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Effect of Numbers And Positions of Shear Walls on Seismic Behaviour of Multistoried Structure

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Abstract- **Tall buildings are the demand of present situation. As the height of structure increases, lateral forces due to wind or seismic become predominant. The major portion of these shall be resisted by the structural elements. Out of different structural systems, moment resisting frames and shear wall frames are two principal structural systems used in reinforced concrete buildings to resist wind and earthquake forces. This paper deals with the Dynamic linear Response spectra method on multi-storey shear wall building with variation in number and position of shear wall. Dynamic responses under prominent earthquake, this paper highlight the accuracy and exactness of shear wall.**

Index term: Shear wall, deflection.

I INTRODUCTION

Shear walls are vertical elements of the horizontal force resisting system. Shear walls are constructed to counter the effects of lateral load acting on a structure. In residential construction, shear walls are straight external walls that typically form a box which provides all of the lateral support for the building. When shear walls are designed and constructed properly and they give strength against forces.

Structural design of buildings for seismic loading is primarily concerned with structural safety during major earthquakes, but serviceability and the potential for economic loss are also of concern. Seismic loading requires an understanding of the structural behaviour under large inelastic deformations. Behaviour under this loading is fundamentally different from wind or gravity loading, requiring much more detailed analysis to assure acceptable seismic performance beyond the elastic range. Some structural damage can be expected when the building experiences design ground motions because almost all building codes allow inelastic energy dissipation in structural system

II METHODOLOGY

Various methods of differing complexity have been developed for the seismic analysis of structures. They can be classified as follows.

1. Linear and Nonlinear Static Analysis
2. Linear and Nonlinear Dynamic Analysis

Equivalent Static Analysis

All design against earthquake effects must consider the dynamic nature of the load. However, for simple regular structures, analysis by equivalent linear static methods is often sufficient. This is permitted in most codes of practice for regular, low- to medium-rise buildings and begins with an estimate of peak earthquake load calculated as a function of the parameters given in the code. Equivalent static analysis can therefore work well for low to medium-rise buildings without significant coupled lateral–torsion modes, in which only the first mode in each direction is of significance.

Response Spectrum Method

The word spectrum in seismic engineering conveys the idea that the response of buildings having a broad range of period is summarized in a single graph. For a given earthquake motion and a percentage of critical damping, a typical response spectrum gives a plot of earthquake-related responses such as acceleration, velocity, and deflection for a complete range, or spectrum, of building periods.

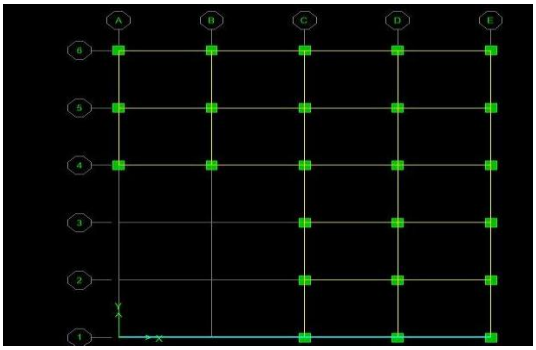


Fig 1 Plan for Bare frame Model 1(M1)

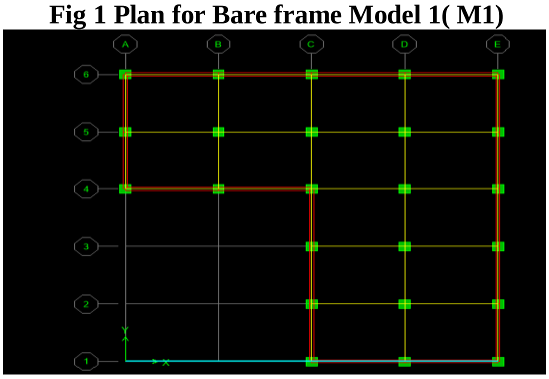


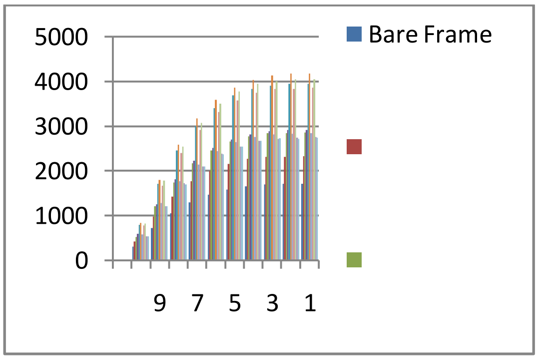
Fig 2 Plan for complete shear wall Model 2(M2)

III. PROBLEM STATEMENT

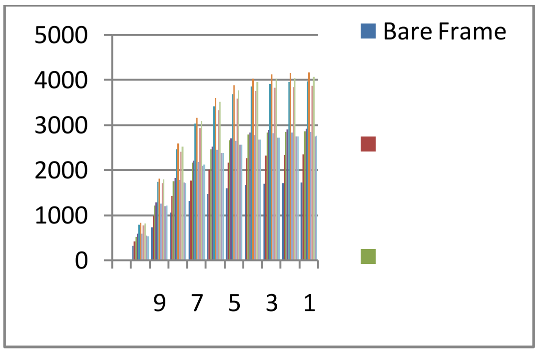
Following data is used in the analysis of the RC frame building models

- Type of frame: Special RC moment resisting frame fixed at the base
- Seismic zone: v
- Number of storey: G+9
- Floor height: 3. m
- Depth of Slab: 125 mm
- Size of beam: (230 × 450) mm
- Size of column: (600 × 600) mm
- Spacing between frames:
  5 m along X directions
  4 m along Y directions
- Floor finish: 2 KN/m2
- Terrace water proofing: 2 KN/m2
- Materials: M 25 concrete, Fe 415 steel
- Density of concrete: 25 KN/m3
- Density of brick infill: 20 KN/m3
- Poison Ratio of concrete : 0.2
- Compressive strength of concrete 5000 $\sqrt{25}$ = 250000 Mpa
- Live load on floor: 3 KN/m3
- Type of soil: Hard, Medium,Soft
- Response spectra: As per IS 1893(Part-1):2002
- Damping of structure: 5 percent

IV. RESULT AND DISCUSSION



Graph 1 Comparative study of base shear of Static x direction.



Graph 2 Comparative study of base shear of Static y direction

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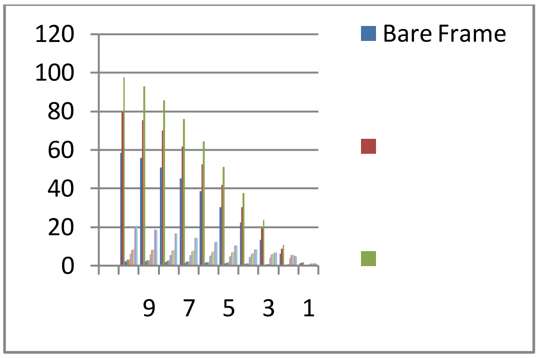
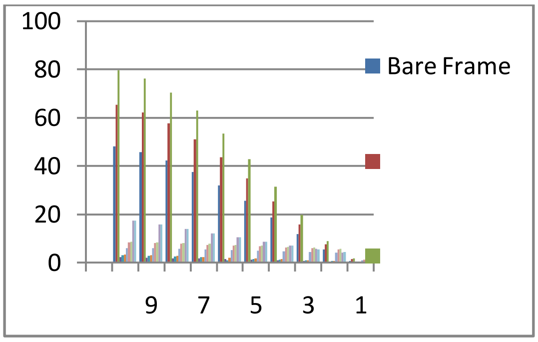
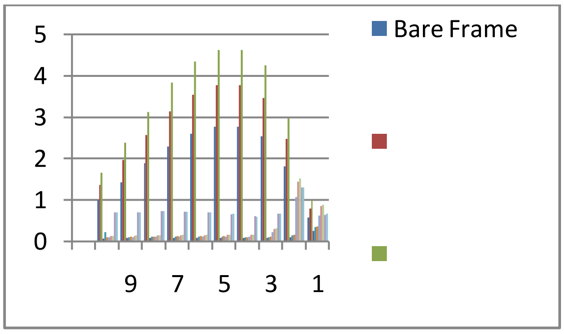


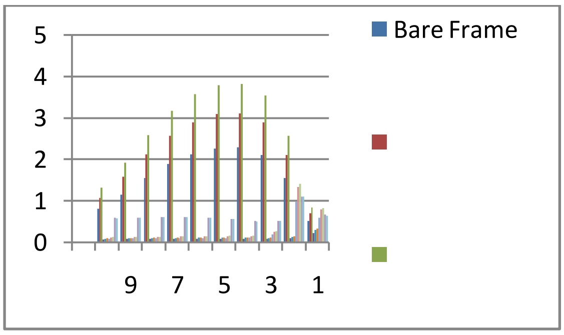
Graph 3 Comparative study of displacement of static x direction



Graph 4 Comparative study of displacement of static y direction



Graph 5 Comparative study of storey drift of Static x direction



Graph 6 Comparative study of storey drift of Static y direction

V CONCLUSION

The purpose of this study has been to analyze effect of the numbers and position of the shear walls on the seismic behaviour of multi-storeyed structures. For this, ETABS software used, a Equivalent static and Response Spectrum used. Dynamic analysis has been carried out to know about the deformations, natural frequencies, and time periods, floor responses displacements. . The models that have been studied is 10 storey Building for four types of model with three types of soil. with additional shear walls with the proper position of which have been created in ETABS.

Thus shear walls are one of the most effective building elements in resisting lateral forces during earthquake. By constructing shear walls damages due to effect of lateral forces due to earthquake and high winds can be minimized. Shear walls construction will provide larger stiffness to the buildings there by reducing the damage to structure and its contents.

Form the linear dynamic analysis (i.e. Response Spectrum Analysis) it was observed that in the first model of Bare frame there is large deflection and storey drift so it is not considered.A model which is complete shear wall is best model because there is very small amount of displacement and storey drift.A model which having shear wall from first storey is also best due to small deflection and storey drift.A model having shear wall at corner position is also good and low cost type.

As per the analysis Best model in sequence wise are Model of complete shear wall,shear wall from first storey,shear wall at corner position and Bare frame.

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