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Comparison of Static and Dynamic Analysis of Multi-Storied Building

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Abstract: *Vibration of ground is the main cause of earthquake damage to building structures. There are many factors responsible for the strength of earthquake shaking at a site including the earthquake's magnitude, the site's proximity to the fault, the local geology, and the soil type. The natural disasters have been fast recurring all over the world causing great concern and damage to man and their properties. Among these disasters Earthquake is an endogenous natural disaster, which occurs suddenly without any warning. The vast devastation of engineering systems and facilities during the past earthquakes has exposed serious deficiencies in the prevalent design and construction. Shear wall is one of the most commonly used lateral load resisting in high rise buildings. Shear wall can be used to simultaneously resist large horizontal load and support gravity load. In the study, one tall RCC building of 13 stories is assumed to be situated in seismic zone V is analysed using two methods (Static and Dynamic Analysis). The share walls are taken at different position of building. The comparison of the different shear wall models is studied in this work against the different parameters like time period, bending moment, shear force, storey drift, displacement*

Keywords: *Static Analysis, Dynamic Analysis, Earthquake, Share Wall.*

I. INTRODUCTION

A shear wall is a vertical element of a earthshattering force resisting system. It is designed to resist plane lateral forces, typically seismic and wind loads. A shear wall resists loads parallel to the plane of the wall of building. Shear walls are typically braced wooden or light-framed walls with reinforced masonry walls, shear panels, or steel plates. It can be used for giving more strength and protection to the structure when the structures are subjected to external loads such as earthquake loads and wind loads. These types of walls basically play a main role for the construction of the tall structure. The location of shear wall can influence the seismic conduct of structure to extensive degree and the shear wall increases the strength and stiffness of the structure.

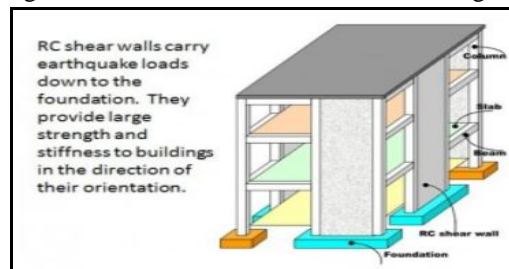


Fig. 1 Share Wall

A. Advantages of Share Wall

- 1) Provide large strength and stiffness.
- 2) Fast performance of building structure.
- 3) Conspicuously reduces lateral sway.
- 4) Construction time is fast.
- 5) Cost effective.
- 6) The shear wall is very Light-weight.

B. Objectives

- 1) To develop, design and analysis model of the High-rise structure in ETABS.
- 2) To compare displacement, story drift, base shear, time period and frequency
- 3) The main objective of this study is to analysed and design a G+13 building with share wall using ETABS software.
- 4) Design of structural components like beam, slab, column and footing using ETABS.

C. Required IS Code

- 1) IS: 875 (Part 1) 1987 - this code includes the dead load.
- 2) IS: 875 (Part 2) 1987 -this code involves the imposed load or live load.
- 3) IS: 875 (Part 3) 1987 -This IS code includes the wind load for a structure.
- 4) IS: 875 (Part 5) 1987 - The different combination of dead load, live load, wind load is given in this code
- 5) IS 1893 (Part 1) 2002 - IS 1893- 2002 is the main code for the earthquake resistant design which provides the seismic design force, seismic zone map and different factors and coefficient like importance factor, seismic zone factor, related to the soil on which structure rests, which are essential in earthquake resistant design.
- 6) IS 13920-1993 - In India, reinforced concrete structures are designed and detailed according to IS 456 (2002).

II. METHODOLOGY

A model of G+12 storeyed is developed, analysed and design using ETABS software. Building plan size is 3150 cm X 2450 cm. In the earthquake zone V, the building is situated. Coefficient of seismic zone is taken as 0.36 as per IS code.

TABLE I
PARAMETERS OF STRUCTURE

Sr No	Parameter	Dimension
1	Plan dimension	3150 cm X 2450 cm
2	Number of stories	G+12
3	Column size	500 mm X 500 mm
4	Beam size	300 mm X 450 mm
5	Thickness of share wall	200 mm
6	Thickness of slab	150 mm
7	Storey height	3500 mm
8	Zone factor	0.36
9	Concrete grade	M 25
10	Steel grade	Fe 415

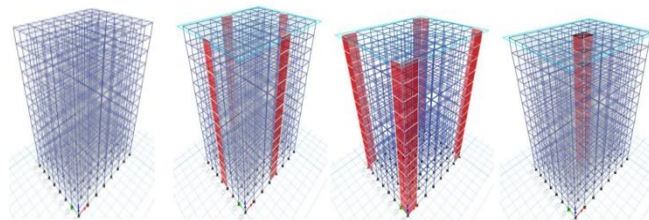


Fig. 1 Structures with Share Wall

III.RESULT

A. Base Share

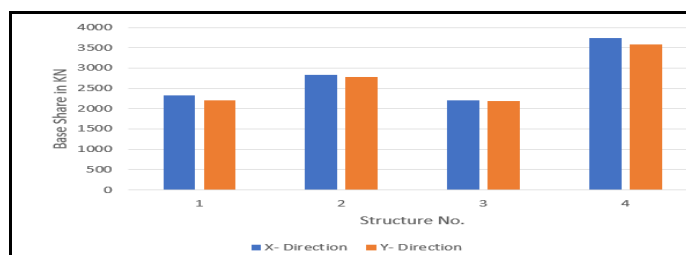


Fig. 3 Base Share

The base shear values are increasing from structure 2, structure 4 and is decreasing in structure 3 when compared with the structure without shear walls.

B. Lateral Force Distribution in X-Direction

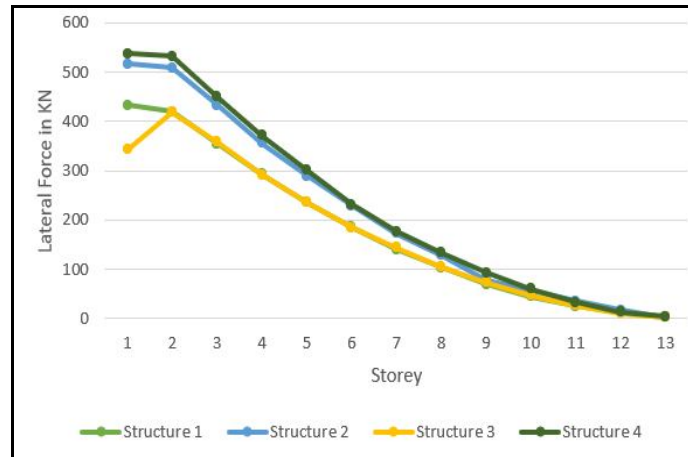


Fig. 4 Lateral Force Distribution in X-Direction

C. Lateral Force Distribution in Y-Direction

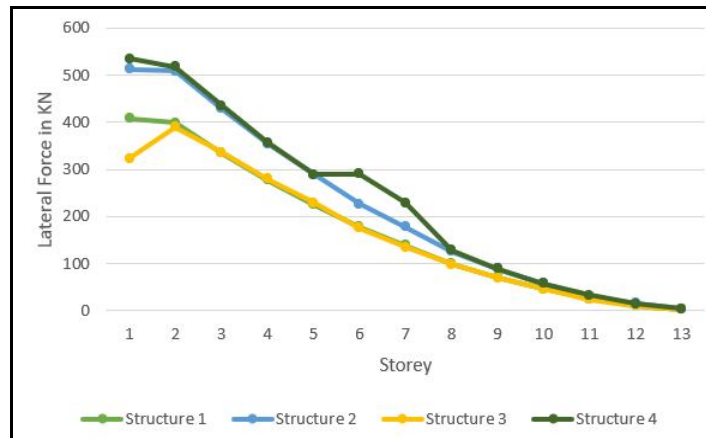


Fig. 5 Lateral Force Distribution in Y-Direction

D. Static Analysis (Displacement)

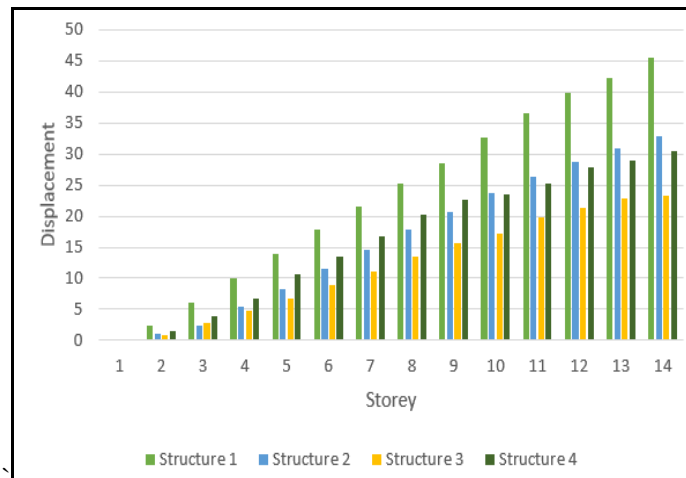


Fig. 6 Static Analysis (Displacement)

In static analysis structure 3 got lesser values of displacements when compare to structure1, structure 2 and structure 4.

E. Dynamic Analysis (Displacement)

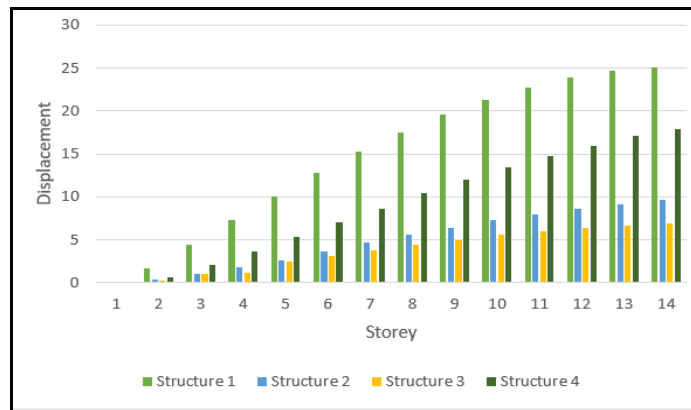


Fig. 7 Dynamic Analysis (Displacement)

In dynamic analysis structure 3 got lesser values of displacements when compare to structure 1, structure 2 and structure 4.

IV. CONCLUSIONS

- A. The base shear values are increasing from structure 2, structure 4 and is decreasing in structure 3 when compared with the structure without shear walls.
- B. In static analysis structure 3 got lesser values of displacements when compare to structure 1, structure 2 and structure 4.
- C. In dynamic analysis structure 3 got lesser values of displacements as compare to structure 1, structure 2 and structure 4.
- D. In above study we conclude that by providing share wall is more effective for resisting lateral force. Share wall at corner is more effective location for building.

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