Comparative Design Of High Rise RCC Building On Sloping Ground By Using E-TABS

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Abstract- *The buildings which are located in hilly regions are different from those are in plain ground. The buildings are generally irregular and torsionally coupled and hence to susceptible to serve destruction when affected by earthquake. In this study the 3D analytical model of G+25 storied building have been generated for symmetric case with step set back with step and step back configurations. The building models are analyzed by using E-TABS software.*

Keywords- Base Shear, Time period, Storey Drift.

I. INTRODUCTION

Earthquake is the most disastrous due to its unpredictability and huge power of devastation. Earthquakes themselves do not kill people, rather the colossal loss of human lives and properties occur due to the destruction of structures. Building structures collapse during severe earthquakes, and cause direct loss of human lives.

Hill buildings are different from those in plains; they are very irregular in horizontal and vertical planes. Hence, they are susceptible to severe damage when affected by earthquake ground motion.

The economic growth and rapid urbanization in a hilly region has accelerated development of infrastructure and construction activities. Because of which, population density in the hilly region has increased. Therefore, there is popular and pressing demand for construction of multi storey building in hilly region.

Analysis of buildings in hilly region is somewhat different than the buildings on leveled ground, since the column of the hill building rests at different levels on the slope. The other problems associated with hill buildings are, additional lateral earth pressure at various levels, slope instability, different soil profile yielding unequal settlement of foundation.

The scarcity of plain ground in hilly regions leads to construct structure on sloping ground. In plain region to construct high rise structure is predominantly known condition, but in case of hilly region it is very difficult.

In this study the 3D analytical model of G+25 storey building is to be generated for symmetric and asymmetric case with varying type of frame configuration. Building models are analyzed and designed by E-TABS software.

We are analyzing the high rise structures for seismic load i.e. equivalent static method and linear static method on sloping ground or hilly regions with varying sloping angles, symmetric frames and step back and set back with step back configuration with varying positions of shear walls by using E-TABS.

Future prospects of these structures are high as having no damage during various disastrous conditions

1.3 OBJECTIVES:-

- To study the most effective configuration for base shear.
- To study the most effective configuration for time period.
- To study the most effective configuration for storey drift.
- To study the effectiveness of configuration of building frame such as set back with step back building and step back building for sloping ground.

1.4 METHODOLOGY

- Defining symmetric plan.
- Defining step back and set back with step back configuration for sloping ground building.
- Defining various position of shear wall in various configuration of building.
- Analyze the various configuration of buildings.
- Compare results of buildings resting on plain ground and sloping ground buildings with varying sloping angle with different configurations.

1.5 EXAMPLE DESCRIPTION

- Number of storey:-G+25
- Floor Height:-3m
- No of bay in X direction:-9
- No of bay in Y direction:-9
- Spacing in X direction:-4m
- Spacing in Y direction:-4m
- Beam size:-300X550mm
- Column size:-300X900mm
- Slab Thickness:-150mm
- Thickness of concrete shear wall:150mm
- Live load:-2KN/M²
- Floor finish Load:-1KN/M²
- Wall Load:-4.41KN/M
- Concrete grade:-M25
- Steel:-Fe415

Earthquake parameters:-

- Type of frame:-SMRF
- Seismic zone:-III
- Response reduction factor:-5
- Importance Factor:-1

As per IS 1893 (part I): 2002 following methods have been recommended to determine the design lateral loads which are:

1. Equivalent Static Method.
2. Response Spectrum Method.

1.6 MODEL CONFIGURATIONS:-

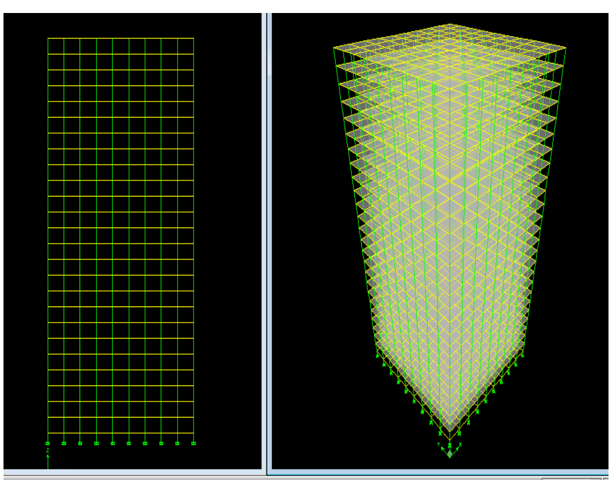

Fig. No. 1.6.1 Building resting on plain ground without shear wall.

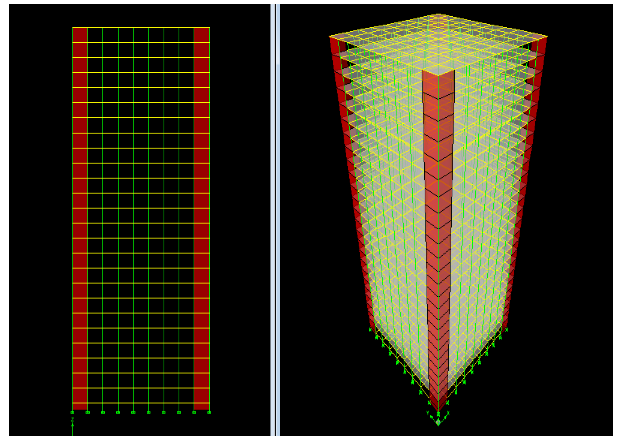

Fig. No. 1.6.2 Building resting on plain ground with shear wall.

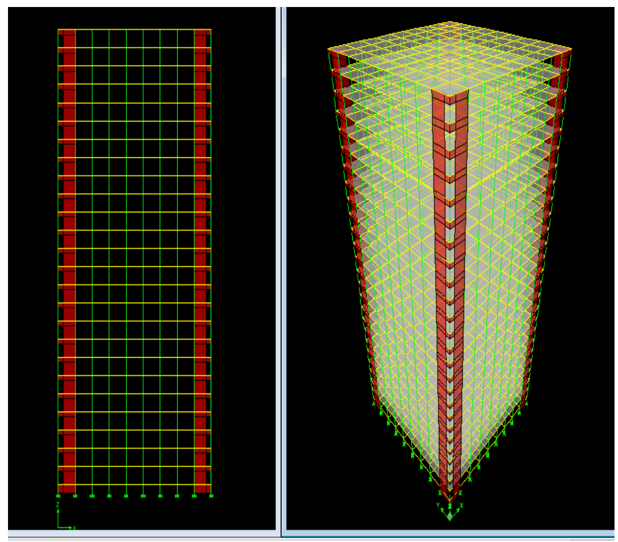

Fig. No. 1.6.3 Building resting on plain ground with shear wall opening at corner.

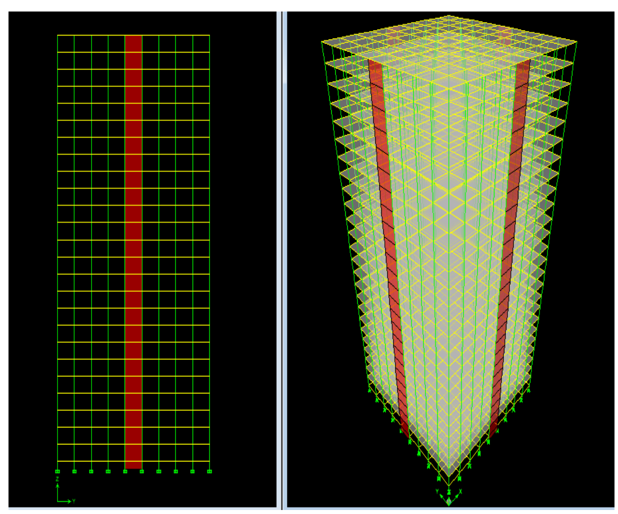

Fig. No. 1.6.4 Building resting on plain ground with shear wall at periphery.

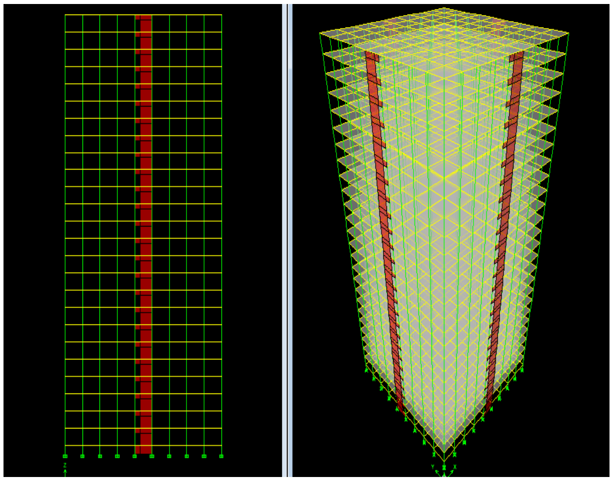

Fig. No. 1.6.5 Building resting on plain ground with shear wall at periphery with opening.

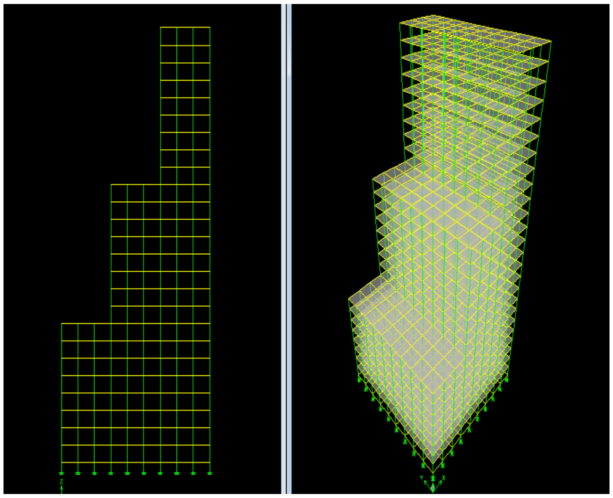

Fig. No. 1.6.6 Building resting on plain ground with set back configuration without shear wall.

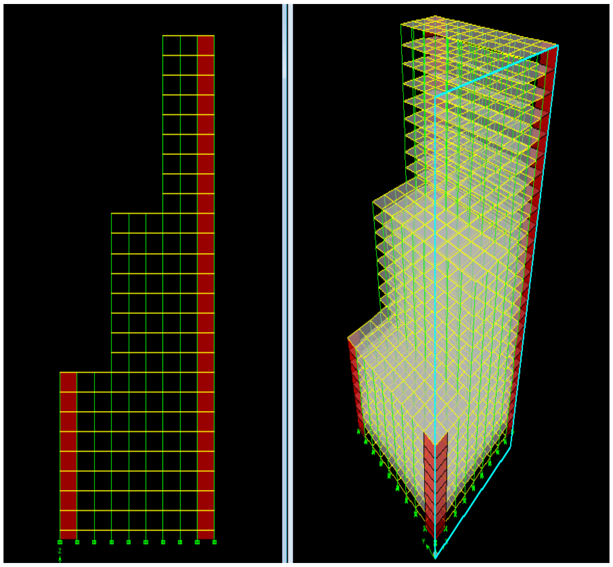

Fig. No. 1.6.7 Building resting on plain ground with set back configuration with shear wall at corner.

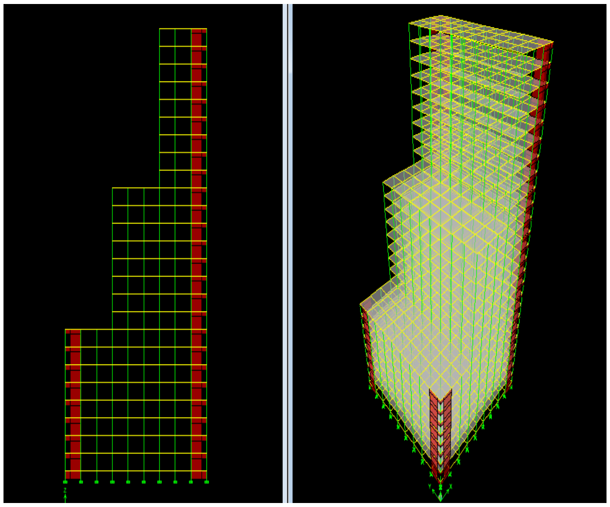

Fig. No. 1.6.8 Building resting on plain ground with set back configuration with shear wall at corner with opening.

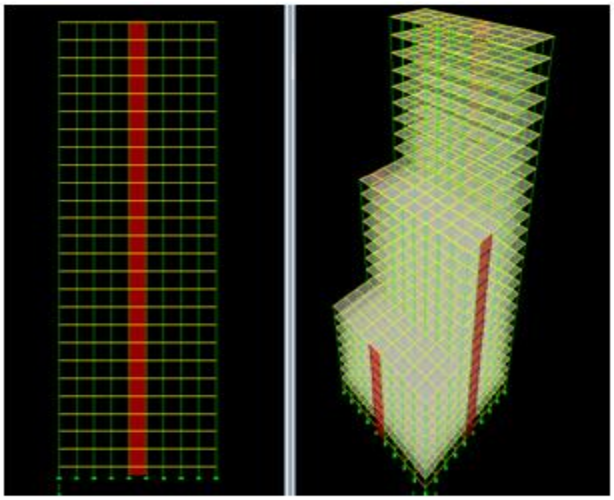

Fig. No. 1.6.9 Building resting on plain ground with set back configuration with shear wall at periphery.

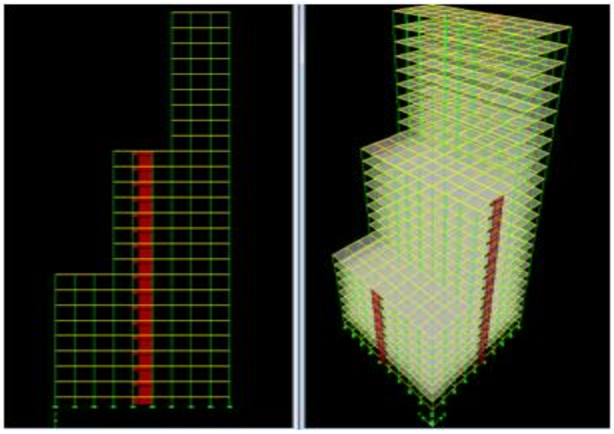

Fig. No. 1.6.10 Building resting on plain ground with set back configuration with shear wall at periphery with opening.

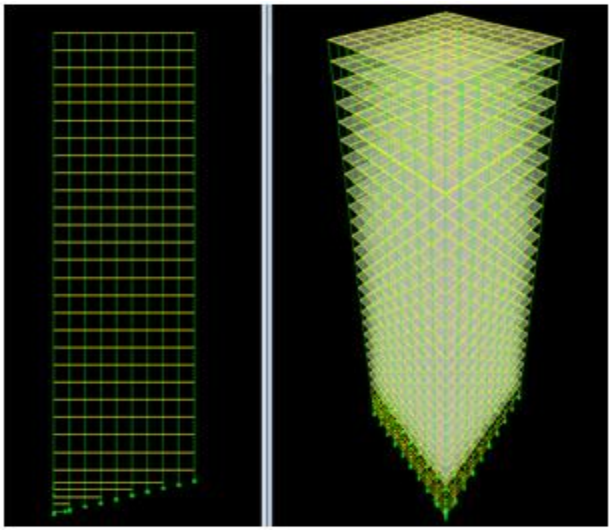

Fig. No. 1.6.11 Building resting on 10º sloping ground with step back configuration.

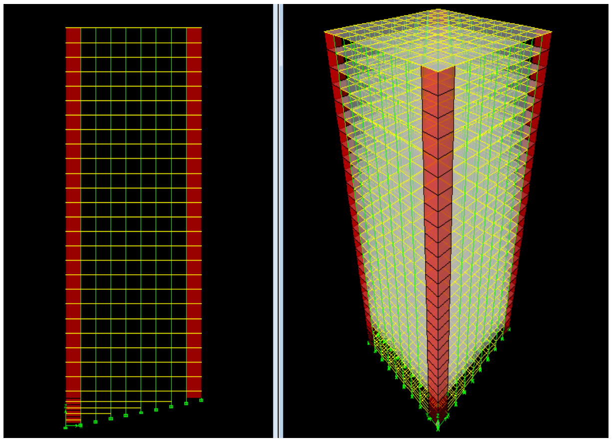

Fig. No. 1.6.12 Building resting on 10º sloping ground with step back configuration with shear wall at corner.

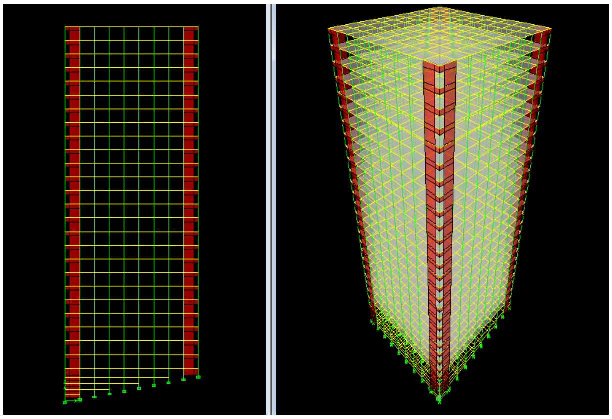

Fig. No. 1.6.13 Building resting on 10º sloping ground with step back configuration with shear wall at corner with opening.

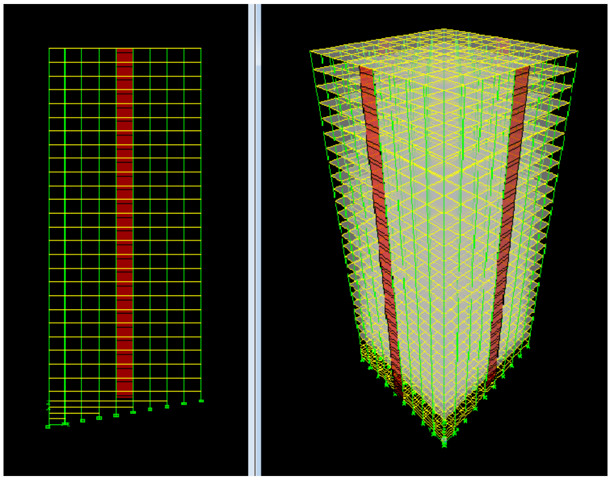

Fig. No. 1.6.14 Building resting on 10º sloping ground with step back configuration with shear wall at periphery.

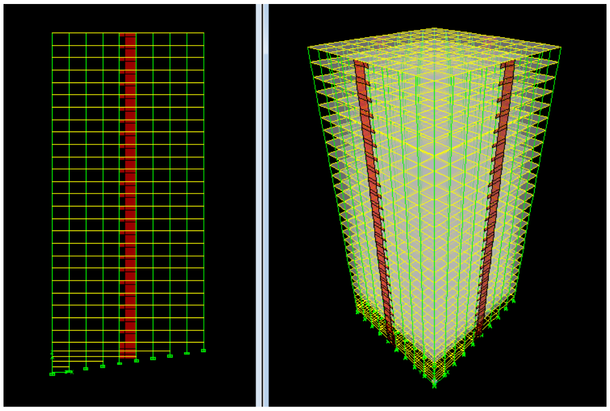

Fig. No. 1.6.15 Building resting on 10º sloping ground with step back configuration with shear wall at periphery with opening.

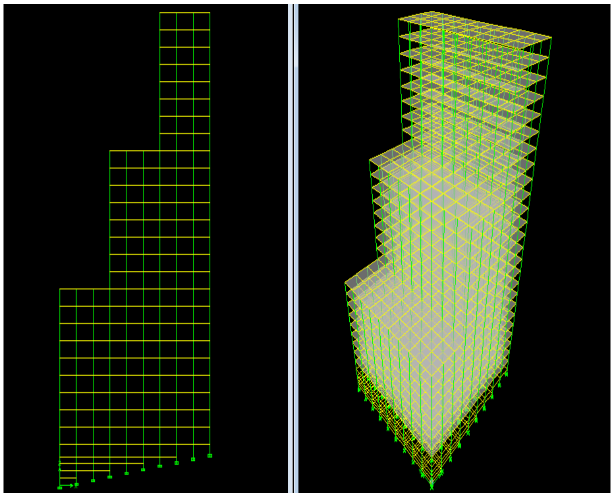

Fig. No.1.6.16 Building resting on 10º sloping ground with set back with step back configuration without shear wall.

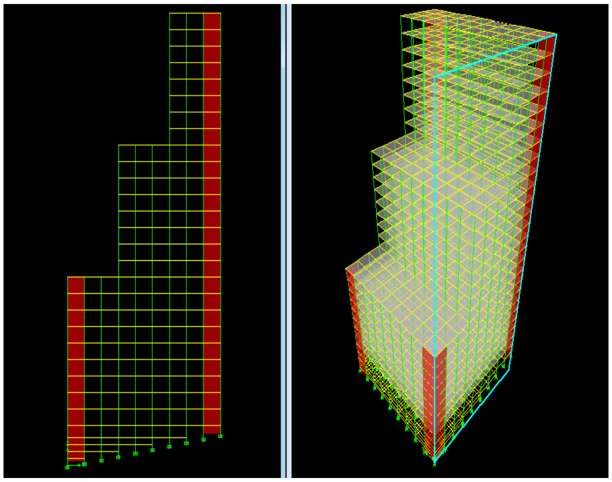

Fig. No. 1.6.17 Building resting on 10º sloping ground with set back with step back configuration with shear wall at corner.

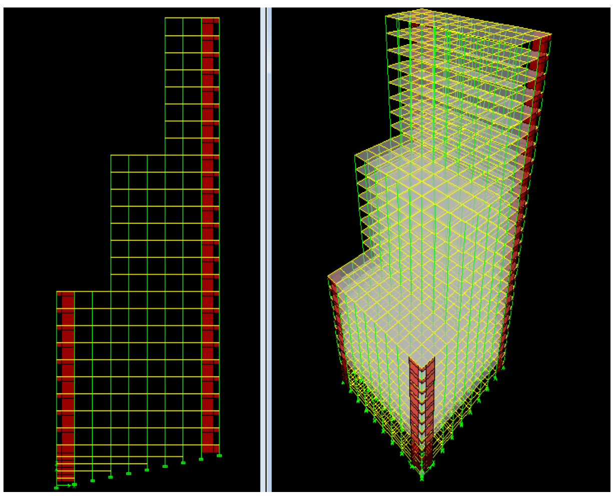

Fig. No. 1.6.18 Building resting on 10º sloping ground with set back with step back configuration with shear wall opening at corner.

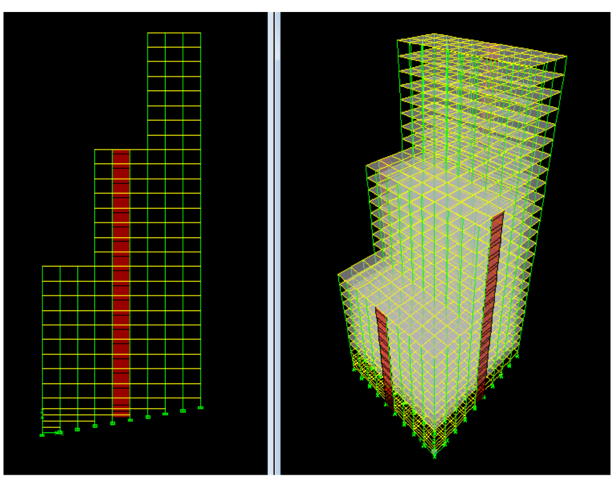

Fig. No. 1.6.19 Building resting on 10º sloping ground set back with step back configuration with shear wall at periphery.

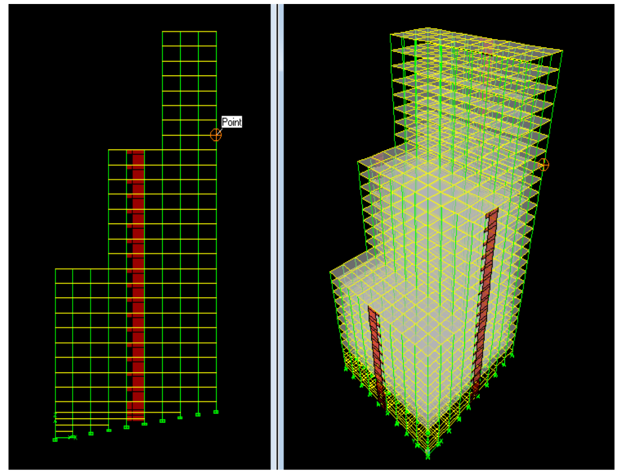

Fig. No. 1.6.20 Building resting on 10º sloping ground set back with step back configuration with shear wall at periphery with opening.

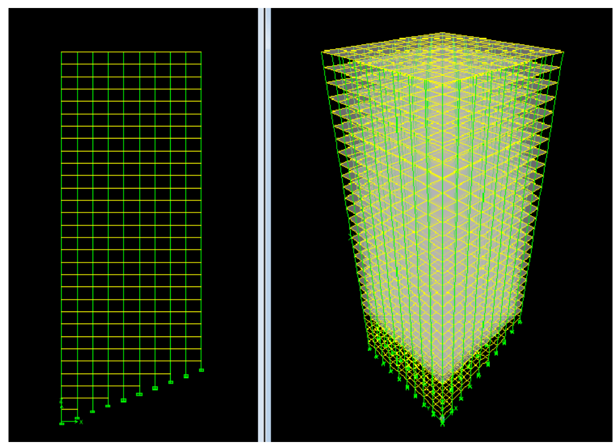

Fig. No. 1.6.21 Building resting on 20º sloping ground with step back configuration without shear wall.

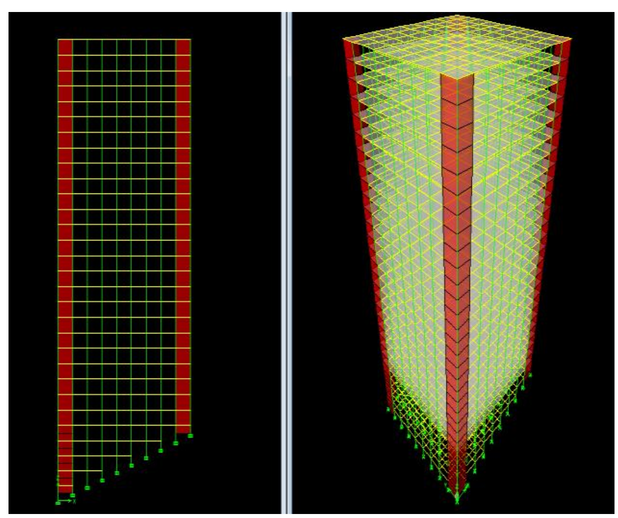

Fig. No. 1.6.22 Building resting on 20º sloping ground with step back configuration with shear wall at corner.

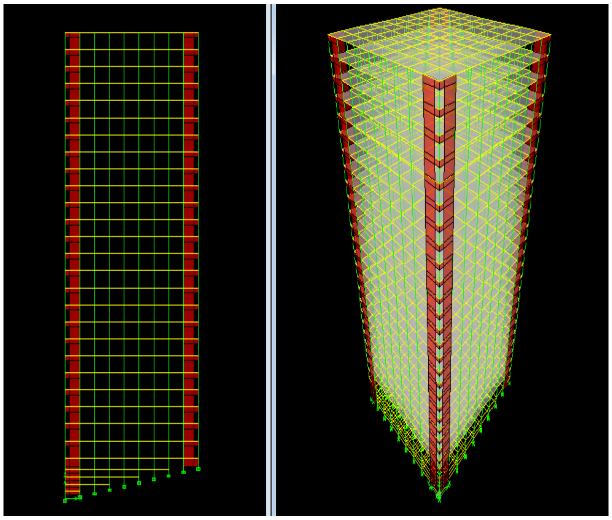

Fig. No. 1.6.23 Building resting on 20º sloping ground with step back configuration with shear wall at corner with opening.

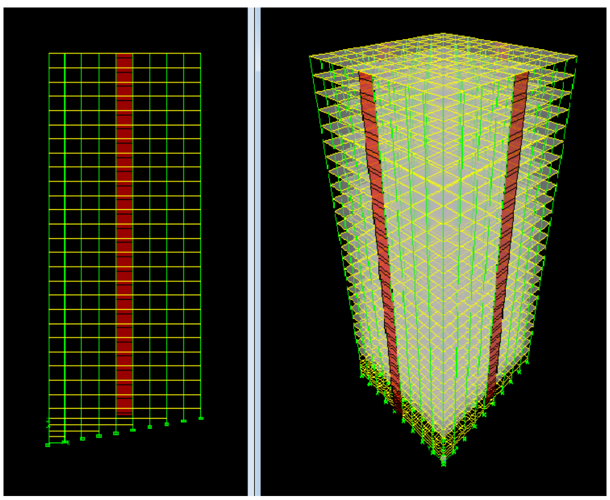

Fig. No. 1.6.24 Building resting on 20º sloping ground with step back configuration with shear wall at periphery.

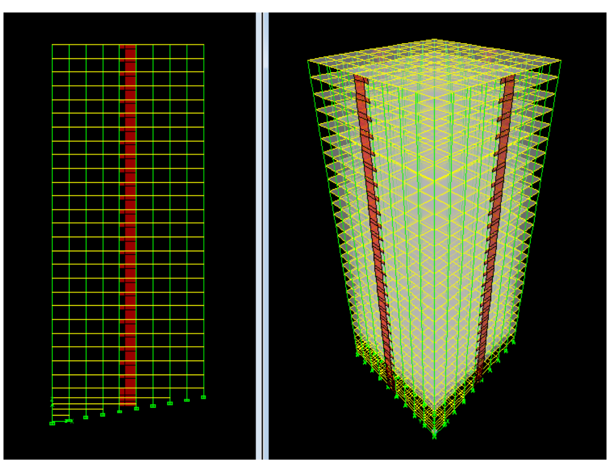

Fig. No. 1.6.25 Building resting on 20º sloping ground with step back configuration with shear wall at periphery with opening.

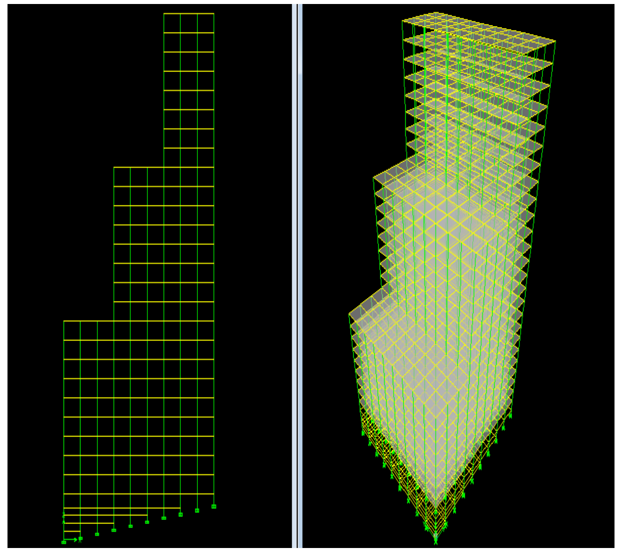

Fig. No. 1.6.26 Building resting on 20º sloping ground with set back with step back configuration without shear wall.

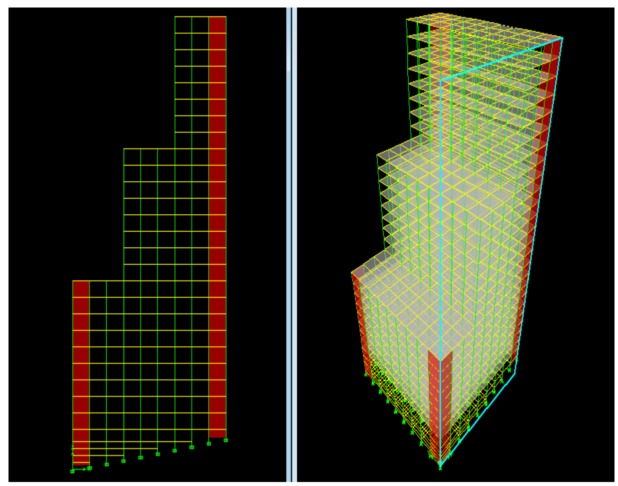

Fig. No. 1.6.27 Building resting on 20º sloping ground with set back with step back configuration with shear wall at corner.

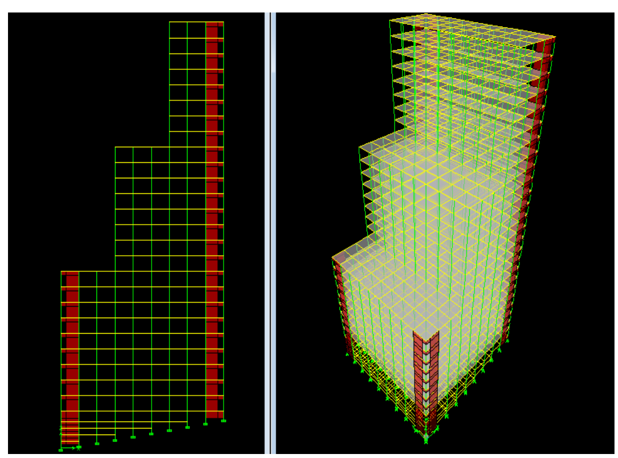

Fig. No. 1.6.28 Building resting on 20º sloping ground with set back with step back configuration with shear wall opening at corner.

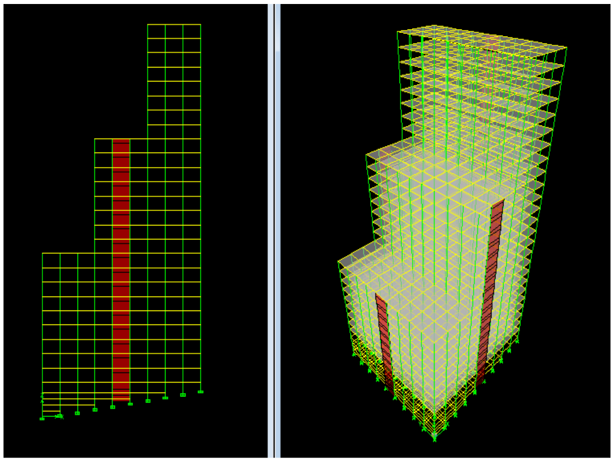

Fig. No. 1.6.29 Building resting on 20º sloping ground set back with step back configuration with shear wall at periphery.

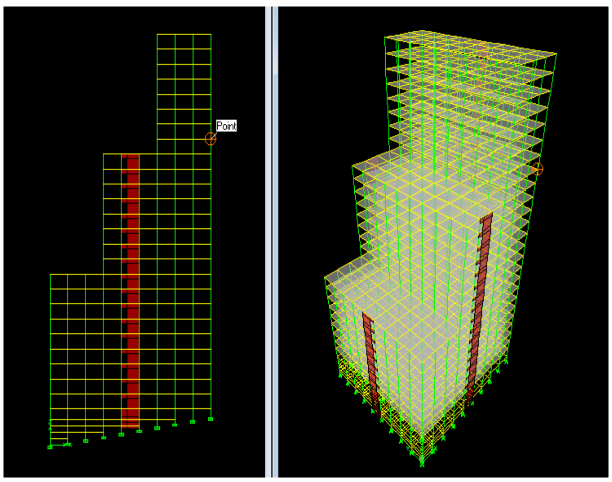

Fig. No. 1.6.30 Building resting on 20º sloping ground set back with step back configuration with shear wall at periphery with opening.

II. RESULTS

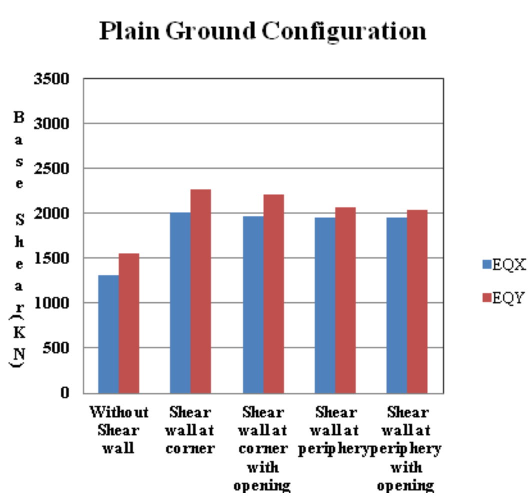

Fig. No. 2.1 Typical building model resting on plain ground base shear results.

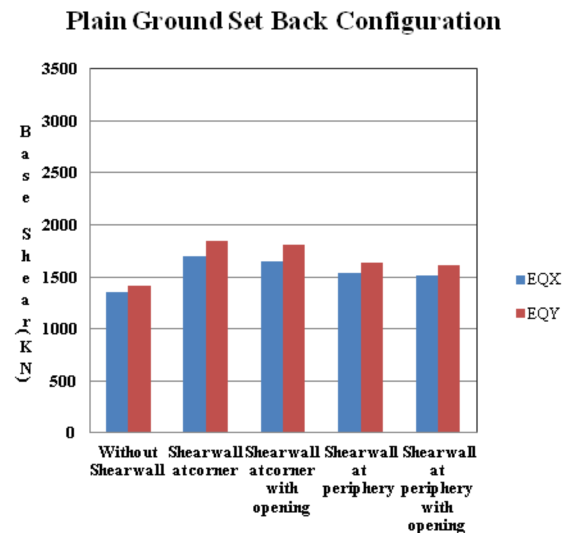

Fig. No. 2.2 Typical building model resting on plain ground with set back configuration base shear results.

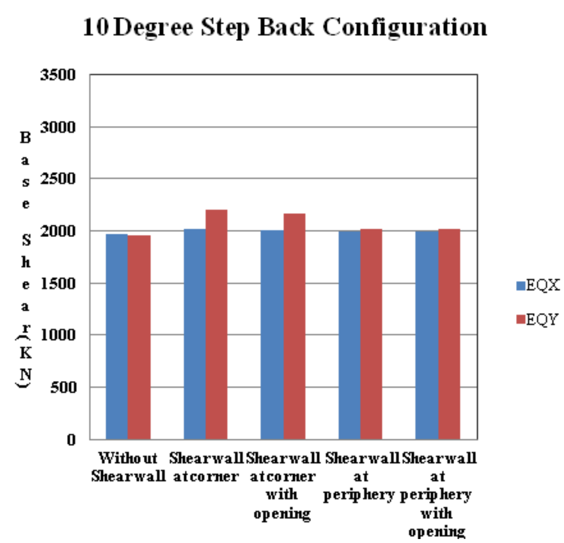

Fig. No. 2.3 Typical building model resting on 10 degree sloping ground with step back configuration base shear results.

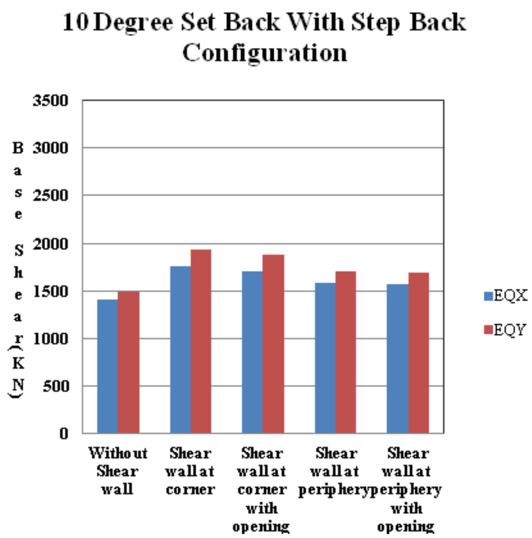

Fig. No. 2.4 Typical building model resting on 10 degree sloping ground with set back with step back configuration base shear results.

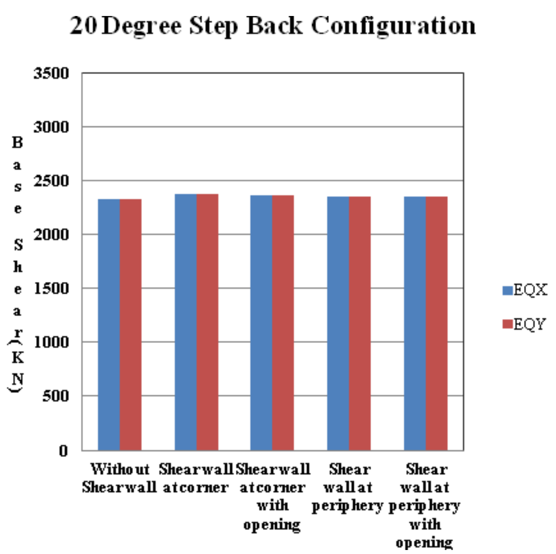

Fig. No. 2.5 Typical building model resting on 20 degree sloping ground with step back configuration base shear results.

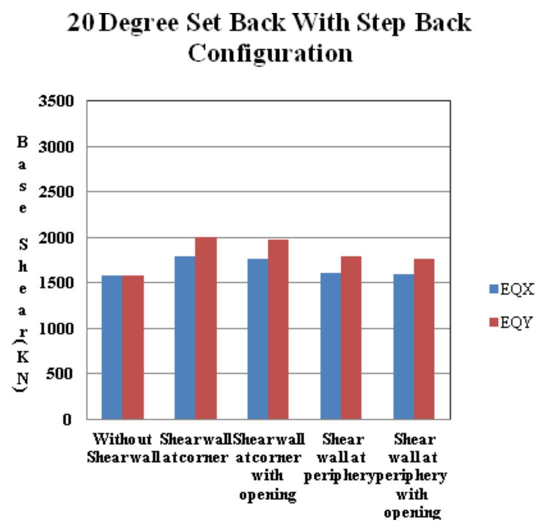

Fig. No. 2.6 Typical building model resting on 20 degree sloping ground with set back with step back configuration base shear results.

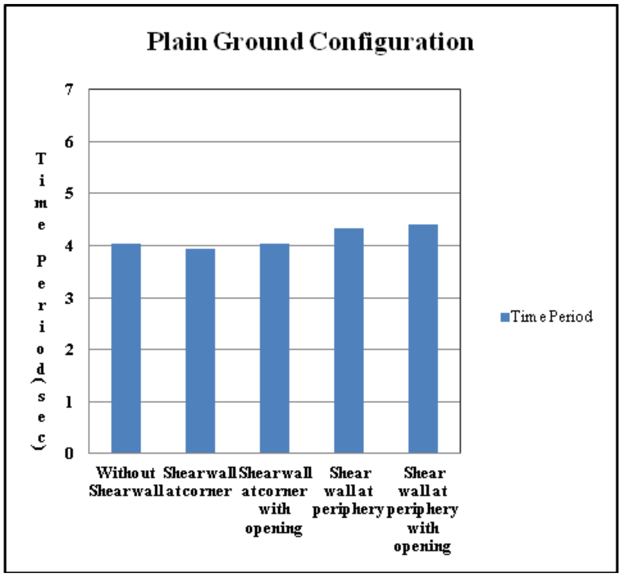

Fig. No. 2.7 Typical building model resting on plain ground time period results.

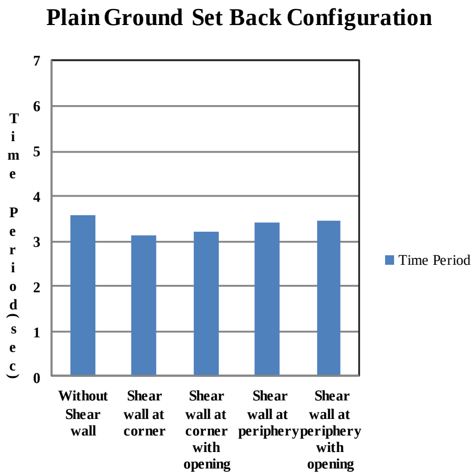

Fig. No. 2.8 Typical building model resting on plain ground set back configuration time period results.

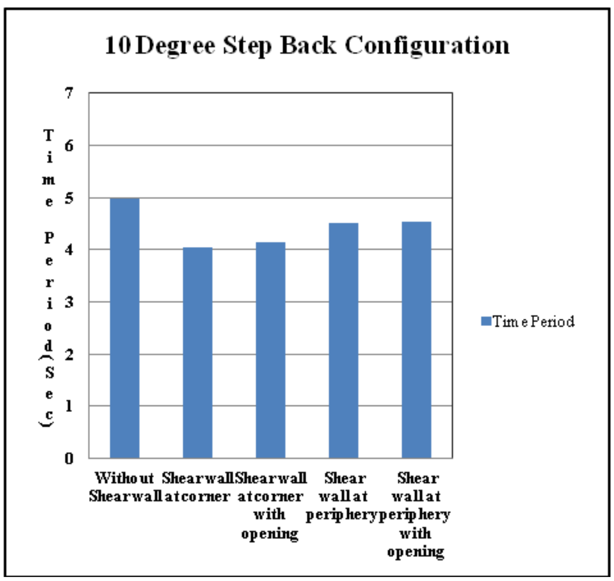

Fig. No. 2.9 Typical building model resting on 10 degree sloping ground with step back configuration time period results.

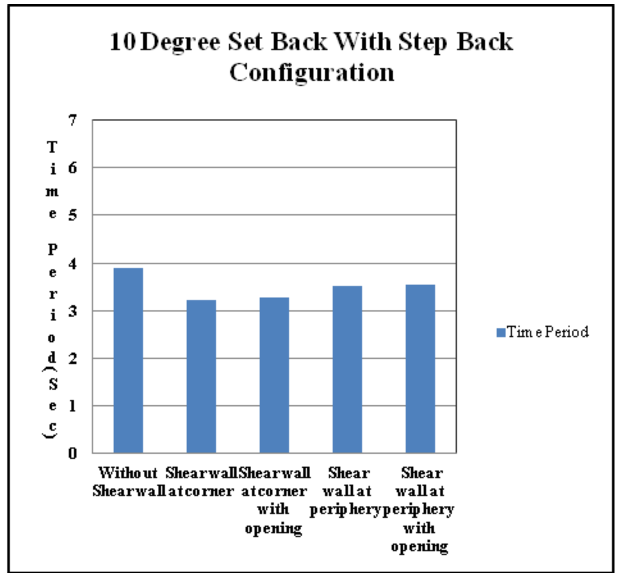

Fig. No. 2.10 Typical building model resting on 10 degree sloping ground with set back with step back configuration time period results.

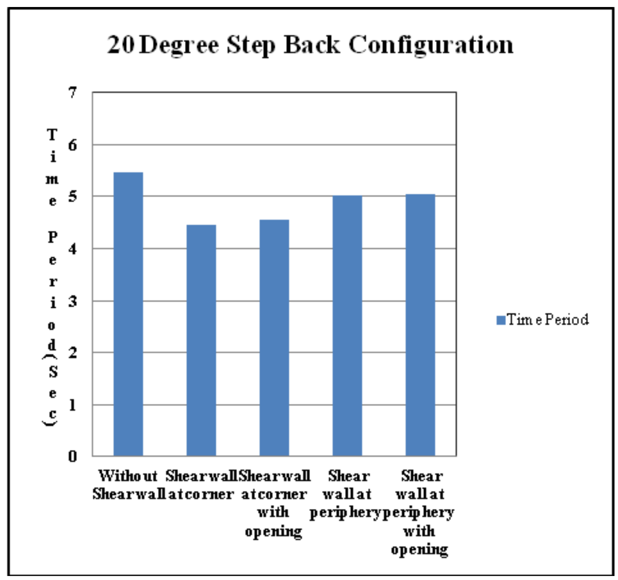

Fig. No. 2.11 Typical building model resting on 20 degree sloping ground with step back configuration time period results.

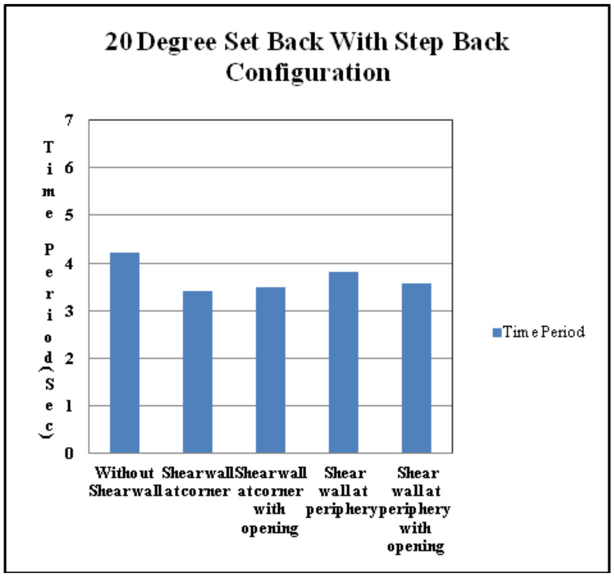

Fig. No. 2.12 Typical building model resting on 20 degree sloping ground with set back with step back configuration time period results.

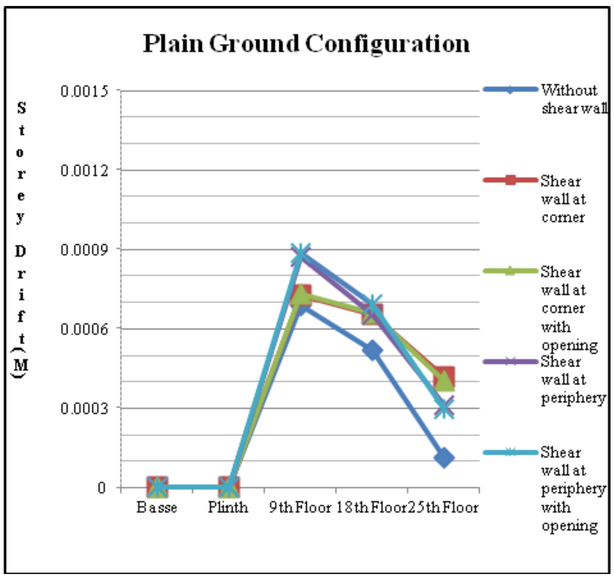

Fig. No. 2.13 Typical building model resting on plain ground storey drift results.

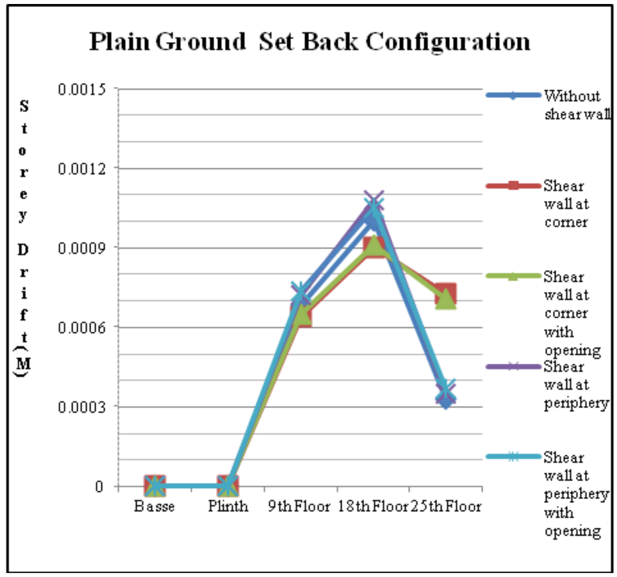

Fig. No. 2.14 Typical building model resting on plain ground set back configuration storey drift results.

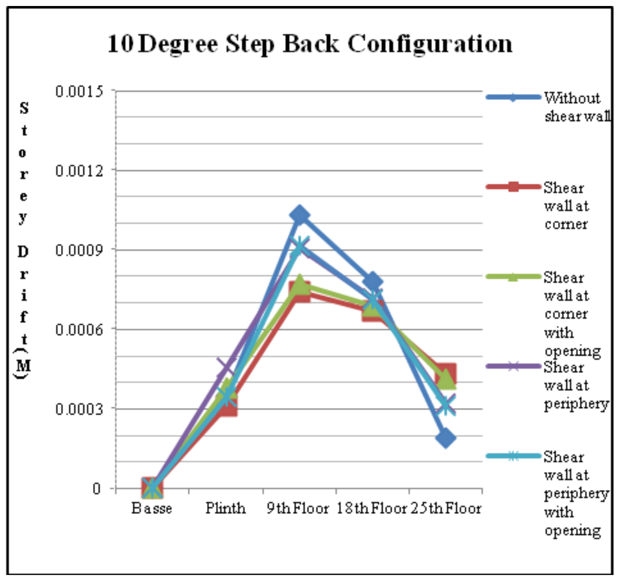

Fig. No. 2.15 Typical building model resting on 10 degree sloping ground with step back configuration storey drift results.

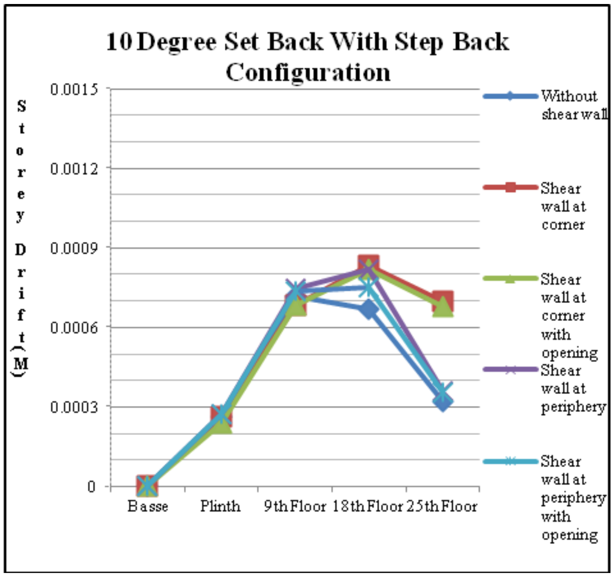

Fig. No. 2.16 Typical building model resting on 10 degree sloping ground with set back with step back configuration storey drift results.

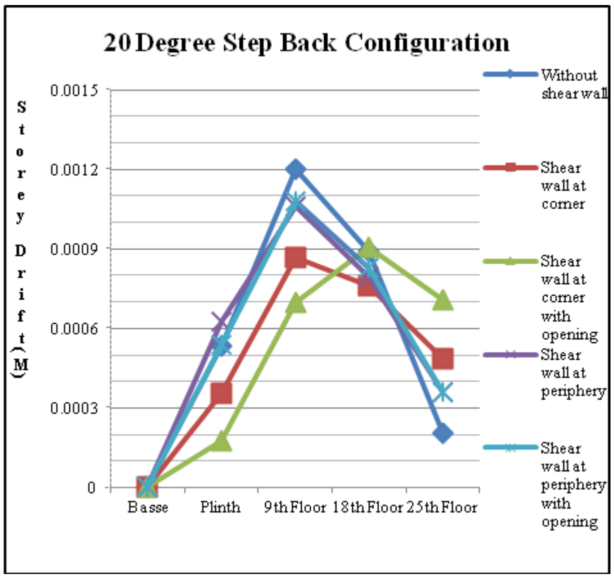

Fig. No. 2.17 Typical building model resting on 20 degree sloping ground with step back configuration storey drift results.

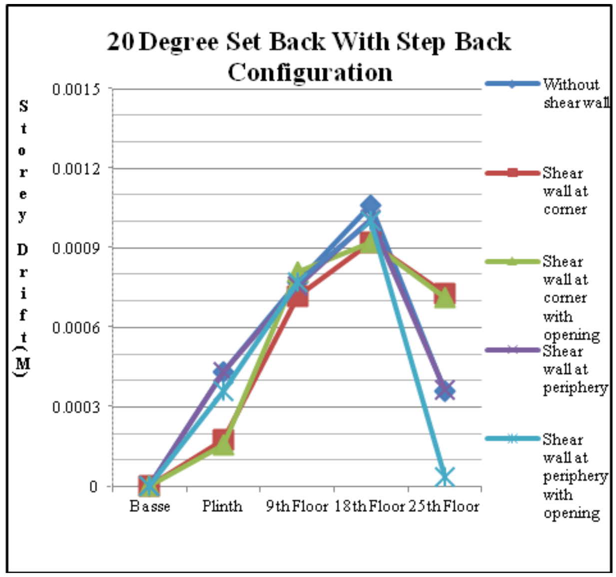

Fig. No. 2.18 Typical building model resting on 20 degree sloping ground with set back with step back configuration storey drift results.

III. CONCLUSION

1. For base shear plain ground without shear wall configuration is most effective.
2. For time period 20 degree step back configuration without shear wall is most effective.
3. For storey drift plain ground configuration without shear wall is most effective.
4. For sloping ground set back with step back configuration is most effective.

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