A REVIEW ON DYNAMIC ANALYSIS OF TALL BUILDINGS USING SOFTWARES

Sayeed ur Rahman[1], Dr. Sabih Ahmad[2]
1. P.G. Student (M.tech-Structureal engineering), Civil Engineering Department, Integral University, Lucknow, India.
2. Associate Professor, Civil engineering Department, Integral University, Lucknow, India.

ABSTRACT

The objectives of structural engineers is to design and build a structure in such a way that during a seismic or high wind loads, the damage to the structure and structural component is minimised and the structure is stable or retain its original position. In this paper available literature reviews on dynamic analysis of tall buildings using various software is being presented. For dynamic analysis time history method or response spectrum method is used. Dynamic analysis may be performed for the symmetrical as well as unsymmetrical building.

Keywords: Dynamic Analysis, Multi-storey buildings, STAAD PRO, E-TABS.

INTRODUCTION

Dynamic analysis is one of the effective procedures for evaluating the seismic as well as wind loading performances of the building. The damage control is one of important design considerations which is increasing its influence and can be achieved only by introducing dynamic analysis in the design. The dynamic analysis can be done by software like E tabs, STAD-Pro and SAP.E tabs is one of the leading software which is presently used by many companies and Structural Engineers for their projects. In this paper available literature reviews on dynamic analysis of tall buildings using various software is being presented.

LITERATURE REVIEW

1. **Bahadur.B, Ehsan, S.F. and Mohammadreza, Y**,2011 had modelled a multi-storey irregular building with 20 storeys using E tabs and deal how the height of the building will affect the structural response of the building which has shear walls and also dynamic responses of building is investigated under actual earthquakes, EL-CENTRO 1949 and CHI-CHI Taiwan 1999. They observed that, in the first five stories, the difference between the results obtained with different methods is insignificant. With increasing the height of building, the difference between the displacements is gradually increased, by considering the maximum displacement of each storey and displacement of centre of mass.

2. **Ni, W. and Kyaw, L.H.,** 2014 had taken a 12 storied building for comparative study of static, dynamic analysis under load consideration of Uniformed Building Code (UBC-1997) and compared displacement, storey shear, storey moment and storey drift. The structure was designed in accordance with American Concrete Institute (ACI-318-99) design code. The proposed building was analysed with static analysis and dynamic analysis with response spectrum method be used. In their paper, the results of static and dynamic analysis such as displacement, storey shear, storey moment and storey drift are compared.

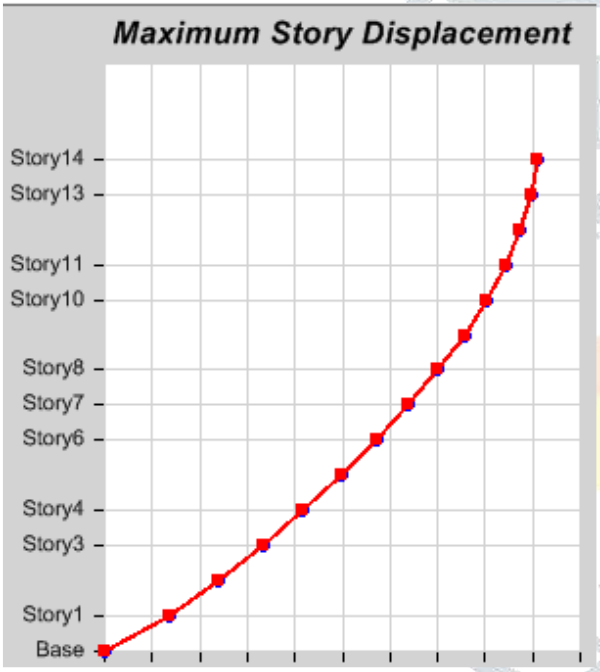
3. **Mohit, S. and Savita, M, 2014.** They modelled on a G+30 storied regular building. These buildings have the plan area of 25m x 45m with a storey height 3.6m each and depth of foundation is 2.4 m. & total height of chosen building including depth of foundation is 114 m. The static and dynamic analysis has with the help of STAAD-Pro software using the parameters for the design as per the IS-1893- 2002-Part-1 for the zones- 2 and 3 and the post processing result obtained has been summarized.

4. **Mohammed Rizwan Sultan, 2015.** They had taken a 15 storey high building with different shapes like rectangular, L-shape, H-shape, C-shape for comparison and dynamic analysis has been done to evaluate the deformation of the structure. The building located in severe earthquake zone (V) of India and to evaluate lateral forces, overturning moment, deflections and storey drift. They concluded that Irregular shapes are severely affected during earthquakes especially in high seismic zones and the C-shape building is more vulnerable compare to all other different shapes.

5. A**rvindreddy and Fernandes,** 2015 had taken a 15 storey regular, irregular building for static, dynamic analysis and shown the behaviour of irregular structure in comparison with regular structure. It may be concluded that structure built-in with stiffness irregularity will be on non-conservative side and as seen from time history analysis, as storey increases behaviour of stiffness irregularity and diaphragm irregularity becomes reverse.

6. **Geethu et.al** (2016) made a comparative study on analysis and design of multi storied building by STAD.-Pro and ETABS software. They provided the details of both residential and commercial building design. The planning was made in accordance with the national building code and drafted using Auto CAD software. They concluded that while comparing both software results, ETABS software shows higher values of bending moment and axial force.

7. **Balaji.U and Selvarasan M.E** (2016) worked on analysis and design of multi-storeyed building under static and dynamic loading conditions using ETABS. They choose a model of G+13 storey residential building and studied for the earth quake loads u1 sing ETABS. They assumed that material property to be linear, static and dynamic analyses were performed. The non-linear analysis was carried out by considering severe seismic zones and the behaviour was assessed by considering type II soil condition. Different results like maximum displacements, base shear were plotted and studied.

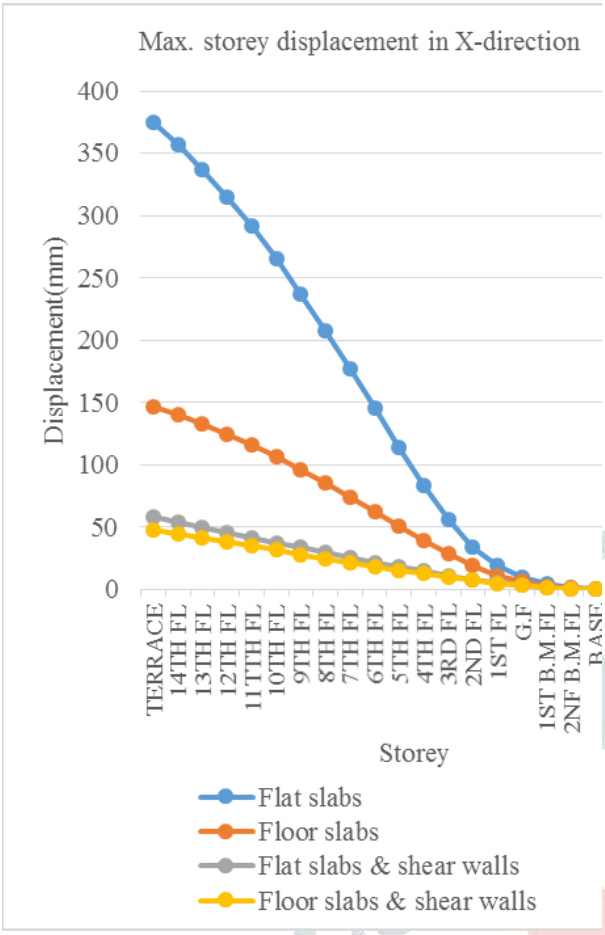


Displacement vs. Base Shear

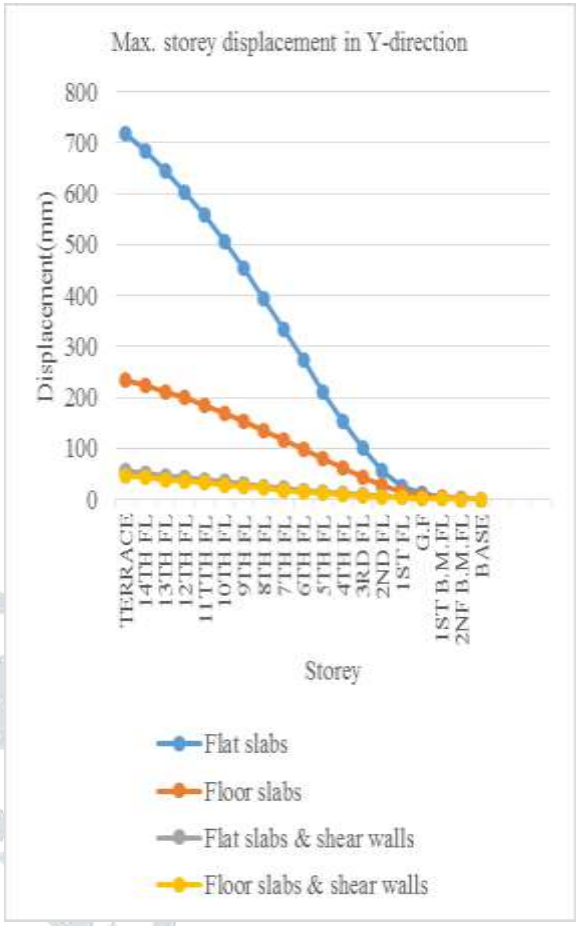
Monitored Disp. (mm)	Base Force (KN)
0.9	18608.8428
0.2436	18608.8428
0.9	18608.8428
0.2436	18608.8428
0.9	18608.8428
0	0

8. **Ms. Monal P Tayade, M. R. Vyawhare 2017.** Staad-PRO and ETAB are the most popular software's for analysis of multi-storeyed buildings. It has been observed that results obtained by both the software's are not same in most of the cases. This study is an attempt to investigate and compare the results for building with different stories. A regular plan building with G+5, G+10 and G+15 stories have been considered in this study. It has been observed that buildings with less no of stories when analysed by STAAD-PRO give conservative results and buildings with high number of stories when analysed by ETAB produced conservative results.

9. **Udaya Bala K, Manish Kumar Gupta and Senthil Pandian, 2017.** Had modelled with different structural elements for minimum story displacement. The dynamic analysis of multi-storey buildings is done using ETADS 2015 by IS and SP code provisions (ETABS User's Manual, 2015). They concluded that, shear walls must have to be present in the high rise buildings to control storey displacement, storey drift and centre of mass displacement.



Max storey displacement in X-direction



Max storey displacement in Y-direction

10. **Ragy Jose, Restina Mathew, Sandra Devan, Sankeerthana Venu, Mohith Y, 2017**. A G+3 storey building is considered for this study. Analysis is carried out by static method and design is done as per IS 456:2000 guidelines. Also an attempt has been made to design the structural elements manually. Drawing and detailing are done using Auto CAD as per SP 34. They concluded that the by both the manual work as well as the software analysis gives almost the same result.

CONCLUSION

Time history analysis is an elegant tool to visualise the performance level of building under a given earthquake. Seismic performance of structure can be obtained by selecting an adequate recorded ground motion for time history analysis. Static analysis is not sufficient for tall buildings, for tall buildings dynamic analysis must be done to understand the lateral forces. For important structures time history analysis should be performed as it predicts the structural response more accurately in comparison with other two methods i.e. response spectrum, equivalent static analysis.

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