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

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Abstract - *With the increase of population and urbanization, the demand of space on the hilly areas is increasing day by day. the construction of slopes on hilly areas has to be considered to complete this demand. Seismic analysis is a static linear analysis which is used to predict the failure caused by the earthquakes before it happens. In this thesis G+5 model has been analysed resting on different sloping angles 0-degree, 15-degree, 30 degree. This G+5 model is analysed by software ETABS 18.0.2. models are analysed on the plane and sloping areas. Firstly, seismic analysis is performed on the model assigning load cases and load combinations. After applying all the loads and all the lateral loads on the G+5 Model the model is set to run analysis. After running analysis, the results have to be compared such as storey drift, storey shear, overturning moment, maximum storey displacement. after analysing the results, the graph plotted according to the results came. All the loads are applied according to IS code 1893:2016 part 1. Storey shear is a graph that shows how much lateral (horizontal) load is acting per storey, whether from wind or seismic activity*

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

1.INTRODUCTION

Due to the structural irregularity, seismic forces are more severe in hilly terrain. In addition, earthquakes are more likely in steep terrain, according to research. The north-east Indian states, for example. The distribution of mass and stiffness in both the horizontal and vertical planes of a structure determines how it behaves during an earthquake. Both of these qualities are affected by irregularity and asymmetry in hilly regions. Shears and torsion are more likely to occur in such structures in seismically active places. The architecture in the hills differs from that on the plains. In horizontal and vertical planes, they are exceedingly uneven and asymmetrical lead to destructive earthquakes process of dislocations segments is caused by the waves known as seismic waves. Earthquake is a type of natural disaster and its consequences are often disastrous. Basically, earthquake can cause effects due to multistorey as well high-rise buildings running text should match with the list of references at the end of the paper.

The idealisation of the structure's geometry and the loading on the structure determine the approach and correctness of analytical conclusions.

The present work aims at providing a simple approach

For analyzing the G+5 model resting on plane and sloping ground and to compare the results of storey drift, storey shear, overturning moment, maximum storey displacement.

1.1 Objective

- To compare the lateral displacement of multi-storey building resting on plain and sloping ground at different sloping angles with respect to the multi-storey building resting on plain ground.
- To compare the behaviour of sloping ground structures at different sloping angles in different seismic zones with the same loading and structural frames.
- To study the effect of lateral forces on short columns and long columns of multi-storey building resting on sloping and plain ground.

1.2 Methodology: Review existing literature and Indian design code provisions for multi-story building design. only horizontal earthquake ground motion is taken into account while designing and analysing bridges.

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 1893:2016 part 1.

Dynamic analysis of the selected building model

Using Response Spectrum Method, and a comparative study on the results obtained from the

Analyses. After that 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-2018.0.2 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 –189.6m^2

Number of Storey-G+5

Height of Each Storey- 3m

Size of Column-600*450mm^2

Size of Beam-450*300mm^2

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/M^2

On floor-3 KN/M^2

Floor Finish- 0.5KN/M^2

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:

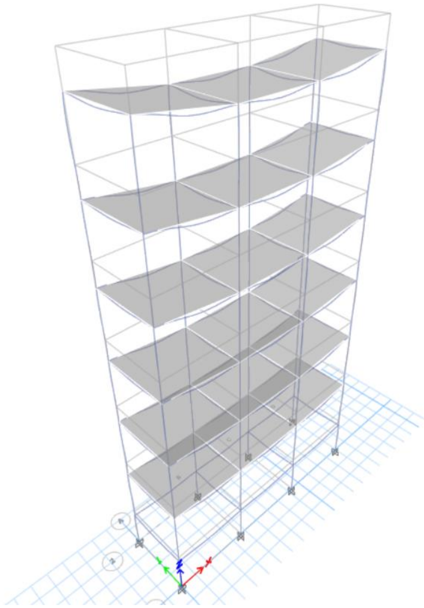


Fig -1: Case 1

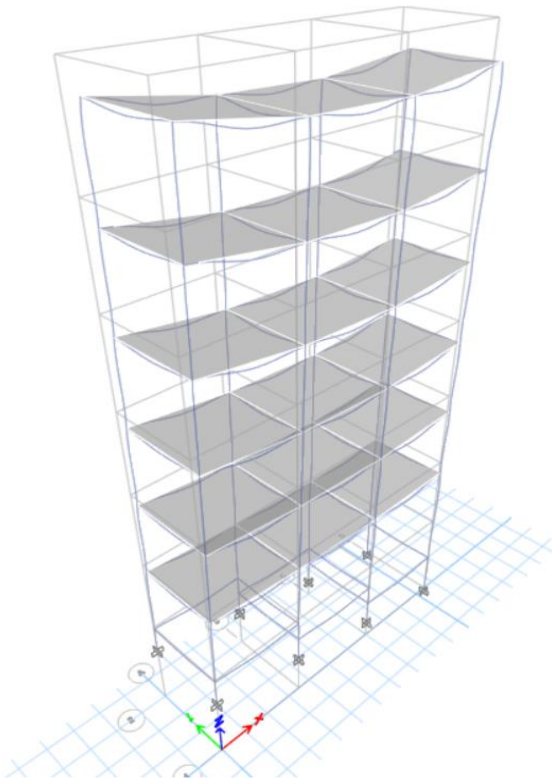


Fig -2: Case 2

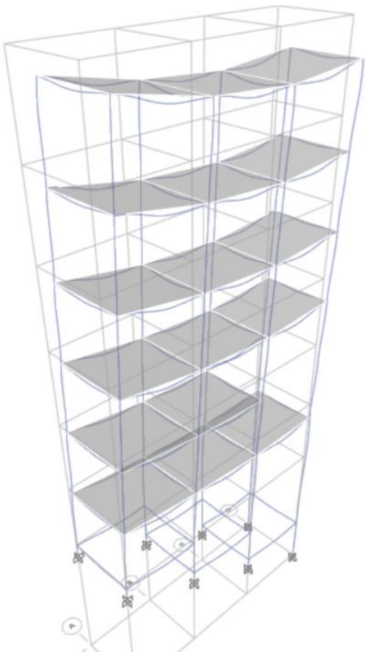


Fig -3: Case 3

2 Analysis & Comparative Result

3.1 Displacement

ZONE 4

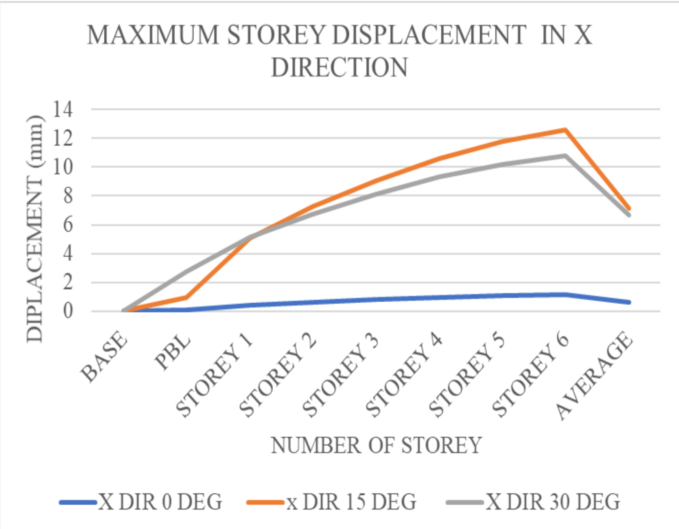


Chart -1: Displacement

ZONE 5

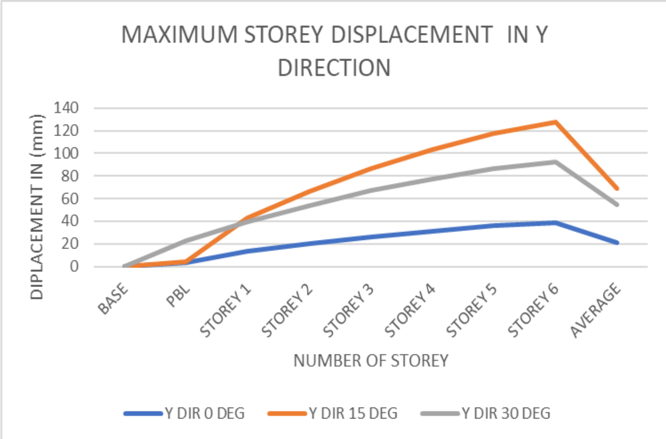


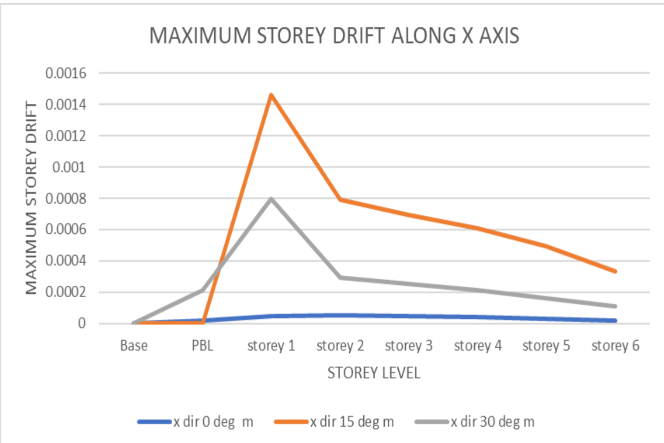
Chart -2: Displacement

From the above graph it is observed that maximum displacement is observed in y direction of 15-degree model.

According to the observation made from the graph plotted it is clear that as the height of building increases maximum displacement gets increased but as the slope of the angle is increasing maximum displacement gets decreased. So, that is why maximum storey displacement is maximum in 15-degree value.

3.2 Storey Drift

ZONE 4



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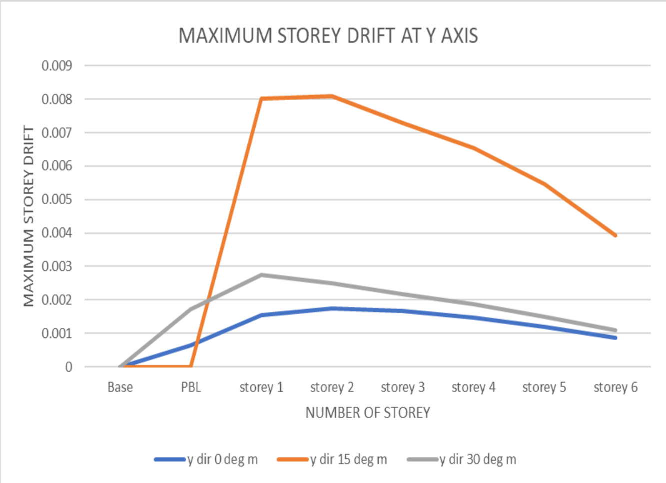

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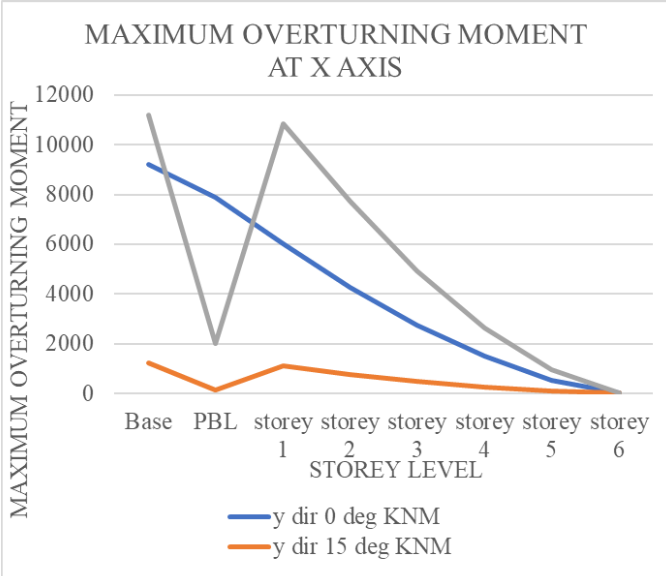

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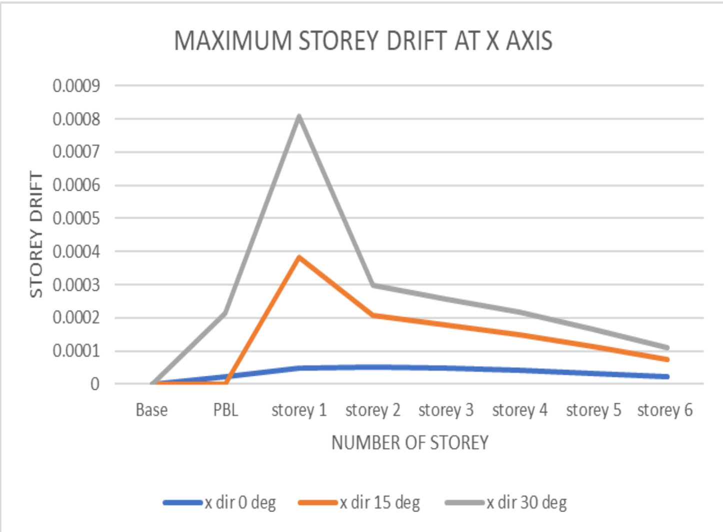

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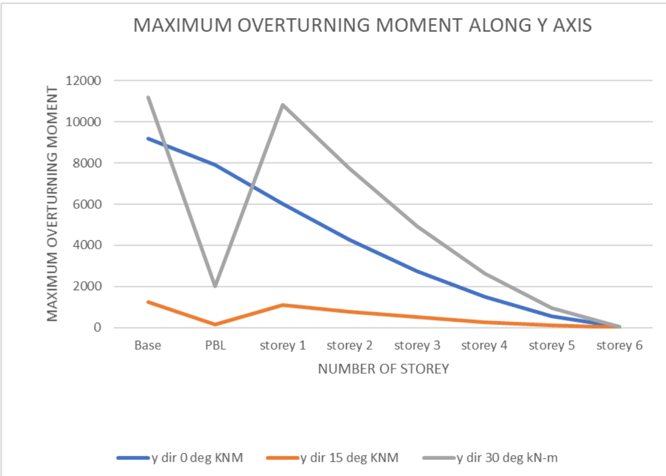

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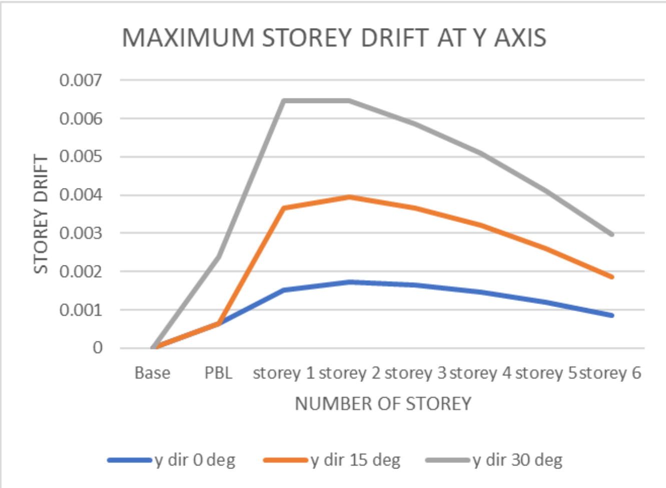

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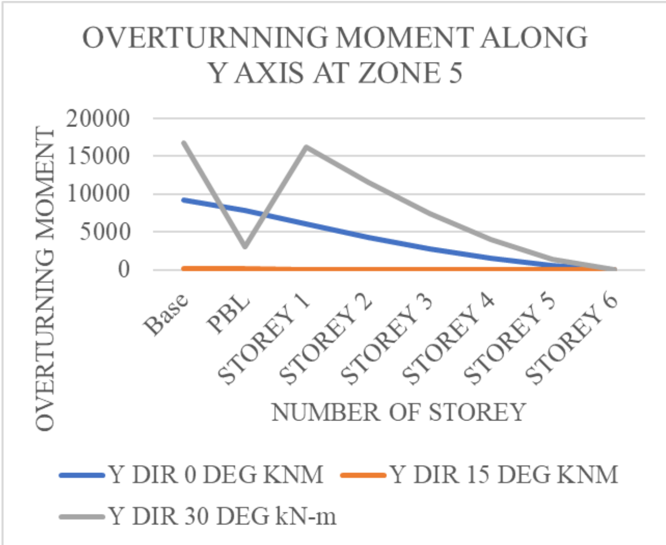

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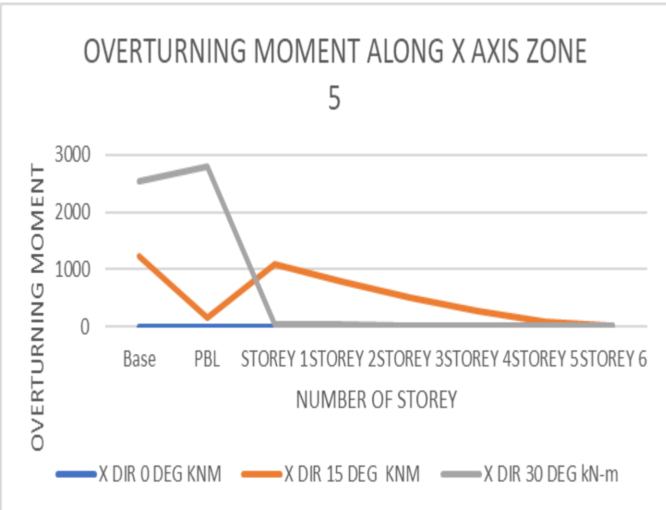

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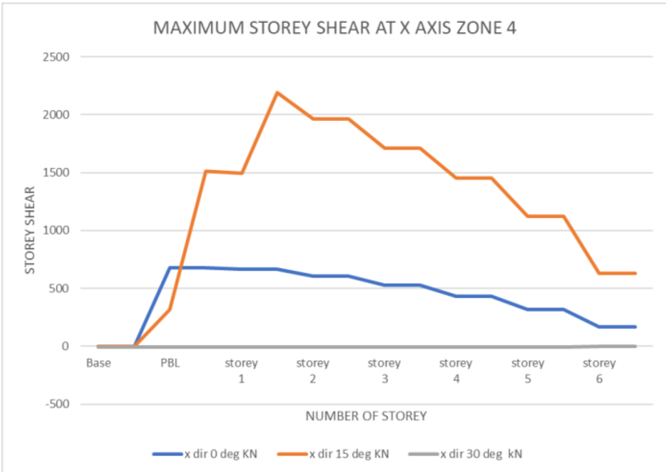

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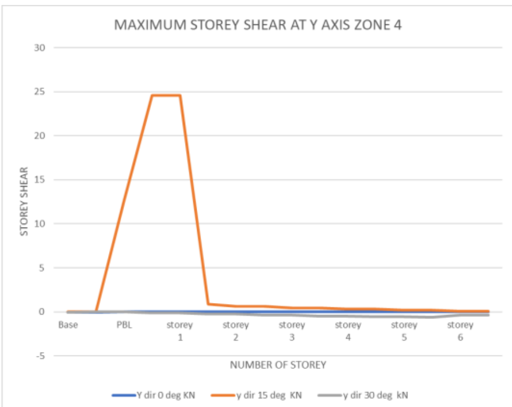

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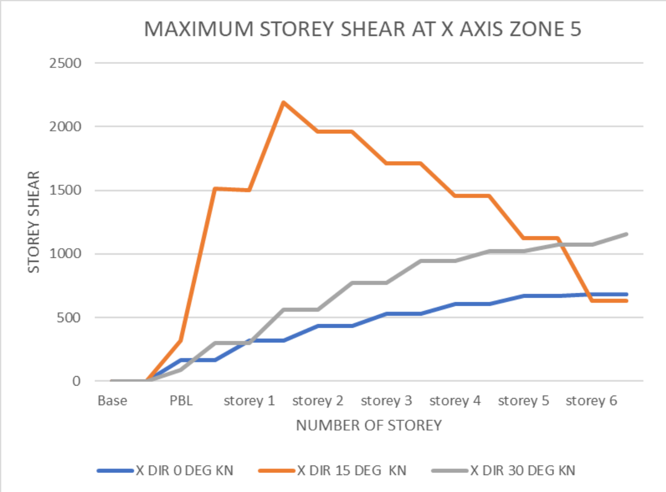

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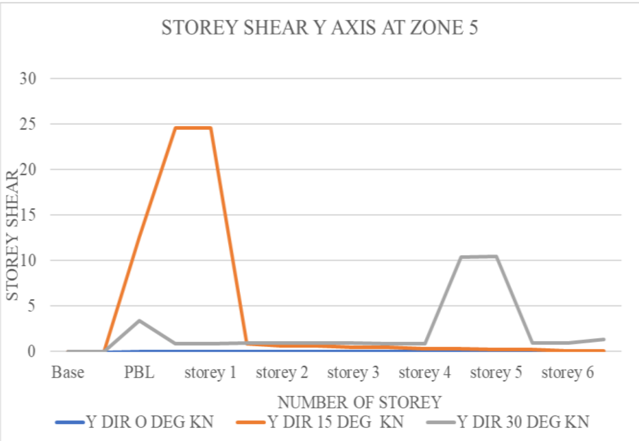

4. SUMMARY

A G+5 multi-storey building which is constructed in different angles 0-degree, 15 degree and 30 degree inclined on plane as well as sloping ground, seismic zones 4 and 5 With I 1.2, response reduction factor R 5, moment resisting frame building with medium stiff soil Type 2 Is Considered. The Main aim of this work is to Compare the Results After different analyses of the model resting on plane as well sloping ground.

5. conclusion

The G+5 Storey building as per IS 1893 (Part-1) :2016 on the basis of results came now it can be concluded that:

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 is more 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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