SEISMIC ANALYSIS OF MULTISTOREY BUILDING FRAME RESTING ON PLANE AND SLOPING GROUND

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Abstract - The need for space on the steep terrain is increasing day by day as the population and urbanisation expand. To meet this demand, slope development on hilly terrain should be considered. Seismic analysis is a static linear analysis that is used to anticipate earthquake failures before they occur. The G+5 model was investigated in this thesis when it was sitting on various slope angles of 0-degree, 15-degree, and 30 degree. Software ETABS 18.0.2 is used to analyse the G+5 model. On both flat and sloping surfaces, models are examined. To begin, the model is subjected to seismic analysis, which includes the assignment of load situations and combinations. The findings of the study, such as storey drift, storey shear, overturning moment, and maximum storey displacement, must be compared. After analysing the data, a graph was created based on the findings. All loads are imposed in accordance with Part 1 of IS code 1893:2016. Storey shear is a graph that depicts the amount of lateral (horizontal) load acting per storey, as a result of wind or earthquake activity.

***Key Words*: Seismic Analysis, G+5 Model, Lateral Load, Storey Shear, Storey Drift.**

1.INTRODUCTION

Seismic forces are more intense on mountainous terrain due to structural irregularities. In addition, research shows that earthquakes are more common in steep terrain. Consider the states in India's northeast. How a structure reacts during an earthquake is determined by its stiffness and vertical planes. In hilly areas, irregularity and asymmetry affect each of these properties. In seismically active areas, shears and torsion are more likely to occur in such structures. The architecture of the hills is distinct from the plains. They are extremely uneven and unequal in horizontal and vertical planes, resulting in devastating earthquakes. Seismic waves cause the process of dislocations segments. Earthquake is a sort of natural calamity with often disastrous results. In general, earthquakes can have consequences for both multistorey and high-rise buildings. The reference list at the conclusion of the paper should match the running text for the buildings. The goal of this study is to develop a simple method for analysing the G+5 model on flat and sloping terrain, as well as to compare the results of storey drift, storey shear, overturning moment, and maximum storey displacement.

1.2 Method of analysis

Review current literature and provisions for multi-story building design in Indian design codes. When building and analysing bridges, only horizontal earthquake ground motion is considered.

Select A Multistorey Building for Case Study.Modelling and analyse the G+5 Multistorey Building Structure resting on plane and sloping ground.Two seismic zones are considered by model as mention. Design is according to IS 456:2000 and IS 1893:2016part1. Dynamic analysis of the selected building model Using Response Spectrum Method, and a comparative study on the results obtained from the Analyses. After compare the results of storey shear, storey displacement, overturning moment, maximum, storey displacement to get an optimum Conclusion.

2. WORKDONE

The design of an RCC medium-rise building with G+5 stories and a floor height of 3 metres that will be subjected to earthquake loads in Zones IV and V has been explored. In this case, the ETABS- software has been considered as a useful tool. To determine the influence on the building, displacements, axial forces, shear force, bending moment, storey drift, and storey shear , storey displacement, maximum overturning moment have been calculated for G+5 structure resting on plane and sloping ground for different angles such as 0 degree, 15 degree, 30 degree thus to find out the various effect on the building.

The multi storey building of G+5 structure resting on plane and sloping ground considering seismic zone 4 and seismic zone 5 selected for the present study. the structure model is symmetric for 0-degree plane and unsymmetrical for the building which is resting on 15 degree and 30-degree plane.

2.1 BUILDING DESCRIPTION

Plan Dimension –189.6m²

Number of Storey-G+5

Height of Each Storey- 3m

Size of Column-600*450mm²

Size of Beam-450*300mm²

Thickness of slab-150mm

Thickness of wall-230mm

Seismic Zone- 4 and 5

Soil Condition- Medium

Importance Factor-1.2

Response Reduction Factor-5

Damping Structure-0.05

Live Load on Roof –1.5KN/M²

On floor-3 KN/M²

Floor Finish- 0.5KN/M²

2.2 Analytical Frame

The various effects on the model after analysis has been shown below

Case 1: G+5 building model with 0-degree angle.

Case 2: G+5 building model with 15-degree angle.

Case 3: G+5 building model with 30-degree angle.

As diagrammatic example of following cases is shown:

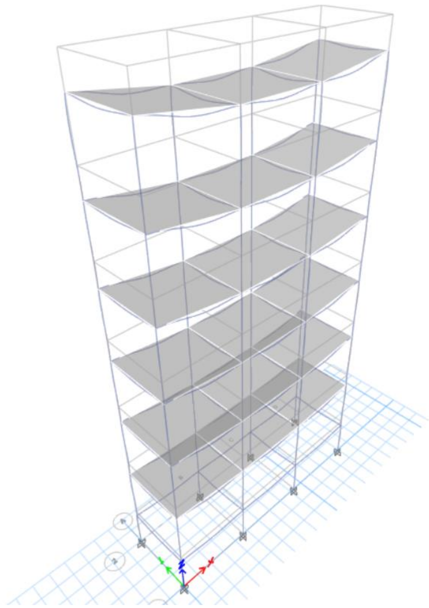


Fig -1: Case 1

Fig -2: Case 2

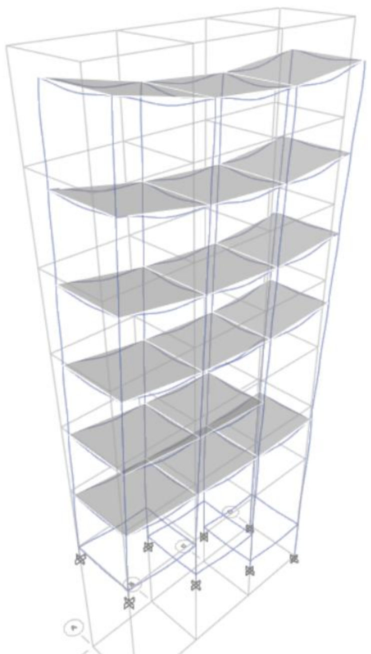


Fig -3: Case 3

3. Analysis & Comparative Result

Displacement

ZONE 4

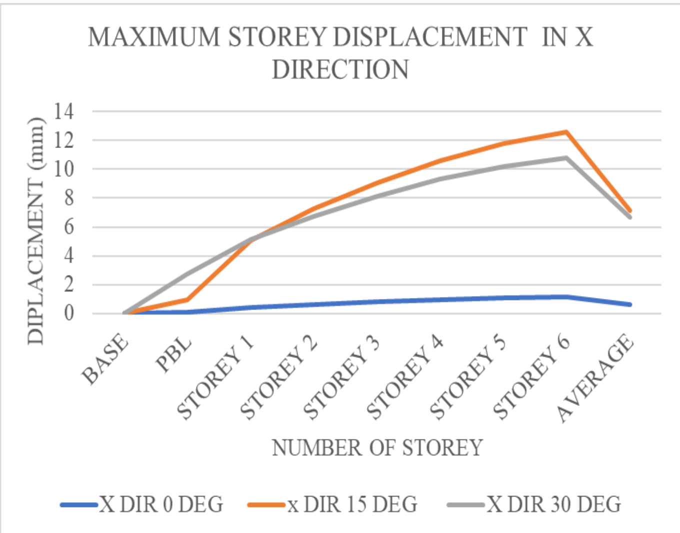


Chart -1: Displacement

Zone 4

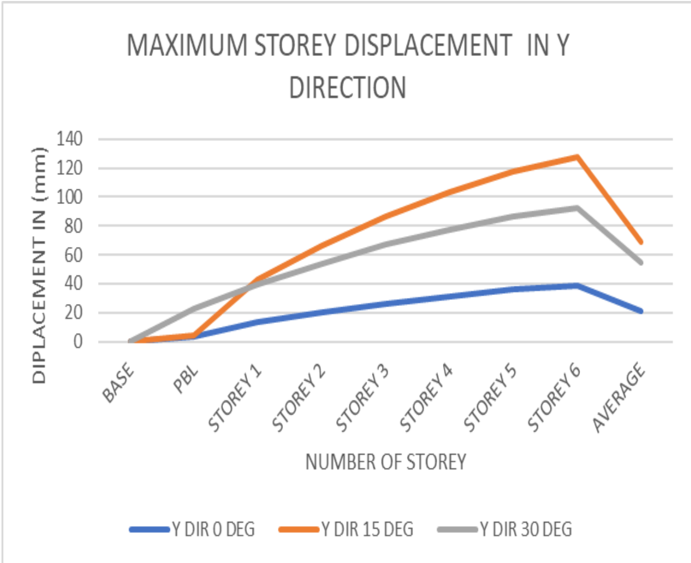
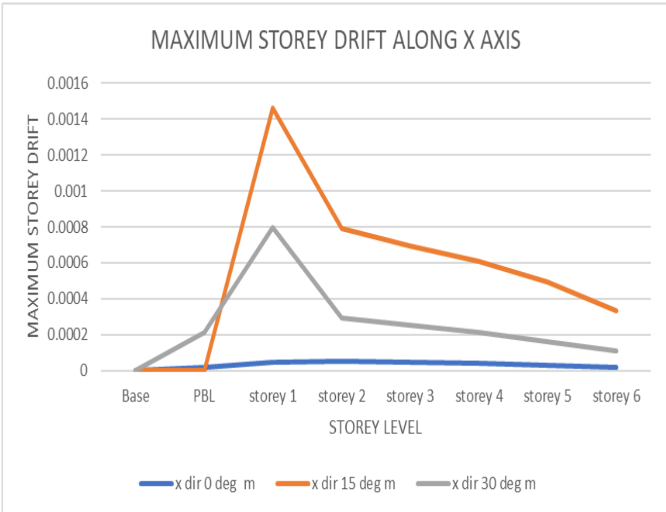


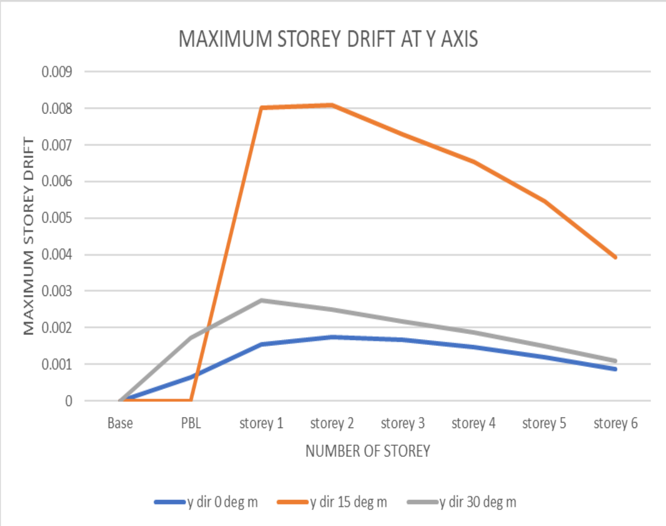
Chart -2:displacemnt

Storey drift

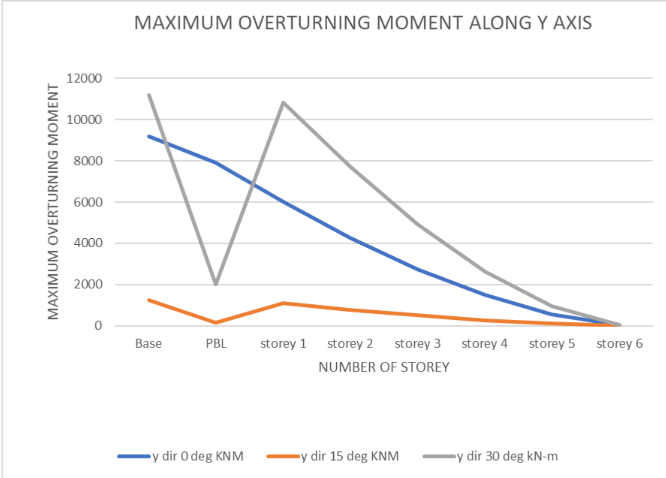
ZONE 4



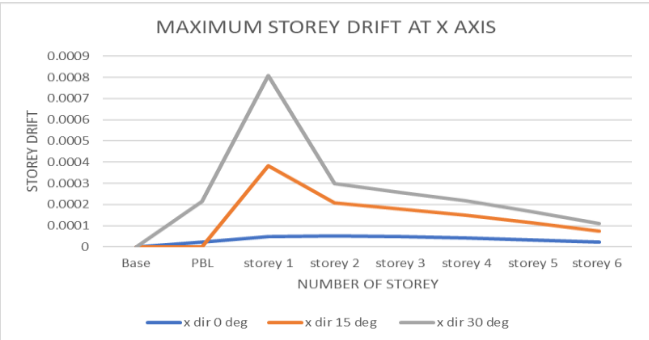
ZONE 4



ZONE 4



ZONE 5



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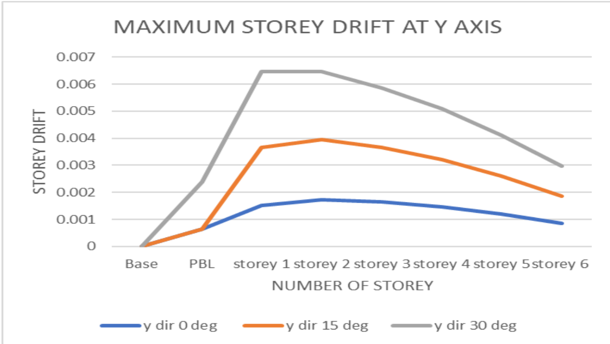

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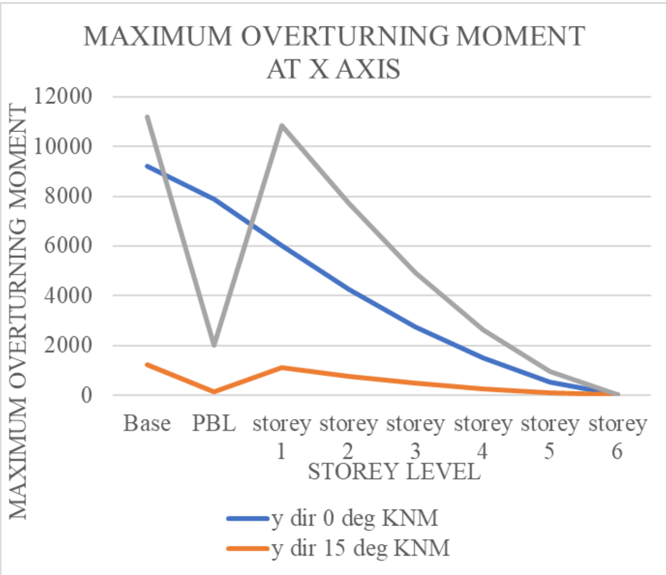

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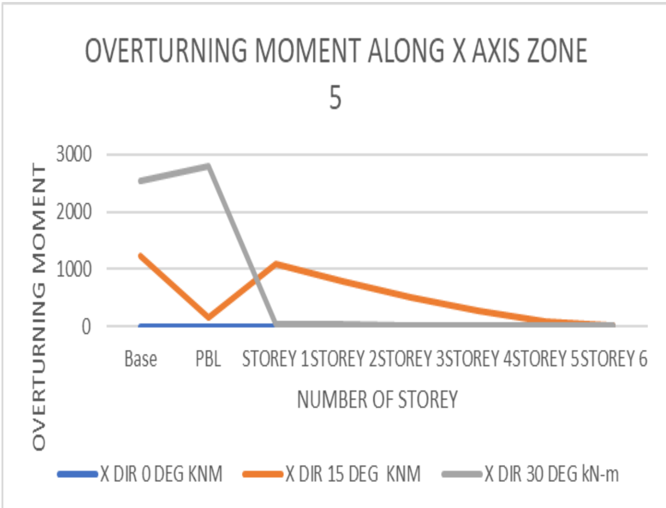

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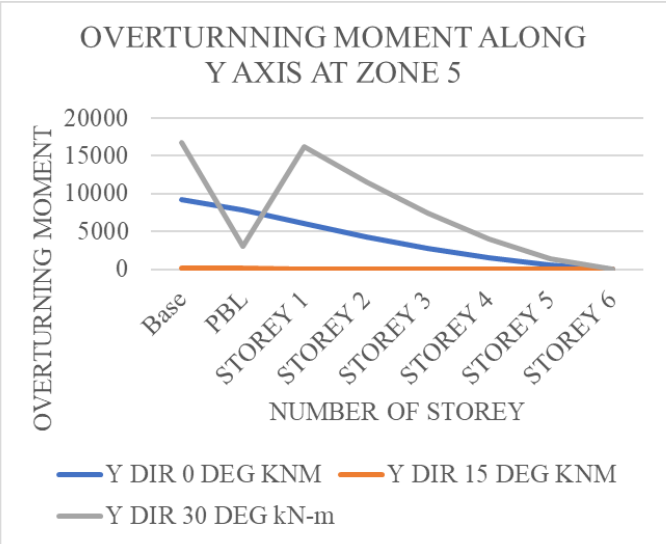
ZONE 5



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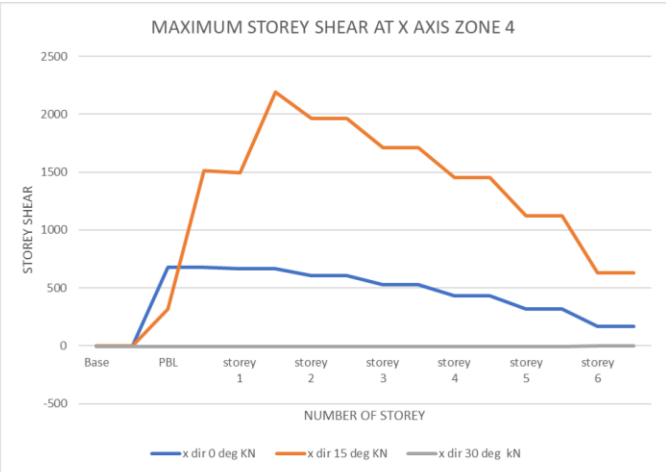

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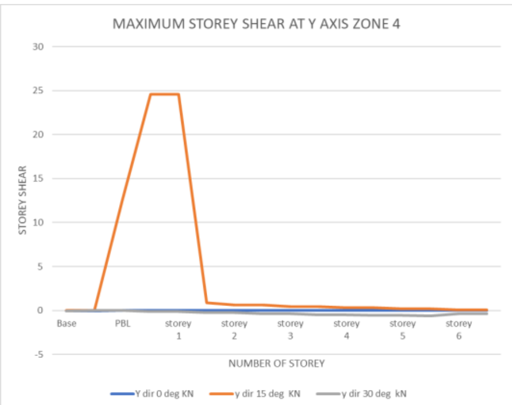

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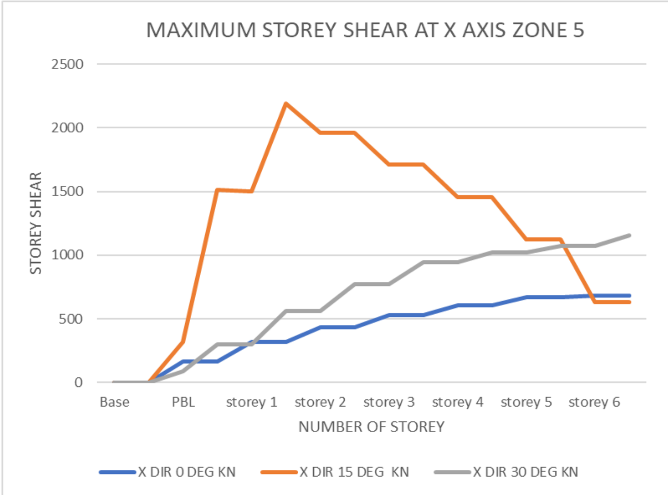
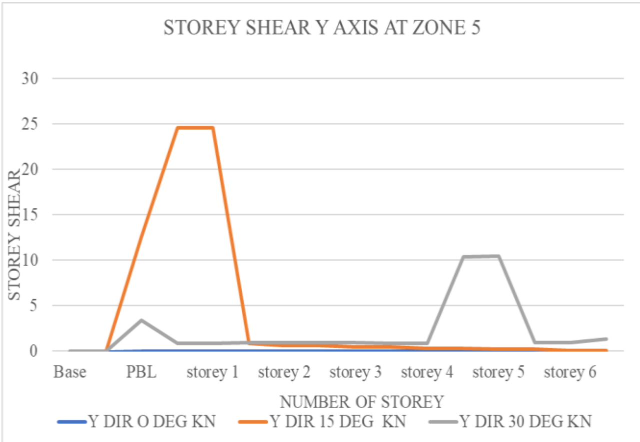


ZONE 5



4. SUMMARY

A G+5 multi-story building constructed at various angles of 0 degrees, 15 degrees, and 30 degrees on a plane as well as sloping land, seismic zones 4 and 5. Moment resisting frame building with medium stiff soil Type 2 is considered with I 1.2, response reduction factor R 5. The main goal of this project is to compare the results of various studies of the model on flat and sloping ground.5. conclusion

The G+5 Storey building as per IS 1893 (Part-1) :2016 on the basis of results came now it concluded observed that, maximum storey displacement has higher value in 15-degree model because as the height increases displacement increases but as the sloping angle increases displacement decreases.G+5 structure resting on 15 degree experiencing more value of storey drift, storey shear, overturning moment due to the reason that length of shorter column has more stiffness as compare to longer column so it attracts more forces and resists more earthquake loads. It is observed that the shorter column has higher value of axial forces and bending moment as compare to long column due to reason that short column attracts more earthquake forces as compare to longer columns due to more stiffness in short column so shorter column attracts larger earthquake forces.

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