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Comparative Study of Shear Wall at Two Different Position by Response Spectrum Method

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Abstract: Structural engineers are mainly concerned with how a structure responds to horizontal forces, and suitable stiffness is required for high-rise structures to resist horizontal forces induced by wind and earthquakes. Shear walls, which are placed to the interior of the proposed structure, are used to counteract horizontal forces such as lateral stresses caused by earthquakes and to increase the structure's stiffness.

The aim of this study to compare the behaviour of shear wall at Central Internal shear wall and Outer Shear wall at the corner of G+25 high rise residential building and the nature of the building exposed to earthquakes. For obtaining result we perform response spectrum analysis on G+25 high rise building to obtain following results: storey drift, storey displacement, and storey stiffness are explored. The whole structure is analysed and modelled in seismic zone 4 for a stable structure using the programme ETABs.

Keywords: High rise structure, Seismic analysis, Shear wall, IS code, ETABs.

I. INTRODUCTION

Earthquakes are nothing more than the shaking of the earth's surface, which releases energy in the lithosphere in the form of seismic waves. Due to the earthquake, these waves produced building fissures, flaws, and rapid collapse. A structure with discontinuities in mass, shape, stiffness, and strength is referred to as structural irregularity. The structural irregularity that develops in structures will degrade their seismic performance. Due to specific irregularities, the structures' resistance to ground motion is torsionally imbalanced in response to induced displacement and large lateral forces, which can result in structural damage and, in most cases, structural collapse. Because of this, the majority of structures avoid construction irregularities. However, the current situation, the needs and desires of the newest generation, and the growing population have made it necessary for architects and engineers to design irregular structures.

II. SHEAR WALL

Shear walls, which may be produced as vertically-oriented broad beams in a reinforced concrete-framed structure, are utilised to reduce the impact of lateral loads acting on structures. In addition to slabs, beams, and columns, they are added to a structure to offer the necessary stiffness, particularly in residential structures, and to act as a building's casing. In the past two decades, shear walls have been frequently employed in mid- and high-rise constructions. Shear walls play a crucial role in tall structures because to their susceptibility to lateral loads and seismic forces.

III. OBJECTIVE OF WORK

1) To investigate the behaviour of multistory structures with Center shear walls, and Outer Shear Wall findings of seismic zone 4 study.
2) To establish the location of the shear wall so that it can effectively withstand lateral stress.
3) The structure was analysed in terms of displacements, drifts, storey stiffness, and Storey forces by adjusting the structure's stiffness and height in seismic zones 3 in India using dynamic analysis.

IV. METHODOLOGY AND PARAMETERS

The flowchart describes the whole method. In this research work, a Regular Shape Structure with a central shear wall and an exterior shear wall is examined. This research makes use of the 75-meter-long G+25 high-rise skyscraper.

The G+25-story building has an average storey height of 3 m. Support circumstances of a certain type are taken into account.

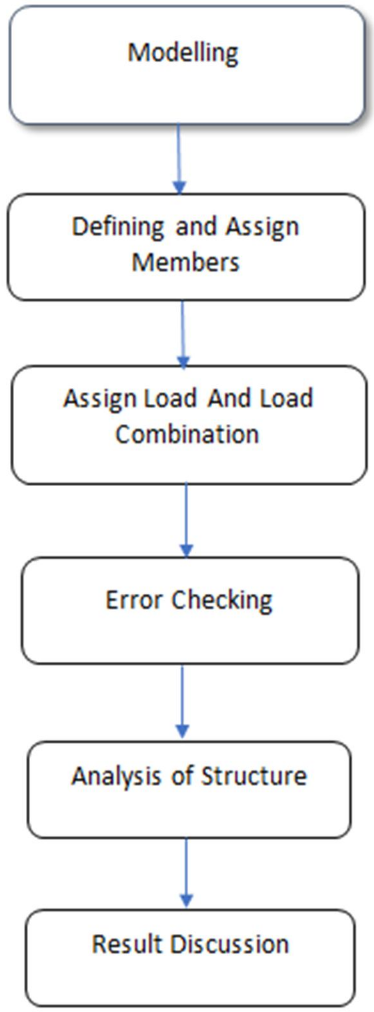

Figure 1. Methodology

Table No. 1 Details and Dimensions of Model.

Title	Specification
Beam Size	550*350 mm
Column Size	600*600 mm
Slab Thickness	150 mm
Thickness of Shear Wall	200 mm
Concrete Grade	M30
Steel And Rebar	HYSD415
Floor to Floor Height	3 m

Table No.2 Load Calculation

Type of Load	Calculation
Wall Load	6.8 kN/m
Live Load	5 kN/m
Seismic Load	AS per IS 1893:2016

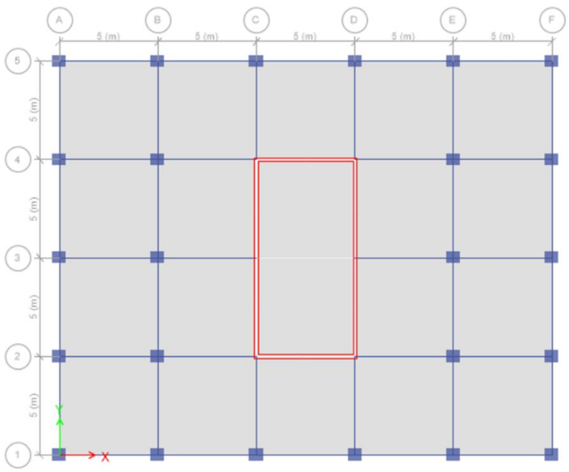

Figure 2. Center Shear Wall

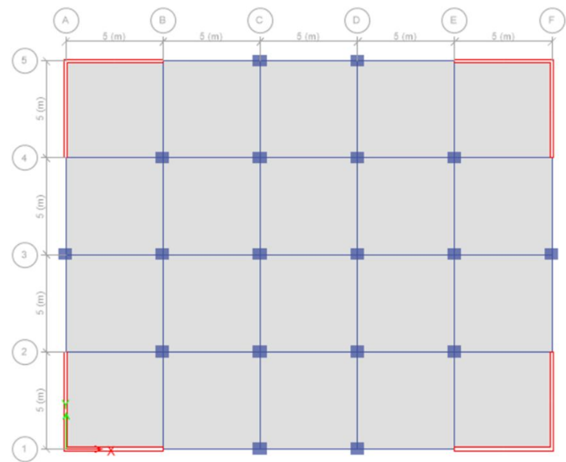

Figure 3. Outer Shear Wall

V. MODELLING

These graphics depict a floor plan and a three-dimensional representation of a building. The entire structure is modelled and analysed using ETABS software**.** All models are analysed for various gravity and lateral load combinations (Seismic and Wind).

A. Defining of Properties

Initially, the material Attribute was defined. We may add new materials to our structural components by describing the required specifications (beams, Columns, and slabs.) After defining each attribute individually, we must now assign them one by one.

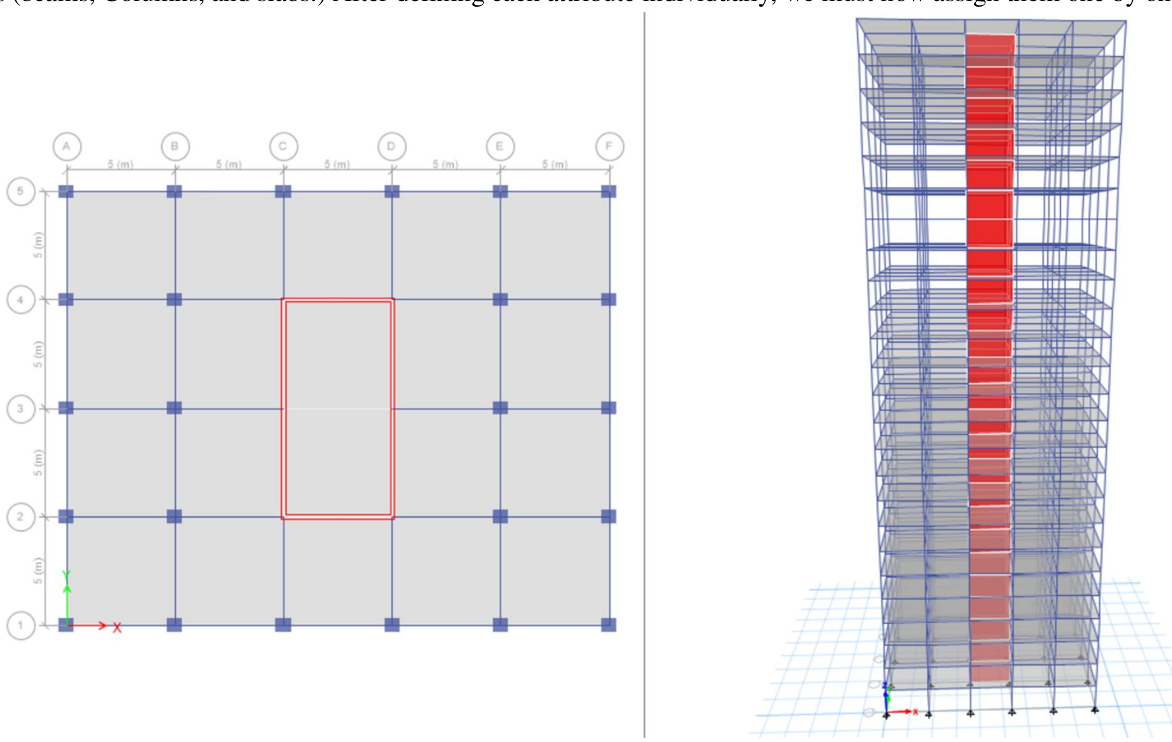

Figure 4. Model With Center Shear Wall With Different Plan View

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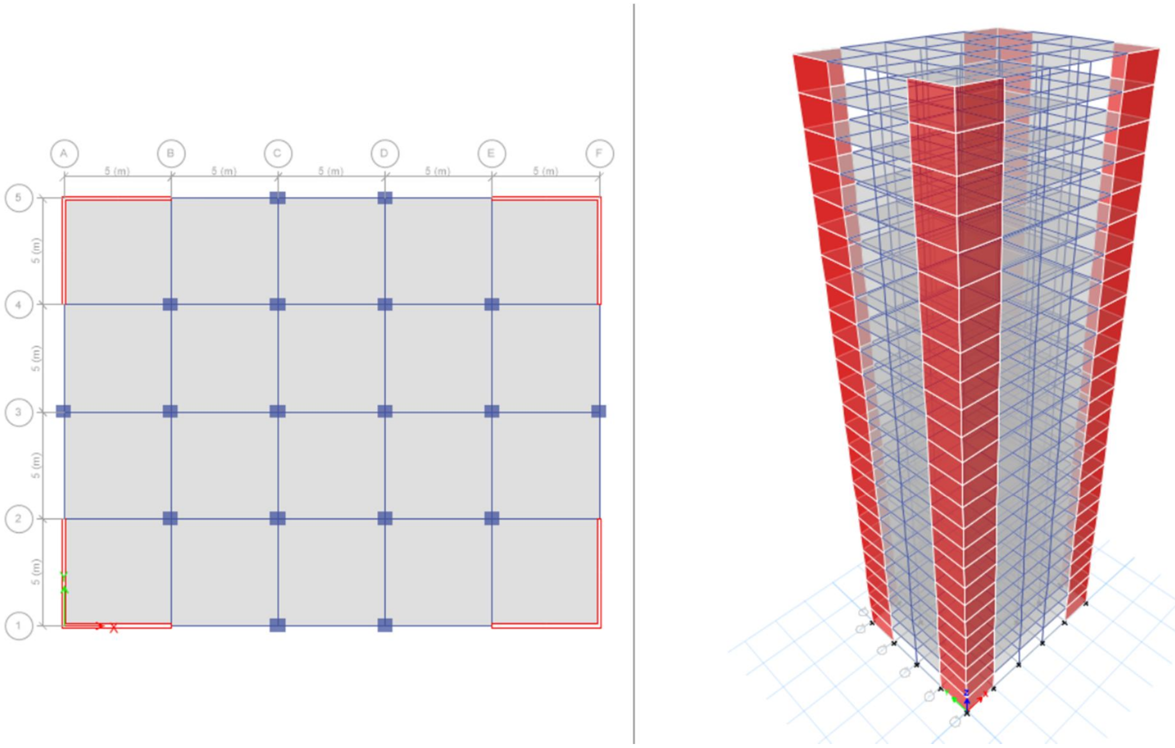

Figure No 5. Model With Outer Shear Wall With Different Plan View

VI. ANALYSIS AND DESIGN CHECK

After analysing each structure in ETABS, the constraints are drawn and displayed in the accompanying images. The load combinations are chosen from all load combinations that have been analysed are 1.2(DL + LL + EQX), 1.2(DL + LL + EQY), 1.2(DL+LL+ WLX), and 1.2(DL+LL+WLY).

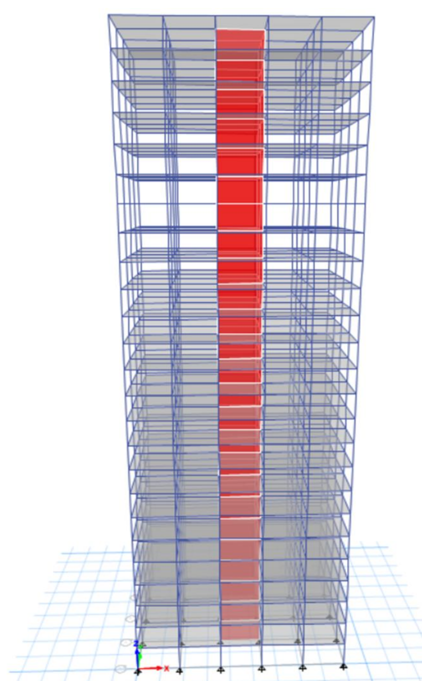

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Figure 6. Center Shear wall

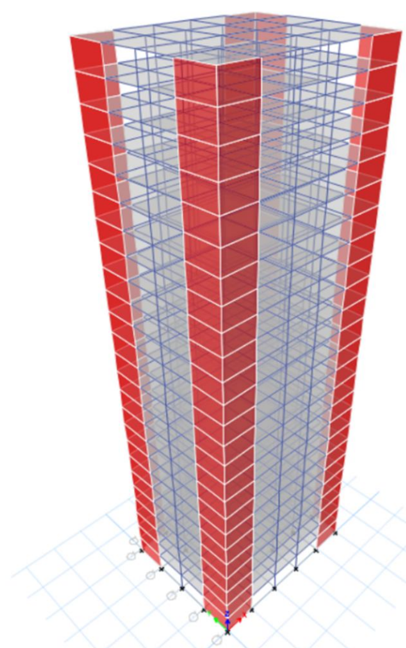

Figure 7. Outer Shear Wall

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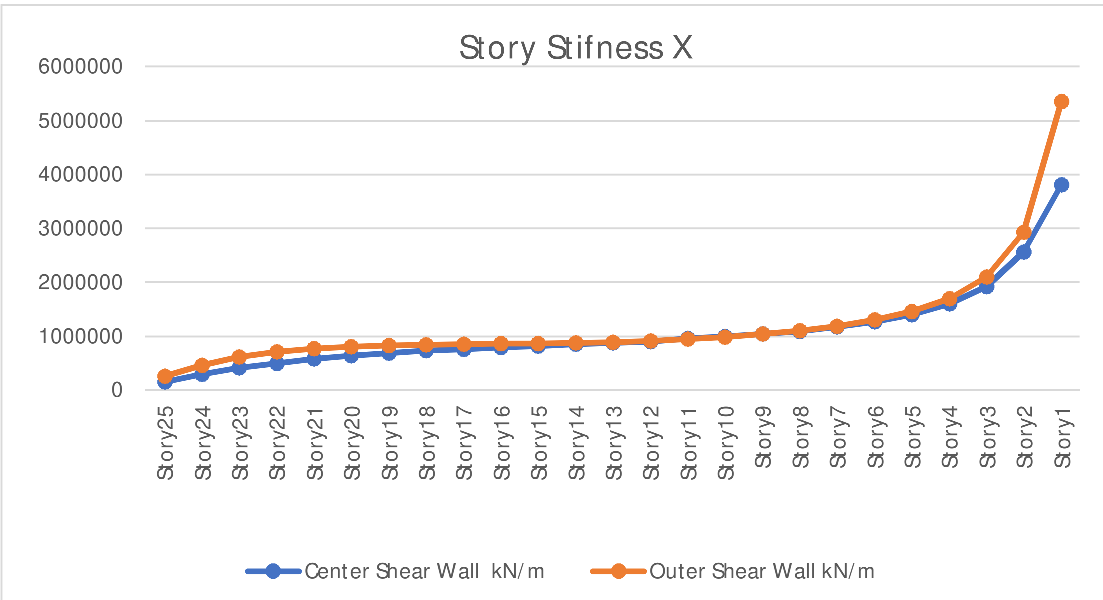
VII. RESULTS AND DISCUSSION

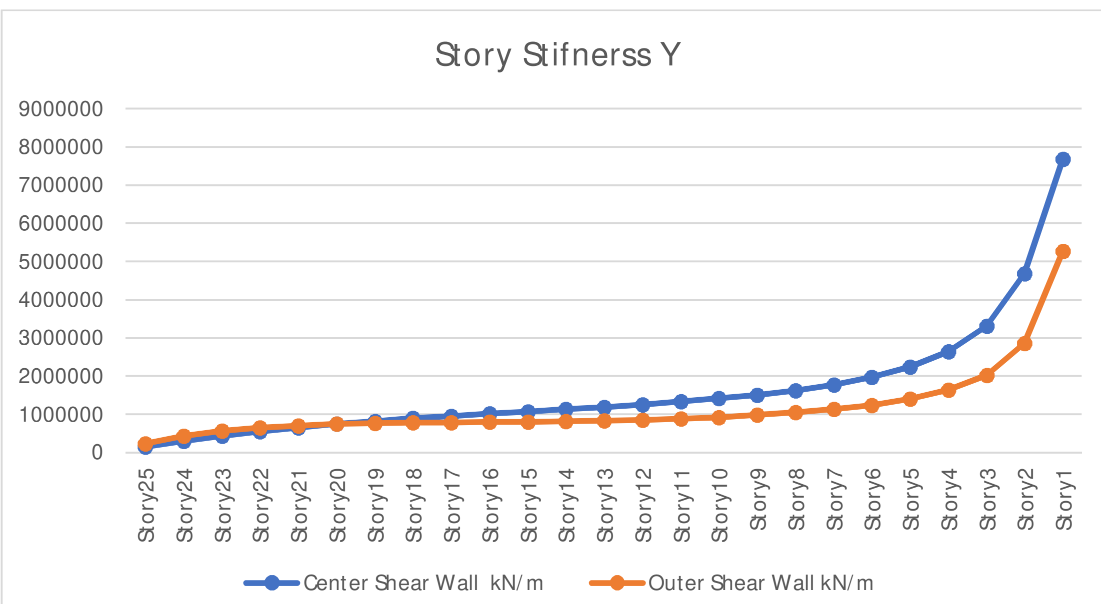
In this work, a building with an inner shear wall and an exterior shear wall is analysed using ETABs Software. Each model is evaluated in the seismic zone 3. Using the results of the study, numerous graphs are created and compared to the various parameters. The following outcomes are discussed in this study. Story Drift, Story Displacement, and Story Stiffness.

A. *Story Stiffness*

The overall lateral stiffness of a certain story or floor level is determined by the sum of the lateral stiffness of all columns and shear walls at that level. The graph expresses the model 2 has a maximum stiffness value of 14.37% more than that model 1 having shear wall at center in X direction where as the maximum stiffness value of shear wall at outer is 70.46 % less than that of Shear wall at center in Y direction.



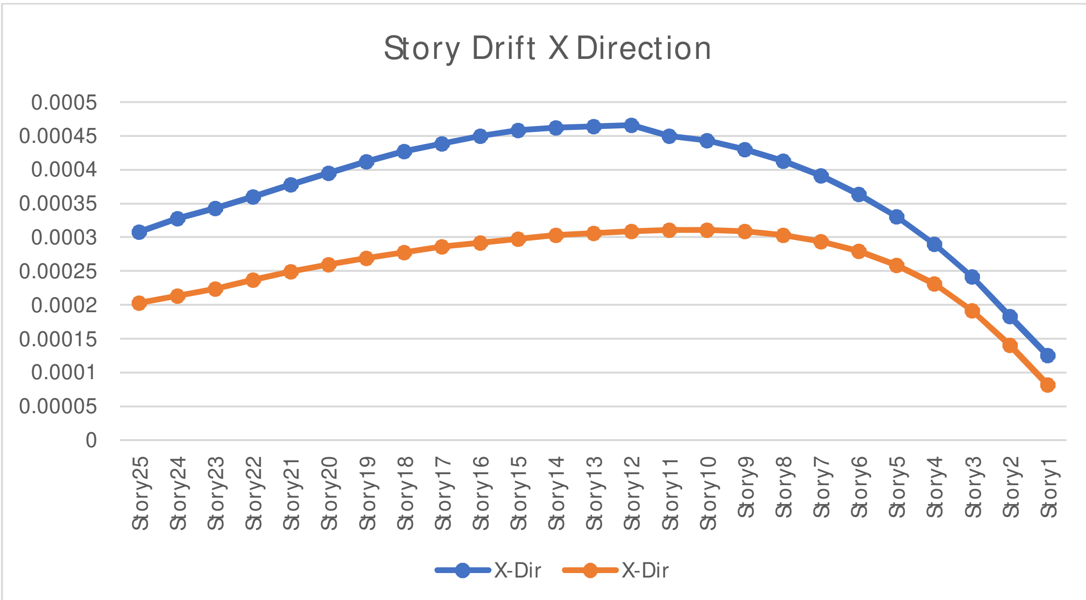
Story Stiffness in X direction



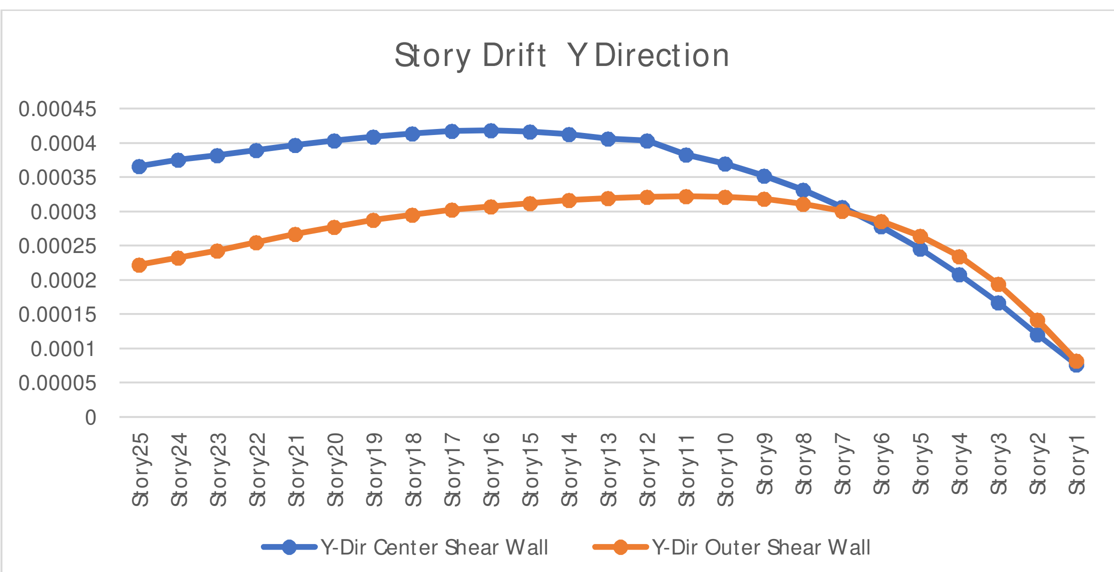
Story Stiffness in Y direction

B. *Story Drift*

Story drift is the relative movement of one level of a multistory building relative to the level below. Inter-story drift is the difference between the floor displacements and roof displacements of any given story during an earthquake, normalised by the story height. The average maximum drift observed during the analysis of Model 1 having Shear wall at center is 99.34 % and 99.78% more than Shear wall in outer model 2 in X Direction & Y direction.



Story Drift In X Direction



Story Drift in Y Direction

C. *Story Displacement*

The Average maximum displacement in X direction of model 1 Center shearwall is 67.99% more than that of model 2 shear wall at outer and The Average maximum displacement in Y direction of model 1 Center shearwall is 33.6 % less than that of model 2 shear wall at outer.

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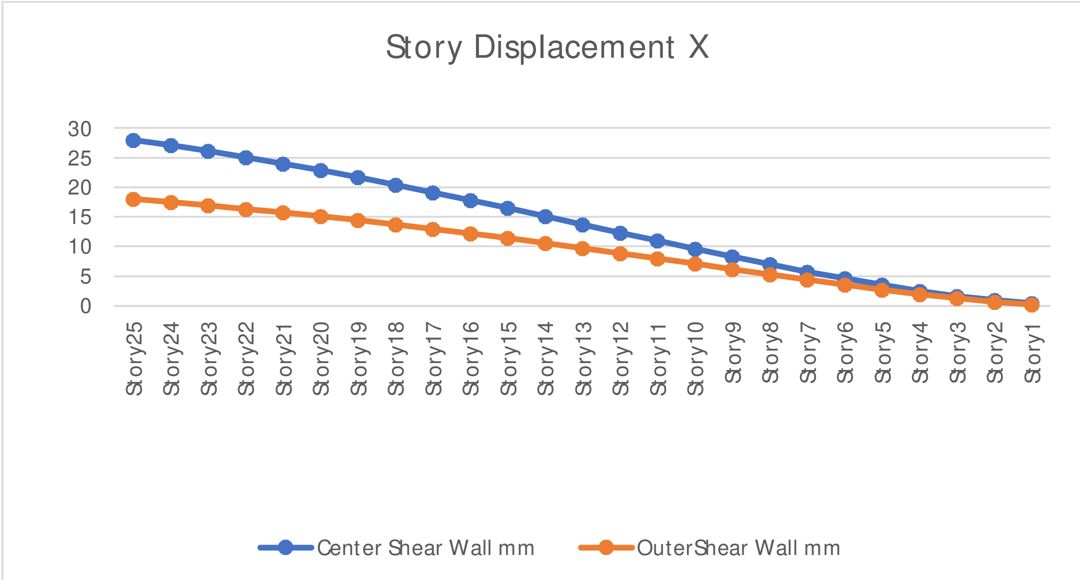
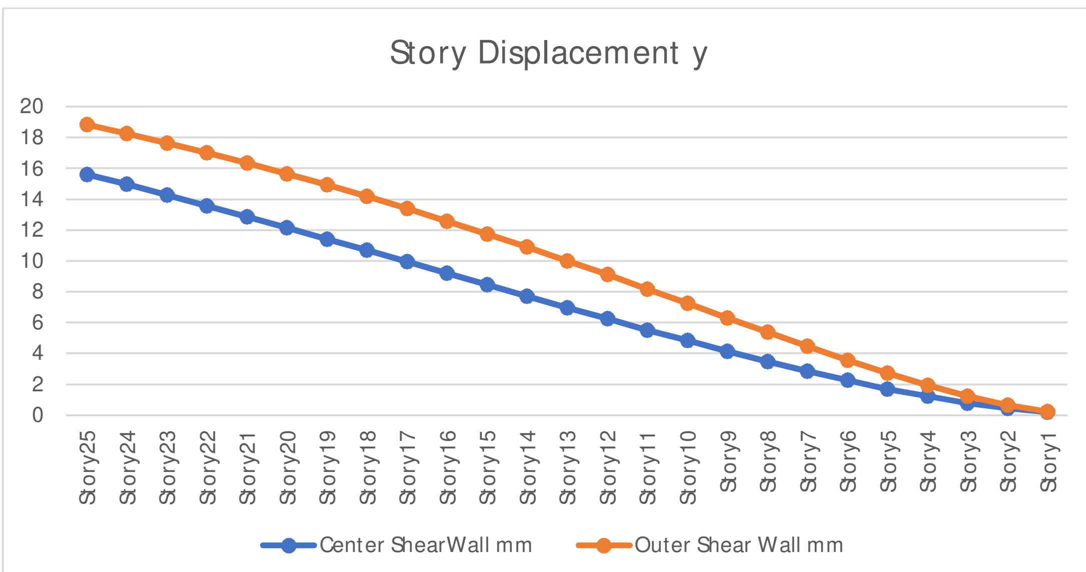


Story Displacement X Direction



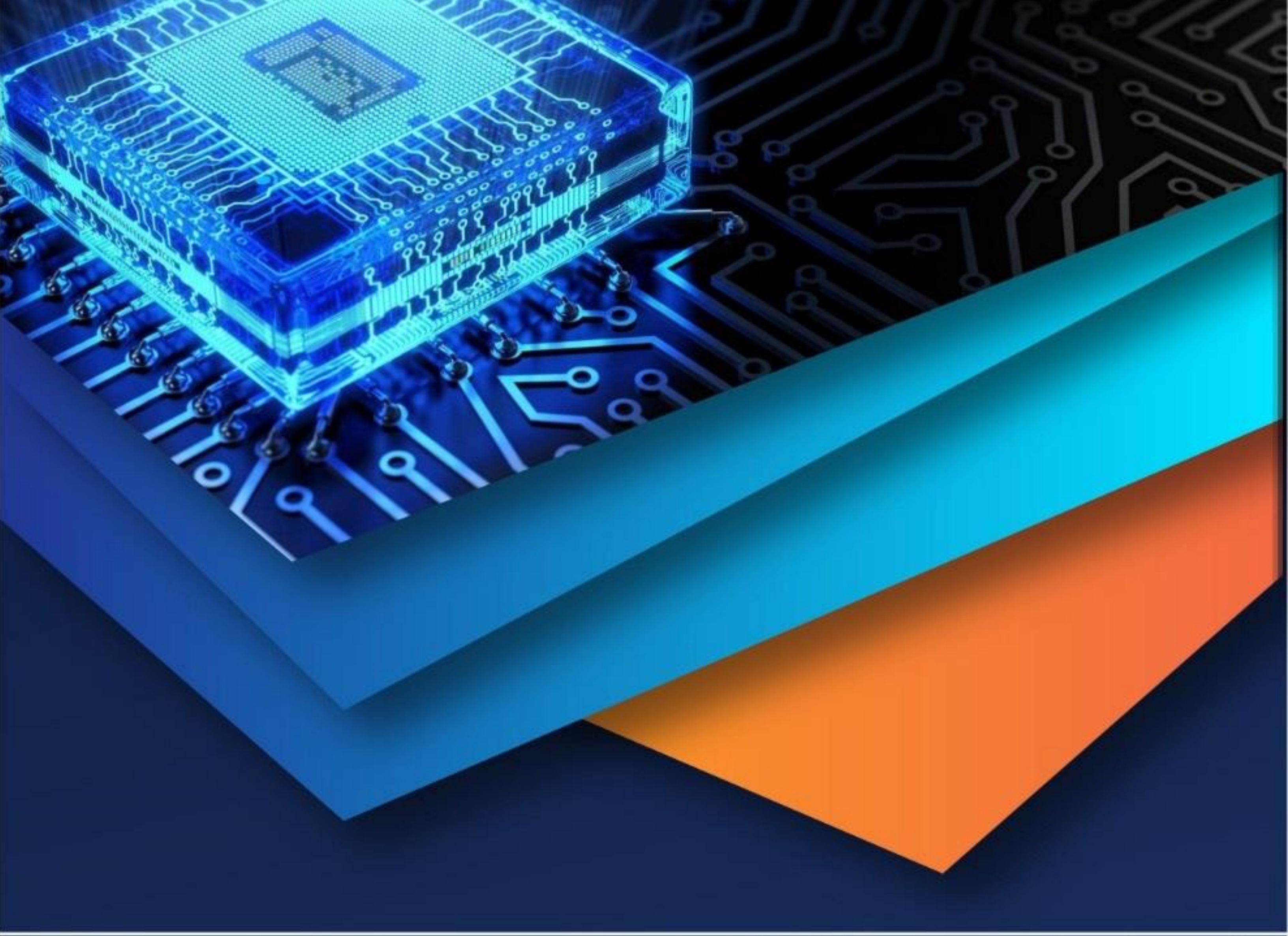
Story Displacement Y Direction

VIII. CONCLUSION

Based on the comparative analysis, it was determined that shear walls play a crucial role in strengthening lateral resistance. The gravity loads and lateral loads are dispersed such that the building bears the centre of gravity as efficiently as feasible. This minimises storey displacement values caused by earthquake force. But model 2 better than model 1. Models 2 and 1 are dissimilar, although both play a vital role against lateral force, with model-2 being more effective.

REFERENCES

[1] IS 13920, "Code of Practice for Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces," was published in 1993.
[2] Building loading standards: IS 875(part 1-5)-code of practise for structural safety
[3] Richa Gupta, Alfiabano "Performance Evaluation of Various Shapes of Shear Wall using Response Spectrum Analysis." 2019
[4] Nikhil Pandey "Stability Analysis Of Shear Wall At Different Locations In Multi-Storeyed Geometrically Irregular Building Using ETABS"2021
[5] Karnati Vijetha, DR. B. Panduranga Rao – "Comparative Study of Shear wall and Bracing for a Multistoried structure under sesmic loading."
[6] Hahzad Jamil Sardar and Umesh.N.Karadi, "Effect of change in shear wall location on storey drift of multistory building subjected to lateral loads", International Journal of Innovative Research in Science, ISSN: 2319-8753, Vol.2, September 2013, pp 4241-4249.



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