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Dynamic Analysis of Structure with and without Shear Wall

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Abstract **- The main criterion these days in designing RCC structures in seismic zones is be in command of lateral displacement ensuing from sideways forces. In this thesis effort has been made to examine the effect of Shear Wall position on lateral displacement and Storey Drift in RCC Frames. Two types of structures are considered, out of which one is bare frame model i.e. without shear wall and for remaining model shear wall is considered in the interior of the building. Both the models are analyzed for Response Spectrum Method i.e. Linear Dynamic Analysis. And after the analysis, obtained results are compared with respect to storey displacement, storey shear, base shear, and natural period for all the three models and then by comparing the results optimum location of shear wall is determined.**

I.INTRODUCTION

Enough stiffness is very imperative in high rise buildings to defy the lateral loads brought by wind or seismic events. RC shear walls are designed for buildings located in seismic areas, because of their high strength, stiffness, and high ductility. A great segment of the lateral load on a building as well as the shear force ensuing from load, are often assigned to structural elements made of RCC. Shear walls have very large in-plane stiffness and hence it can resist lateral load and control deflection very efficiently. Using of shear walls or their corresponding becomes significant in certain high-rise buildings, if inter-storey deflections caused by lateral loadings are to be controlled. Properly designed shear walls not only provide safety but also give a proper assess of protection against costly structural as well as non-structural damage during seismic activity. Shear walls provide large stiffness and strength to buildings, which efficiently reduces lateral deformation of the structure and hence reduces damage to structure. The shear wall is one of the essential structural apparatus placed in multi-storey buildings which are situated in earthquake zones as they have large resistance to lateral earthquake forces. The dynamic analysis of structure is carried out and evaluation is made between both the models on parameters like lateral displacement, storey drift, base shear, and time period.

II. OBJECTVE

1. To conduct dynamic analysis of the G+25 storey structure without shear wall.
2. To conduct dynamic analysis of structure with shear wall in the internal part of structure.

III. PROBLEM DEFINATION and ANALYSIS

1. The modelling of flat slab building is done using finite element-based software E-TAB.
2. The plan of the building selected for the modelling is 36 m in X- direction and 30 m in Y-direction.
3. Selected building is 12 storeys building with typical height of 3m each.
4. The size of each span is 6 m x 5m.
5. The edge distance left on either side for both the directions is 0.3m.

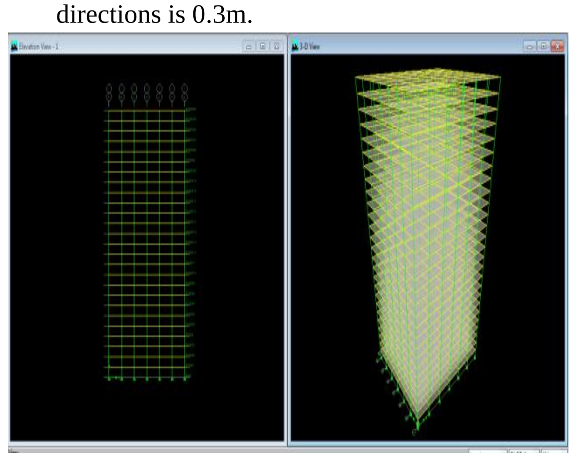

Fig.1 Bare frame structure

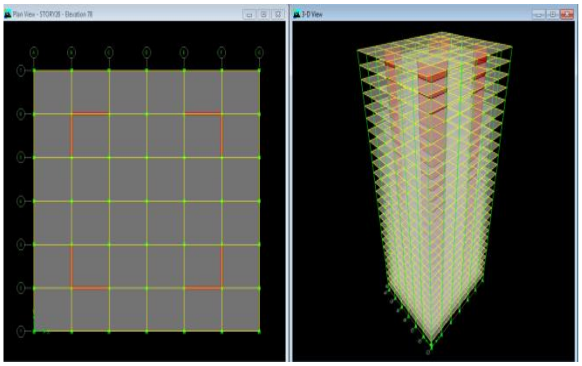

Fig.2- shear wall at interior of structure

IV. METHOD OF SEISMIC ANALYSIS

Response spectrum analysis represents an improvement over linear static analysis. The noteworthy difference between linear static and dynamic analysis is lies in the level of force and their distribution along the height of the structure being analyzed. In response spectrum method, the response of Multi-Degree-of-Freedom system is expressed as the superposition of modal response. Each modal response is then determined from the spectral analysis of Single Degree-of-Freedom system. Both are then combined to work out total response.
Square root of sum of squares (SRSS) method is used. Structural and function damping is 0.05. For this analysis also structures are assumed to be located in zone IV and direction of excitation considered is X.

V. RESULTS

Results obtained for bare frame
Max. Displacement:

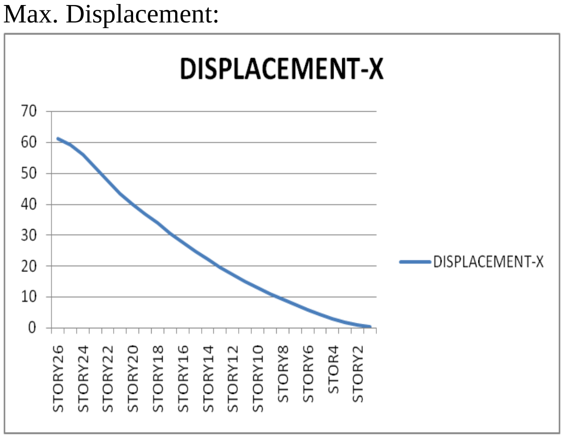

Fig.3: Maximum Displacement of structure

Storey Drift:

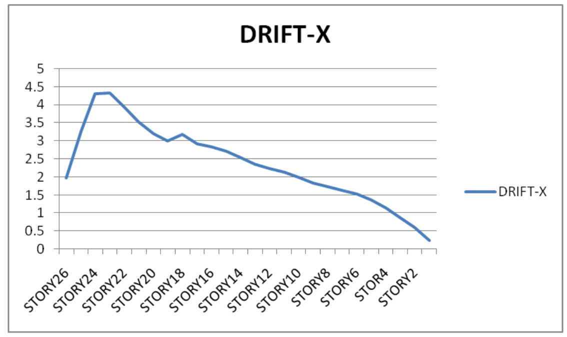

Fig.4: Maximum Drift of structure

Time Period:

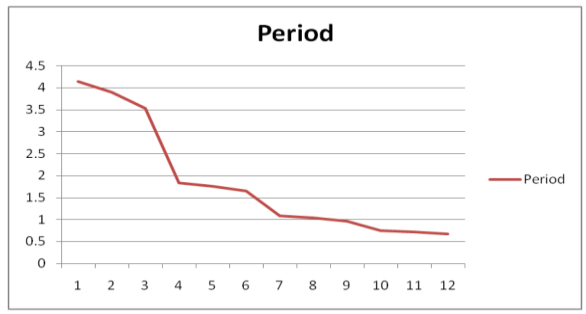

Fig.5 Time Period

Results obtained for a frame with shear wall
Max. Displacement:

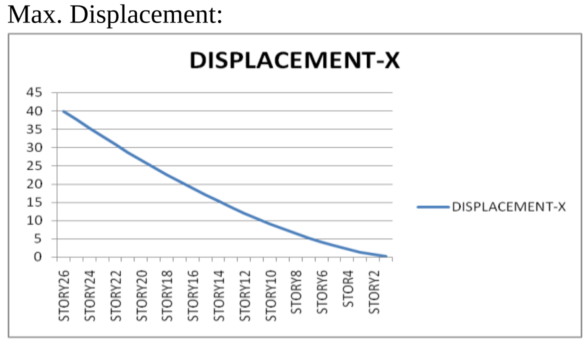

Fig.6: Maximum Displacement of structure

Storey Drift:

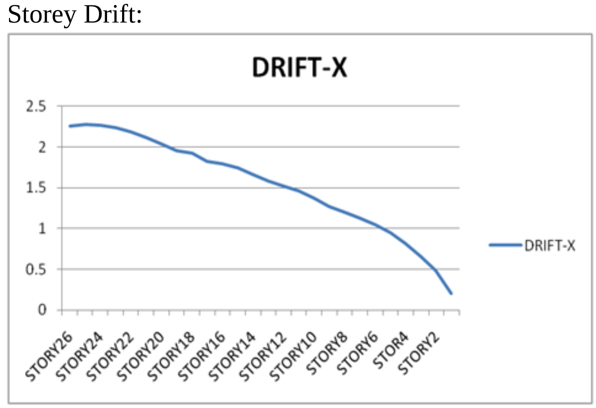

Fig.7: Maximum Drift of structure

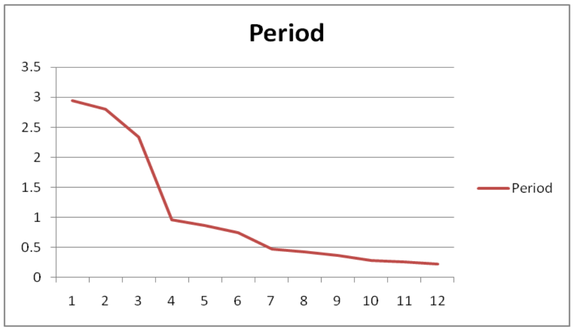

Fig.8 Time Period

VII. CONCLUSION

The results obtained for G+25 storey RC structure with and without shear wall after seismic analysis are concluded as follows:

1. The lateral displacement of bare frame is much higher in absence of shear wall. However, provision of shear wall brings the lateral displacement to a much lesser value making the structure safer.
2. The storey drift follows parabolic path and attains larger drift somewhere in the middle storey level. Provision of shear wall helps building the undergo drift within permissible limit as set by IS1983:2002.

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