International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 8 Issue 4, Jul-Aug 2024 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Comparative Analysis of Slopping Ground Tall Building for Seismic Zone IV & V Using Different Shapes of Shear Wall

Randhir Kumar[1], Prof. Imran Ahmad Faizy[2], Prof. Afzal Khan[3]

[1]M Tech Scholar, [2,3]Professor,
[1, 2, 3]Department of Civil Engineering, Millennium Institute of Technology & Science, Bhopal, Madhya Pradesh, India

ABSTRACT

- The economic process and fast urbanization in hilly region has accelerated the real estate development and resulted in increase in population density within the hilly region tremendously.
- Shear wall represents a most efficient solution to stiffen a structural system of building as the main function of a shear wall is to increase the lateral load resistance. Cross-sections of Shear walls can be used are rectangular shapes to more irregular cores such as channel, C, T, L, barbell shape, box etc.
- The building with structural shear walls Improve the lateral load resistance. For the buildings on sloping ground, the height of columns below plinth level is not same which affects the performance of building during earthquake.

How to cite this paper: Randhir Kumar | Prof. Imran Ahmad Faizy | Prof. Afzal Khan "Comparative Analysis of Slopping Ground Tall Building for Seismic Zone IV & V Using Different Shapes of Shear Wall" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-8 | Issue-4, August 2024, pp.785-791, URL: www.ijtsrd.com/papers/ijtsrd67243.pdf

IJTSRD67243

INTRODUCTION

- The economic growth and rapid urbanization in hilly region has accelerated the real estate development and resulted in increase in population density in the hilly region enormously. Therefore, there is popular and pressing demand for the construction of multi-storey buildings in that region.
- A scarcity of plain ground in hilly area compels the construction activity on sloping ground. Hill buildings behave different from those in plains when subjected to lateral loads due to earthquake. Such buildings have mass and stiffness varying along the vertical and horizontal planes, resulting the centre of mass and centre of rigidity do not coincide on various floors.

OBJECTIVES

- Study of the behaviour of Slopping Ground 18 Storey Tall Building with and without Different Shapes of Shear wall for Seismic Zone IV & V.

METHODOLOGY

In this research work, we have used Staad pro V8i software which is based on the application of Finite Element Method. This software is a widely used in the field of structural design and analysis. Model consists of 18 storey constructions RCC building having seven bays in every direction. The story height for every floor and plinth height is kept as 3.5m and 1.5m severally.

The following models of building are considered on sloping ground.

Model 1 without shear wall

Model 2 with straight shape shear walls

Model 3 with L shape shear walls

Model 4 with C shape shear walls

Model 5 with combined straight, L and C shape shear walls

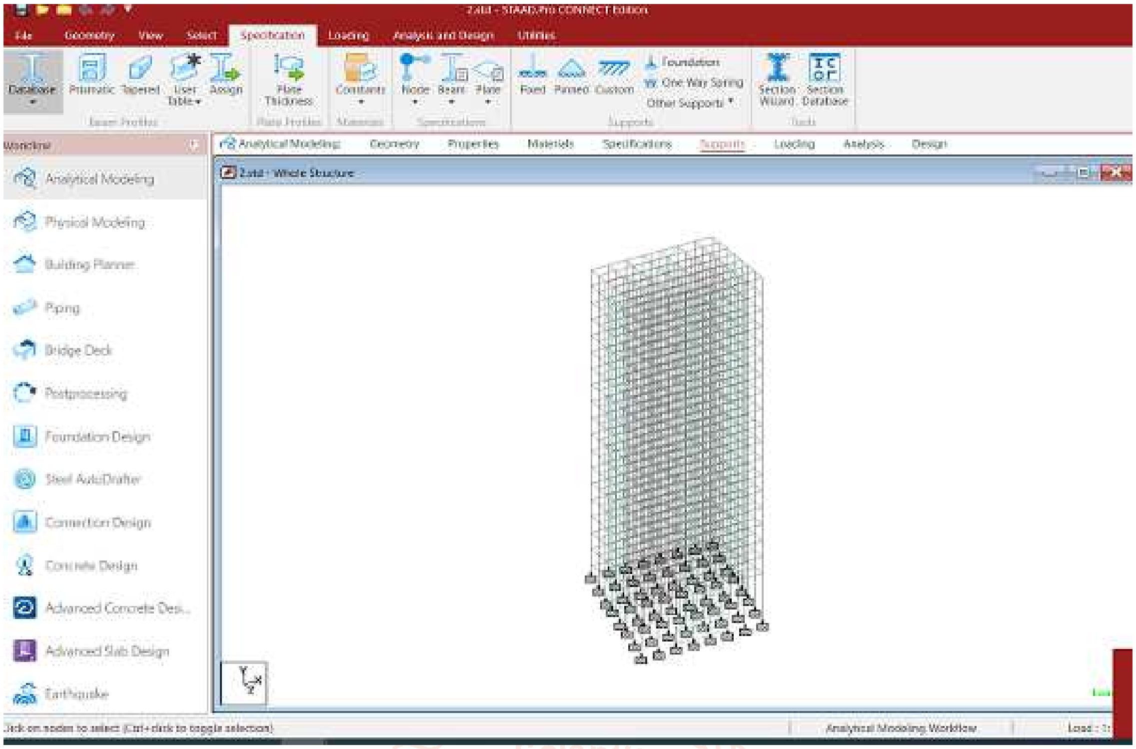

Fig. 1: Analytical Modelling

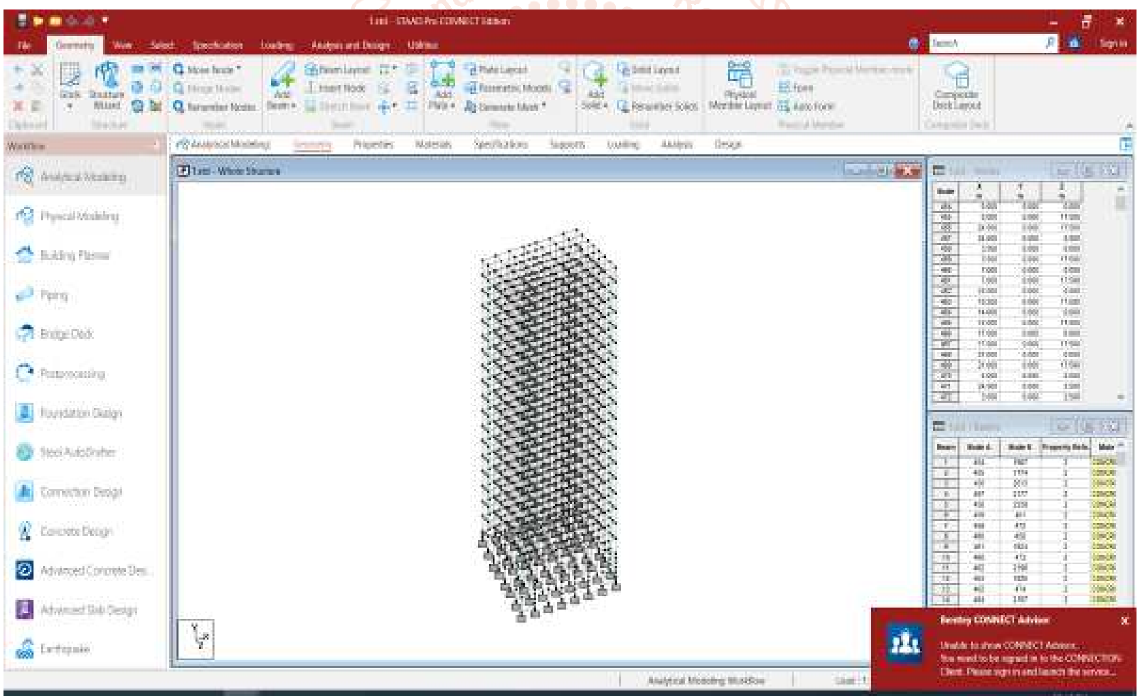

Fig. 2: Whole Structure Nodes and Supports

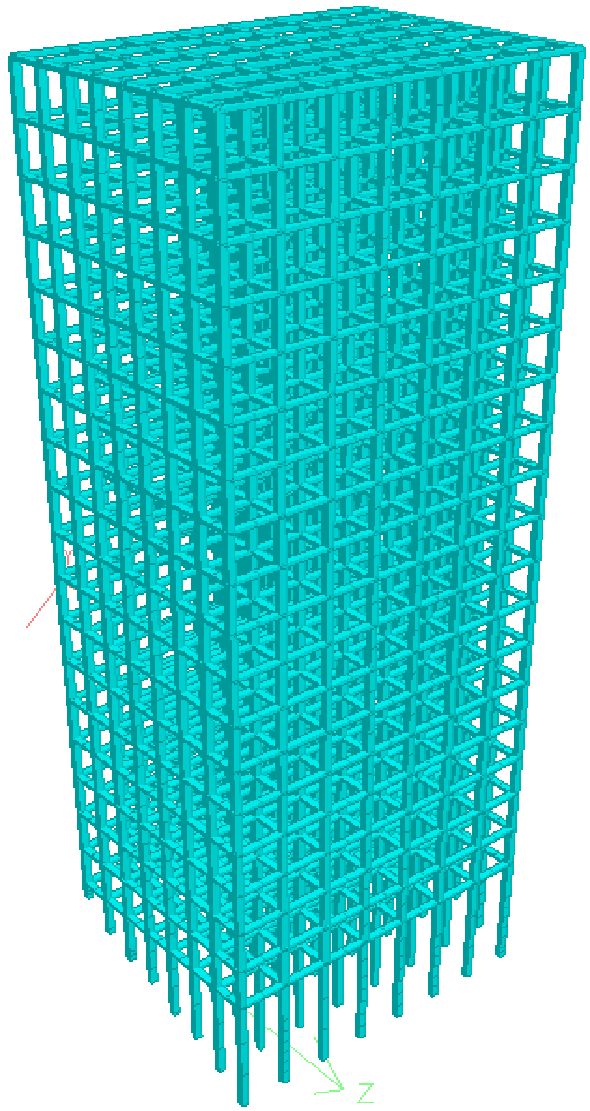

Fig. 3: Building without shear wall on sloping ground

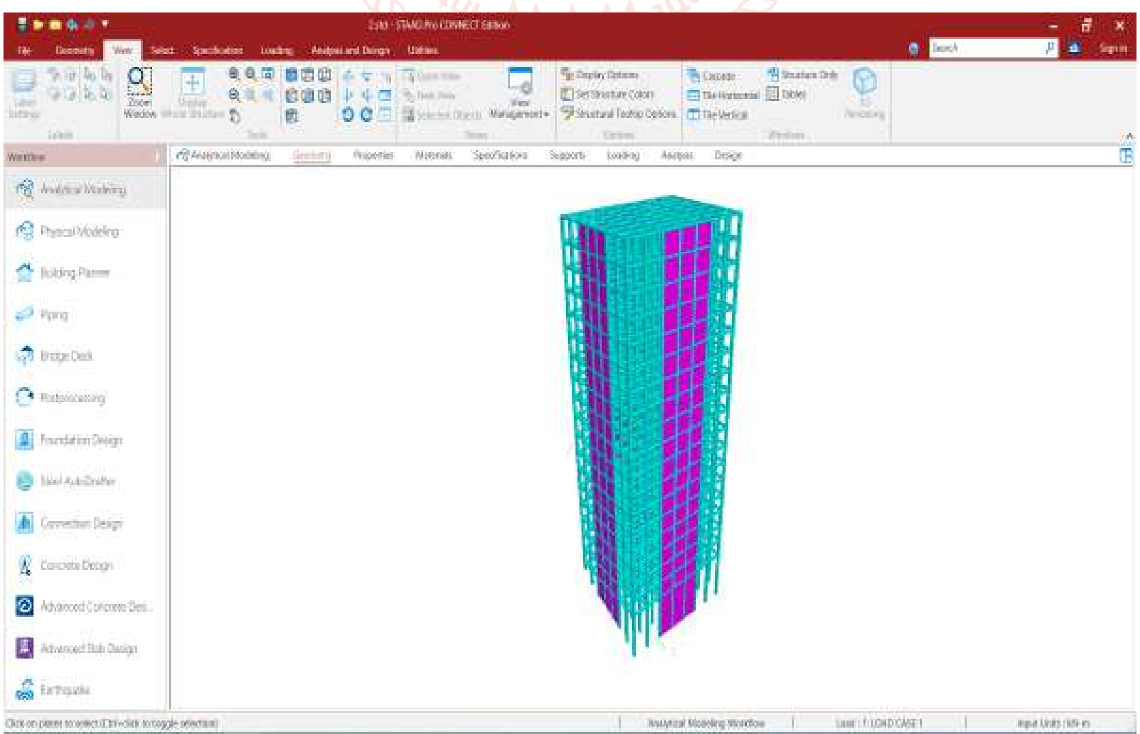

Fig. 4: Building with straight shape shear wall on sloping ground

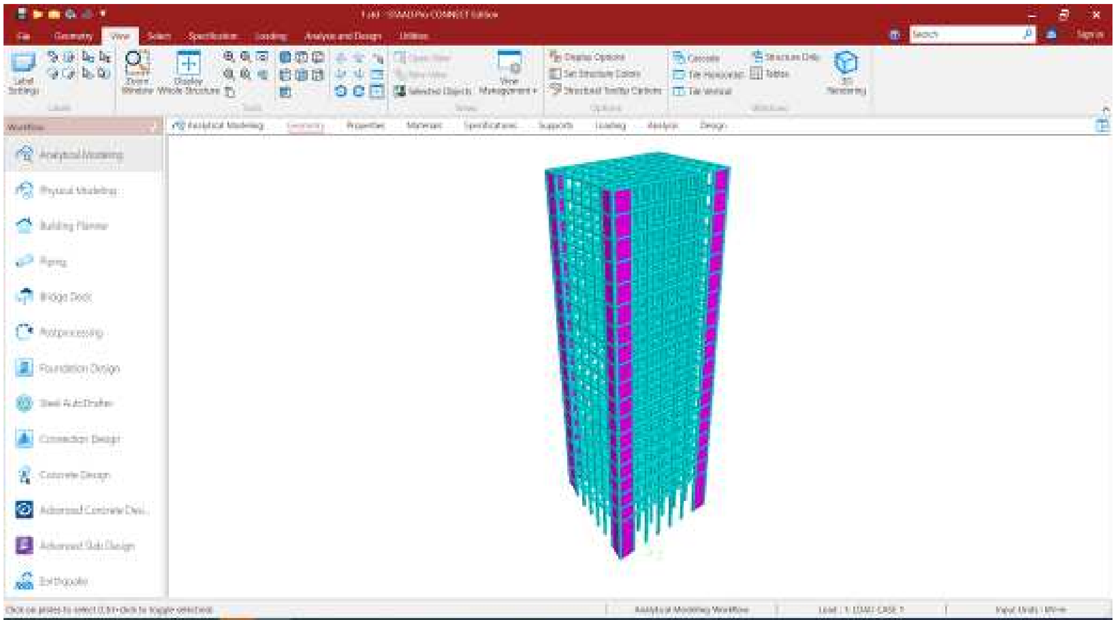

Fig. 5: Building with L shape shear wall on sloping ground

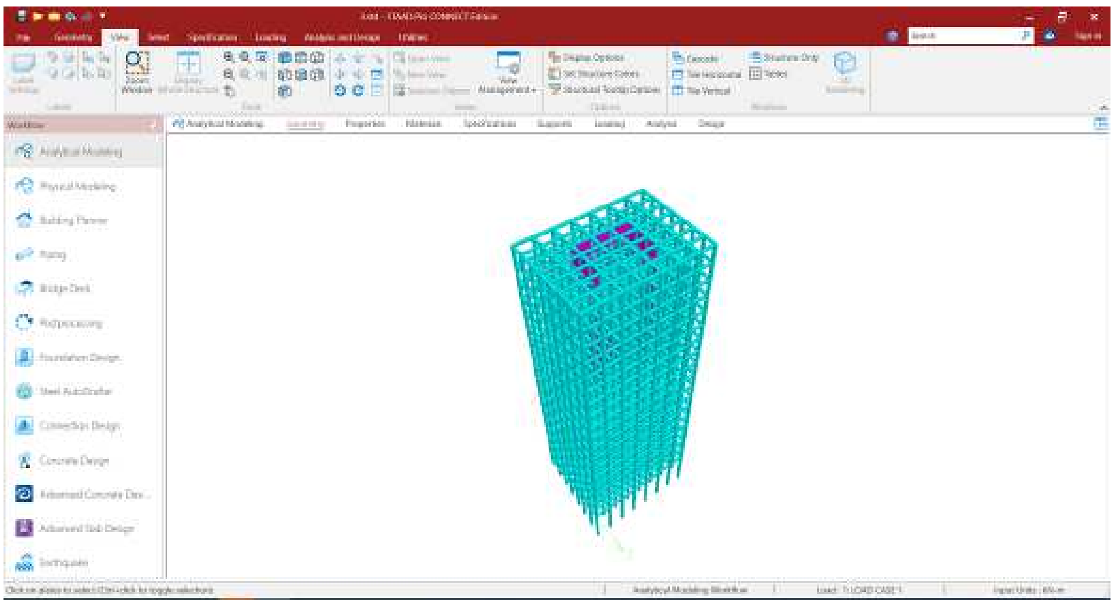

Fig. 6: Building with C shape internal shear wall on sloping ground

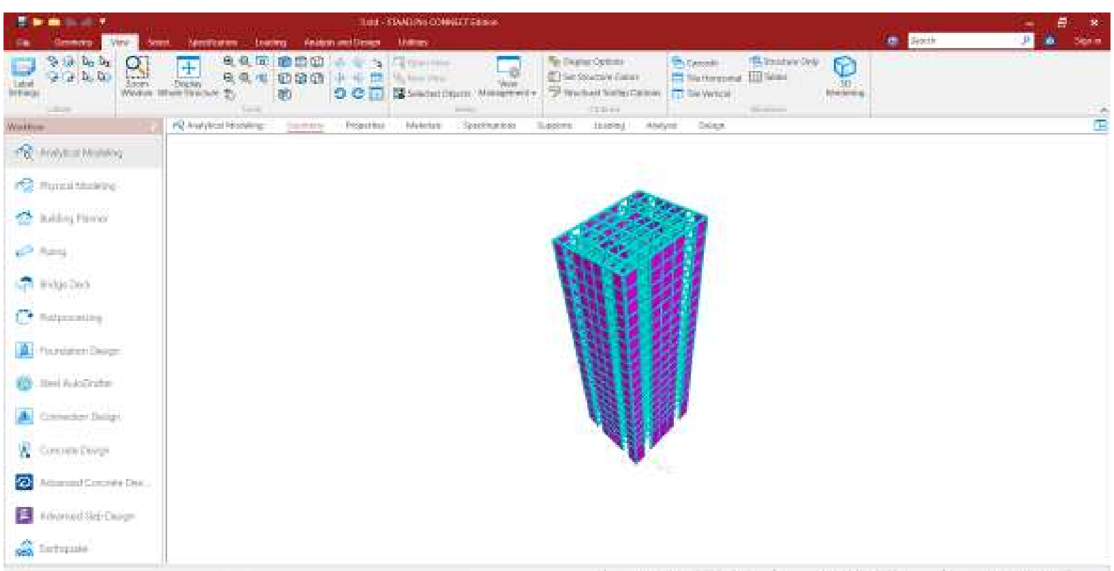

Fig. 7: Building with combined straight, L and C shape shear wall on sloping ground

Results

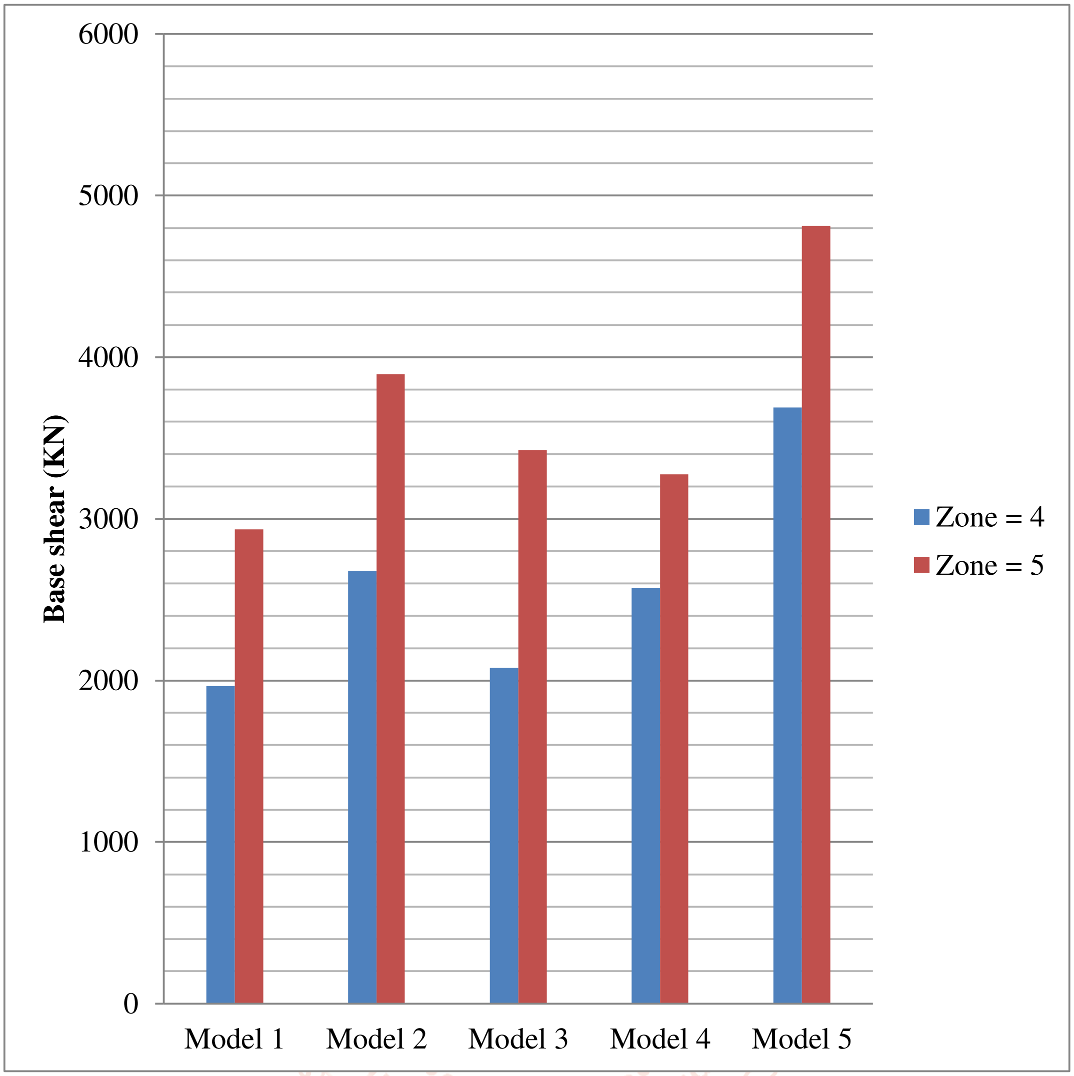

Fig. 8: Variation of base shear for building on slopping ground

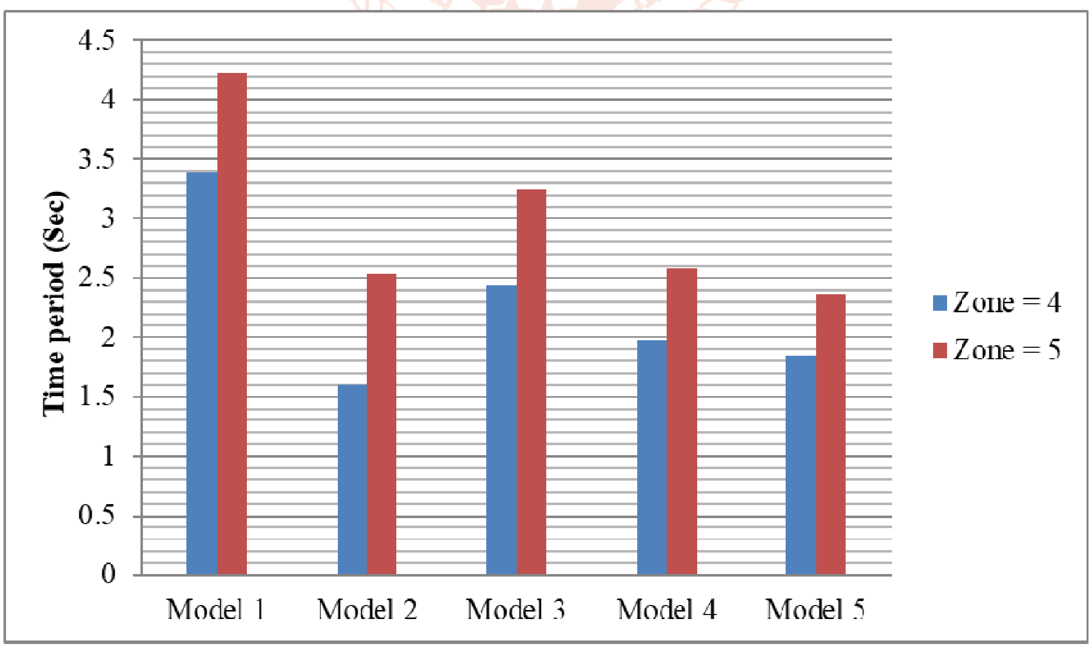

Fig. 9: Variation of time period for building on slopping ground

All the models with shear walls have less time period as compared with model 1. Model 2 has minimum time period for both zone 4 and 5.

NODAL DEFLECTION

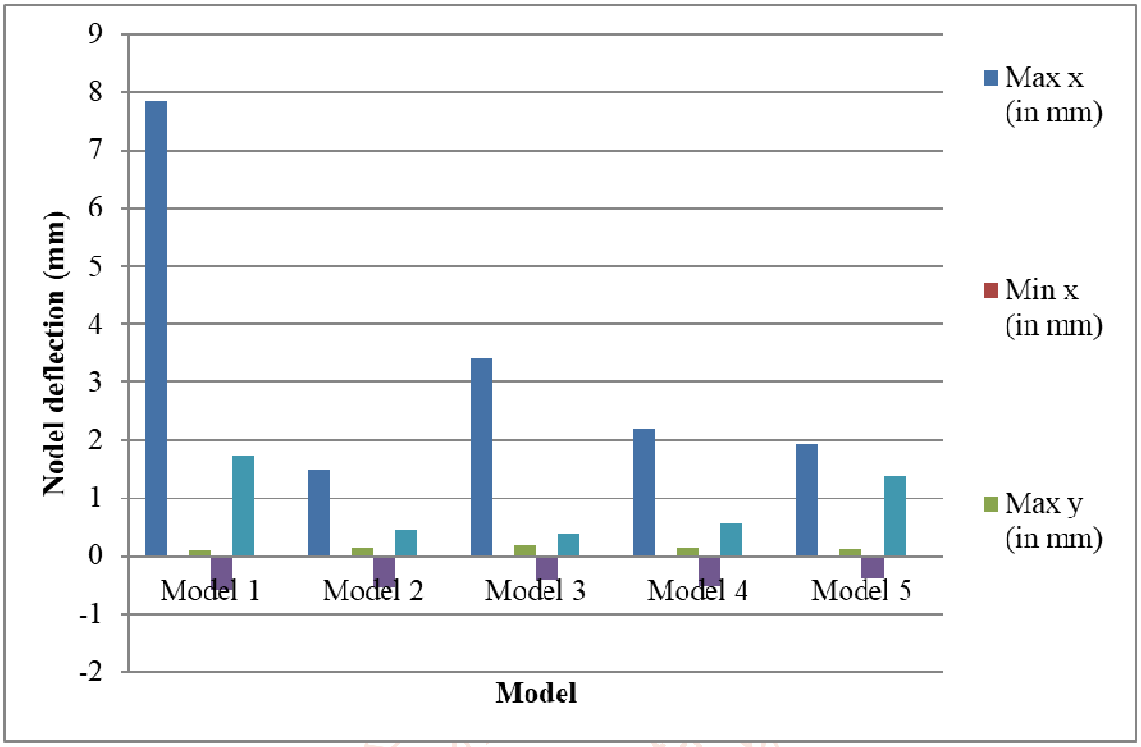

Fig. 10: Nodal deflection results for structure on slopping ground for zone 4

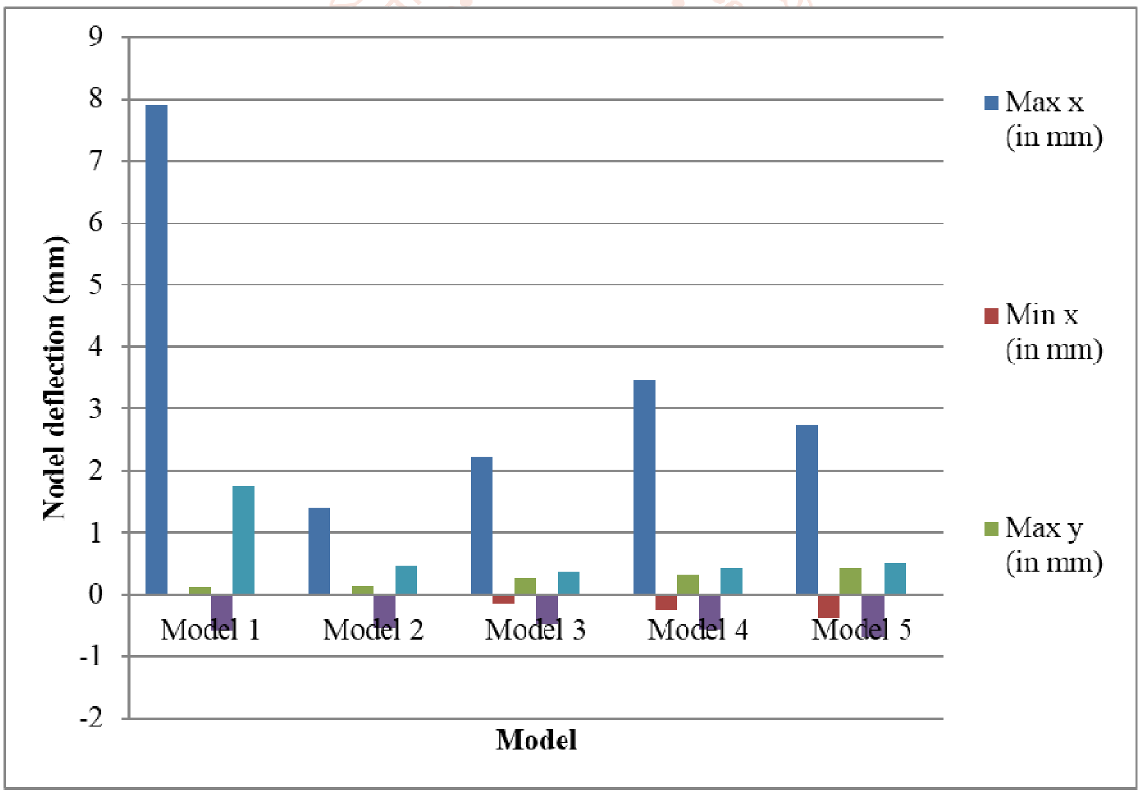

Fig. 11: Nodal deflection results for structure on slopping ground for zone 5

CONCLUSION

From the results obtained from this study it is discovered that the incorporation of shear wall up building on slopping ground will increase the base shear because of increase in lateral stiffness.

1. It's discovered that most bending moments are seen in model one for zone four and zone five. From all the models, model three shown min shear forces for zone four and zone five.
2. Hence in case of slope ground building with L-shape and straight shear wall shape perform best.

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