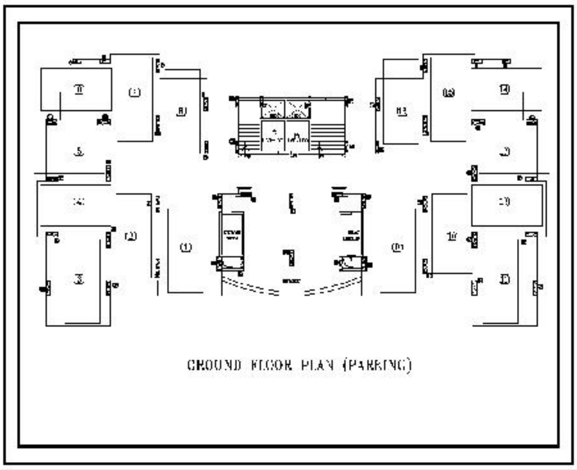
- To carry out the incremental dynamic analysis of existing RC building.
- To calculate probability of yielding and probability of collapse with respect to peak ground acceleration with respect to displacement, storey drift, base shear, and time period of the building.
- To decide whether the building can withstand the particular considered earthquake or not.
- To study the building serviceability to the considered earthquake.
- To compare the response of the structure from incremental dynamic analysis with that of static Response spectrum analysis.

II. METHODOLOGY OF WORK

Incremental dynamic analysis is a powerful tool to study the performance based analysis of the structure. Actual response of the building to the considered earthquake can be plotted by using this method. In this chapter, G+3 building is carried out to validate the results from the ETABS software. Also, G+12 building is carried out response spectrum analysis for different seismic zones. Performance stages such as yielding and collapse of the structure are defined with respect to intensity measure of the earthquake i.e. Peak ground acceleration. Generalized IDA curve is plotted for both the buildings for different seismic zones.

A. PROBLEM STATEMENT OF GEOMETRY

In this project, a G+12-storey structure of a rectangular building with 3 m floor to floor height has been analyzed Non-Linear Dynamic Analysis of multi-story R.C.C Buildings using ETABS software in multiple seismic zones. The plan selected is Rectangular in shape. It is not the plan of any existing or proposed building but is an architectural plan. The structure has been analyzed for both static and dynamic wind and earthquake forces. Hard soil condition has been selected for the structure.



III.RESULTS

A. PREPARE MODELING IN ETABS FOR ZONE I, II, III, IV

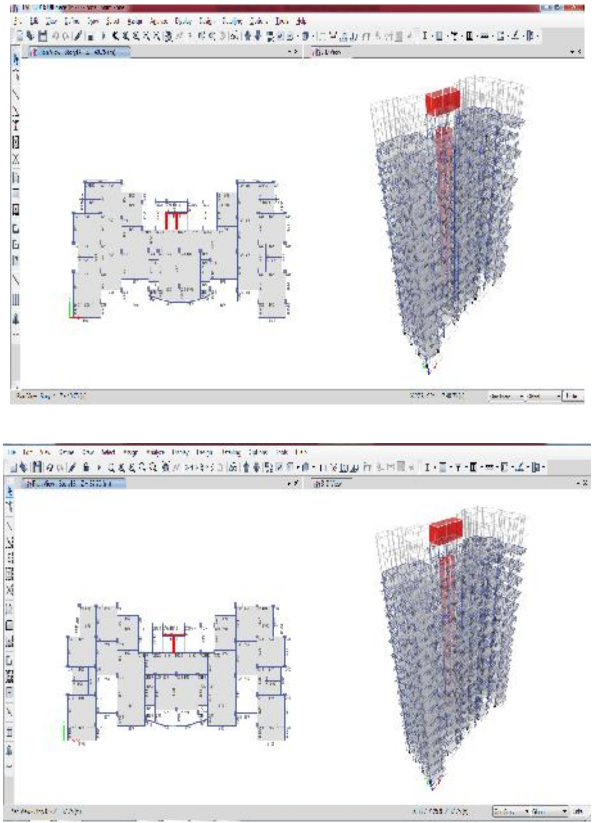
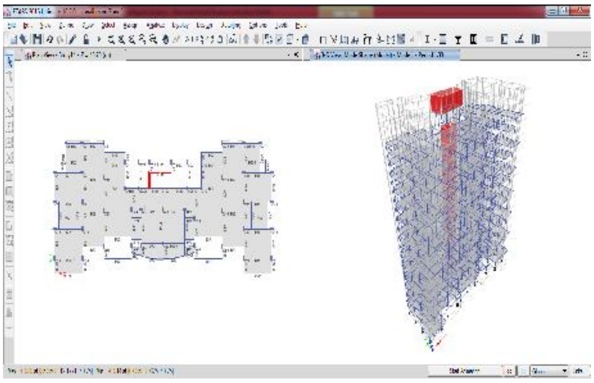
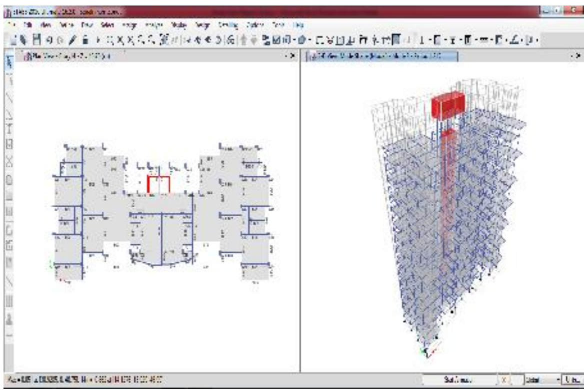


Fig 1 Prepare Model in ETABS

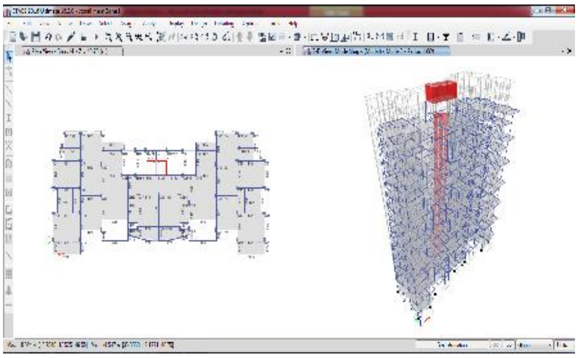
B. TIME PERIOD FOR ZONE I, II, III, IV



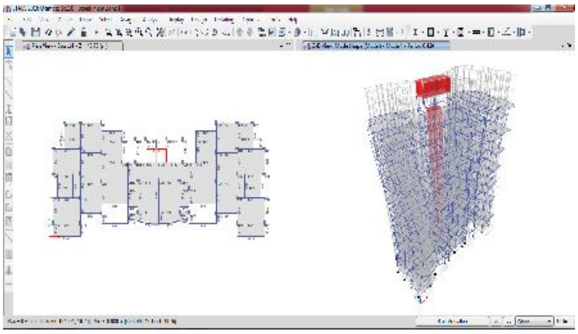
Mode Shape 1 for zone I,II, III, IV



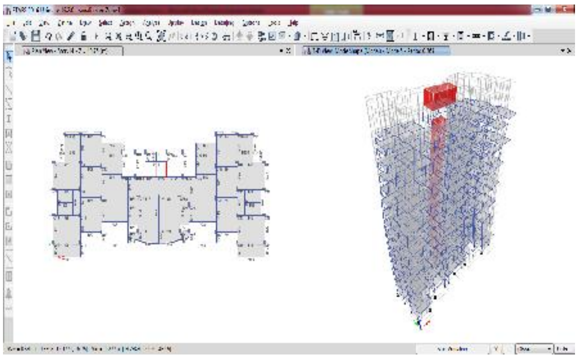
Mode Shape 2 for zone I,II, III, IV



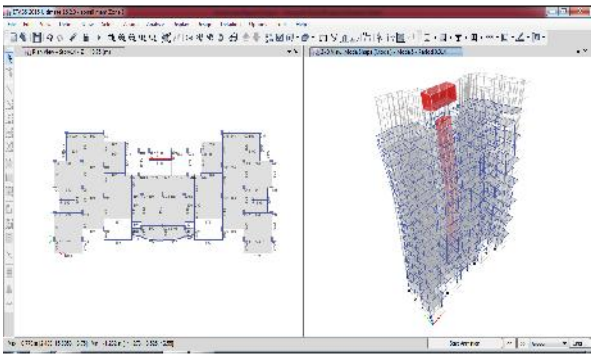
Mode Shape 3 for zone I, II, III, IV



Mode Shape 4 for zone I, II, III, IV



Mode Shape 5 for zone I, II, III, IV

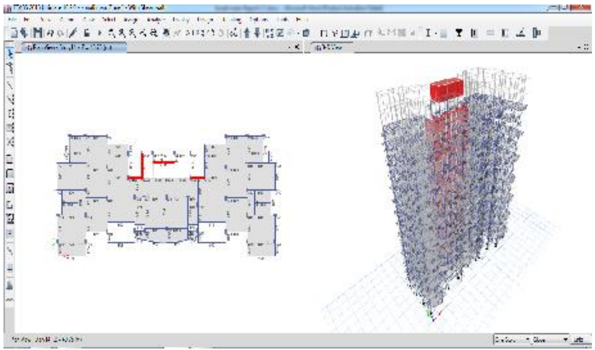


Mode Shape 6 for zone I, II, III, IV

MODE	TIME PERIOD
1	1.33
2	1.215
3	1.069
4	0.428
5	0.365
6	0.314

C. RESULTS AFTER PROVIDING SHEAR WALL FOR ZONE I

The maximum results for storey displacement, Storey Drift, and base Shear are in Zone I so in same model we provide more shear walls to reduce that same results.

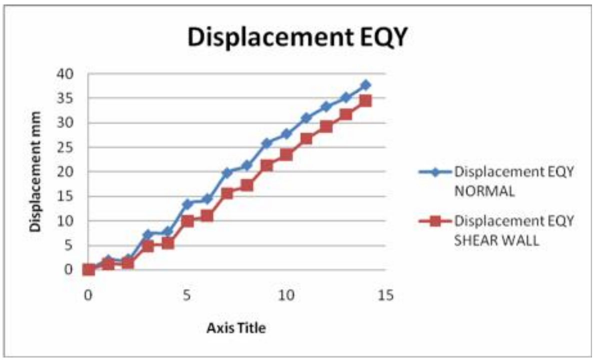


Provide More shear walls for zone I

DISPLACEMENT EQX		
STOREY	NORMAL	SHEAR WALL
14	42.793	33.37
13	40.758	30.866
12	37.952	29.422
11	36.074	27.191
10	31.735	24.484
9	30.113	22.608
8	24.515	18.775
7	23.215	17.321
6	16.848	12.723
5	15.907	11.727
4	9.382	6.893
3	8.815	6.348
2	2.93	2.068
1	2.733	1.906
0	0	0

Above Graph shows the results for the Displacement for forces of Earthquake from X direction for zone I for normal model and shear wall model from the above graph its conclude that the building after providing more share wall are reduce the results of the displacements by 25-30%

DISPLACEMENT EQY		
STOREY	NORMAL	SHEAR WALL
14	37.704	34.533
13	35.167	31.735
12	33.29	29.266
11	30.975	26.767
10	27.754	23.462
9	25.773	21.355
8	21.319	17.25
7	19.748	15.614
6	14.475	11.043
5	13.357	9.921
4	7.813	5.464
3	7.155	4.85
2	2.202	1.368
1	1.982	1.186
0	0	0



Above Graph shows the results for the Displacement for forces of Earthquake from Y direction for zone I for normal model and shear wall model from the above graph its conclude that the building after providing more share wall are reduce the results of the displacements by 25-30%

V. CONCLUSION

After the analysis G+12 RCC building for Zone I, II, III & IV the results conclude that the zone one required heavy design then IV, III And II Simultaneously The maximum results for storey displacement, Storey Drift, and base Shear are in Zone I so in same model we provide more shear walls to reduce that same results this all conclusion are conclude by following points

- The results for the Displacement for forces of Earthquake from X direction for zone I for normal model and shear wall model from the above graph its conclude that the building after providing more share wall are reduce the results of the displacements by 25-30%
- The results for the Displacement for forces of Earthquake from Y direction for zone I for normal model and shear wall model from the above graph its conclude that the building after providing more share wall are reduce the results of the displacements by 25-30%

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