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Structural Analysis of Vertically Mass Irregular RC Frame Structure

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A B S T R A C T

Earthquakes are the most unpredictable and destructive among natural disasters and in recent years, the trend of tall buildings with complex planning and incorrect vertical rise is strongly evolving and challenges design engineers to develop these irregular structures to meet seismic loads, especially for torsional effects. However, it is difficult to assess the seismic behavior of irregular buildings. Distortions in buildings during an earthquake are caused by various causes, and the most common is the asymmetric distribution of mass and rigidity by height of the building.

Keywords:. Response, Irregular Structures, Asymmetric Structures And Seismic

1 INTRODUCTION:

Recent codes provide for counteracting these torsional effects by introducing random eccentricity, which should be considered during analysis and design. Particular care should be taken to ensure that torsional effects do not interfere with the plastic behavior of the structure. It is well known that the greater the eccentricity between the center of mass and the center of rigidity, the greater the torsional effects, which leads to greater displacement and drift in buildings. Another important aspect of building configuration is the inelastic behavior of asymmetric structures - it is the reasoning of the degree of control over inelastic rotation, and our main purpose of design will be to limit inelastic rotation.

2 REVIEW OF LITERATURE

Salunhe and Kanase (2017) investigated that the response to the mass irregular structure should be studied for the earthquake scenario. In this document, the researcher considers the structure framed by the RCC, both regularly and en masse irregularly, by different methods of analysis.

Oman Sayed (2017) focused his research on the effects of fillings and mass irregularities on different floors in LCD buildings. The results were made that brick filling increases the seismic performance of LCD buildings, and poor seismic reactions were demonstrated by a massive irregular building, so this should be avoided in seismic vulnerable regions.

Sagar et al. (2015) analyzed the results of work on the various types of irregularities under consideration, ie. (a) Horizontal irregularity of the plan (b) Vertical irregularity -Mass irregularity. To achieve the goal of the project, a method of analyzing the range of analysis and response was conducted.

Ramesh Konakalla (2014) analyzed four different 20-storey structures for the effect of vertical irregularity using dynamic loads using linear static analysis. The answer to all cases is compared and it is concluded that in the regular structure there is no torsional effect in the frame due to symmetry. The reaction to vertically irregular buildings differs for columns that are located in a plane perpendicular to the action of force. This is due to the rotation of the torsion in the structure.

3 MODELING

Following models of building with vertical mass irregularity are prepared using STAAD software:

i.) Model-I (G+6-Zone-II)

ii.) Model-II (G+6-Zone-III)

iii.) Model-III (G+6-Zone-IV)

iv.) Model-IV (G+6-Zone-V)

v.) Model-V (G+10-Zone-II)

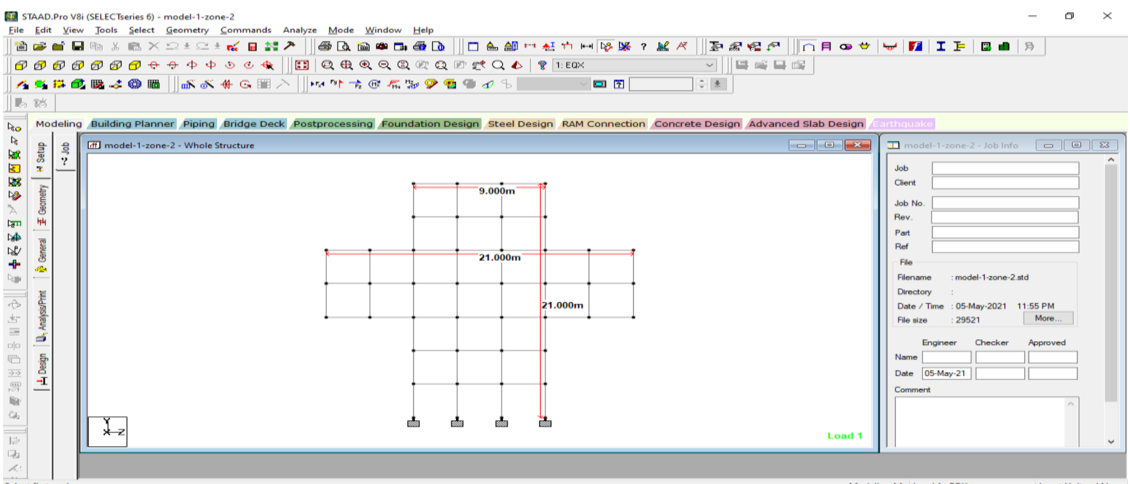

Figure 1:Elevation of model-I

The above figure shows the elevation of model-I giving the details of dimensions used in the model.

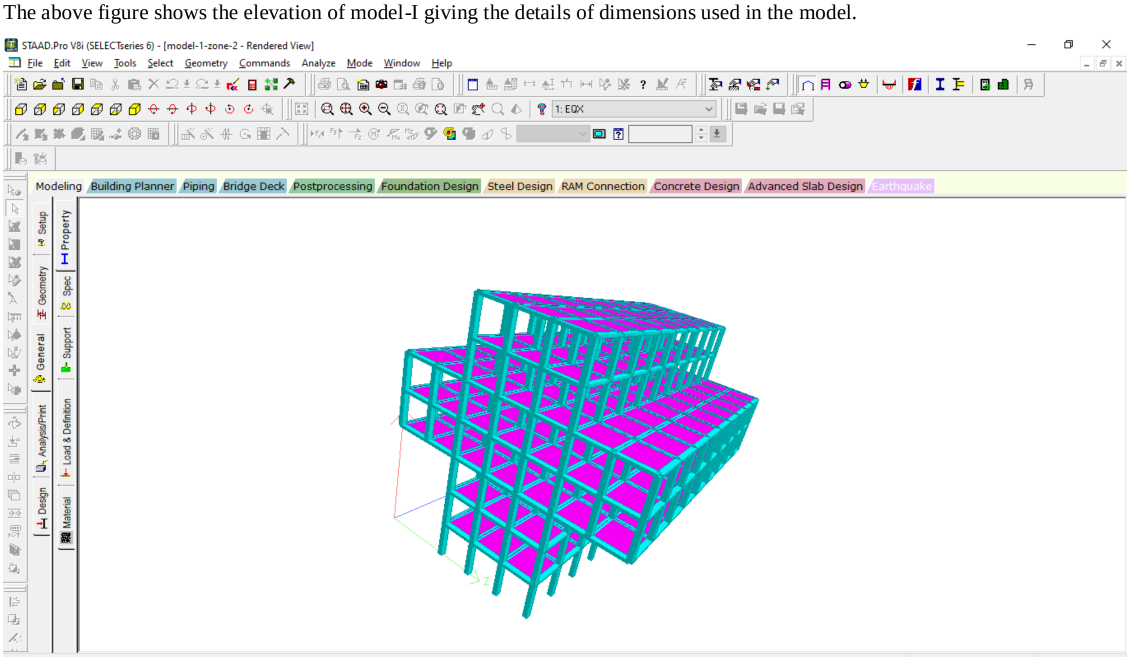

Figure 2: 3D structure of model-II

The above figure shows the 3D structure of model-II showing the details of the model.

4 RESULTS

The analysis is carried out in STAAD-PRO software and the results in terms of shear force, bending moment and other parameter is obtained as follows.

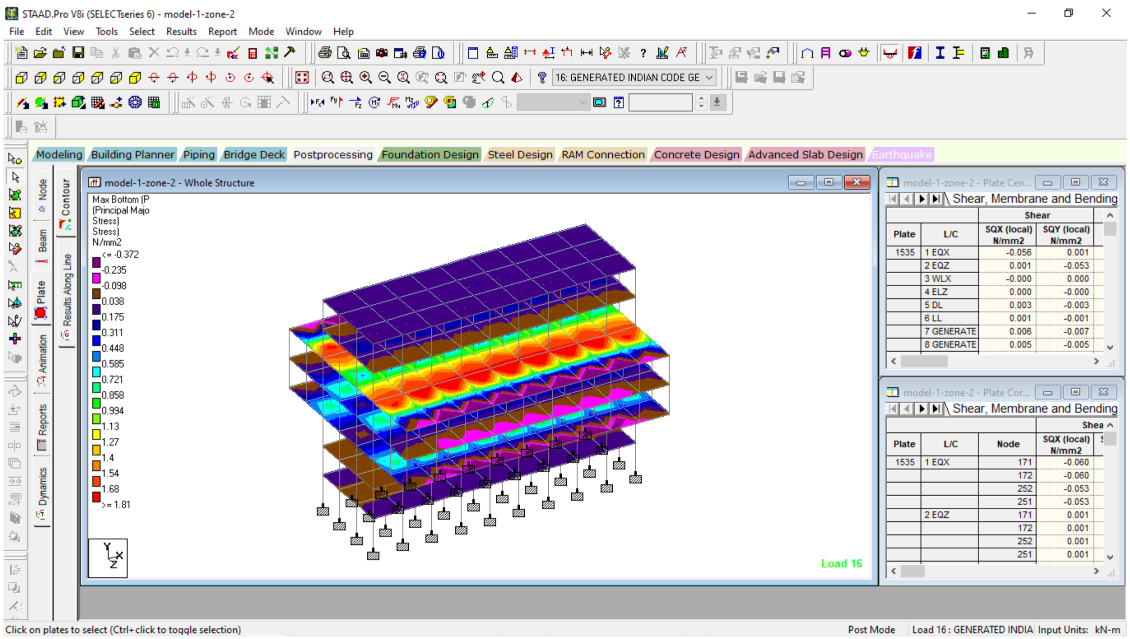

Figure 3:Maximum bottom principal major stresses for model-I

The above figure shows the Maximum bottom principal major stresses for model-I and the maximum value obtained is 1.81 N/mm^2.

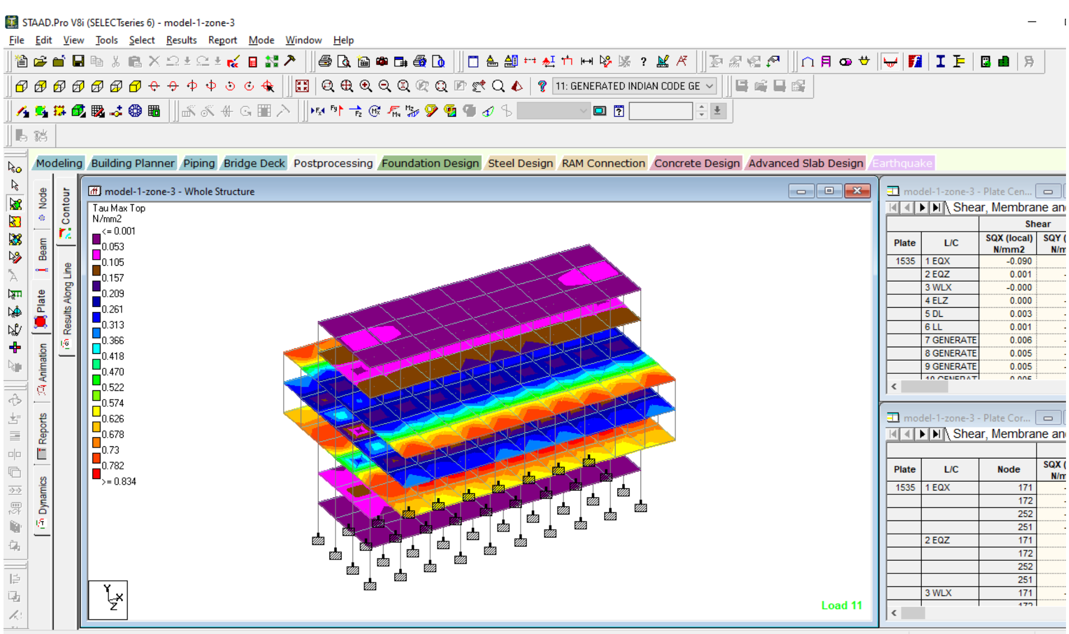

Figure 4:Tau max (top) stress for the model-II

The above figure shows Tau max (top) stress for the model-II and the maximum value obtained is 0.834 N/mm^2.

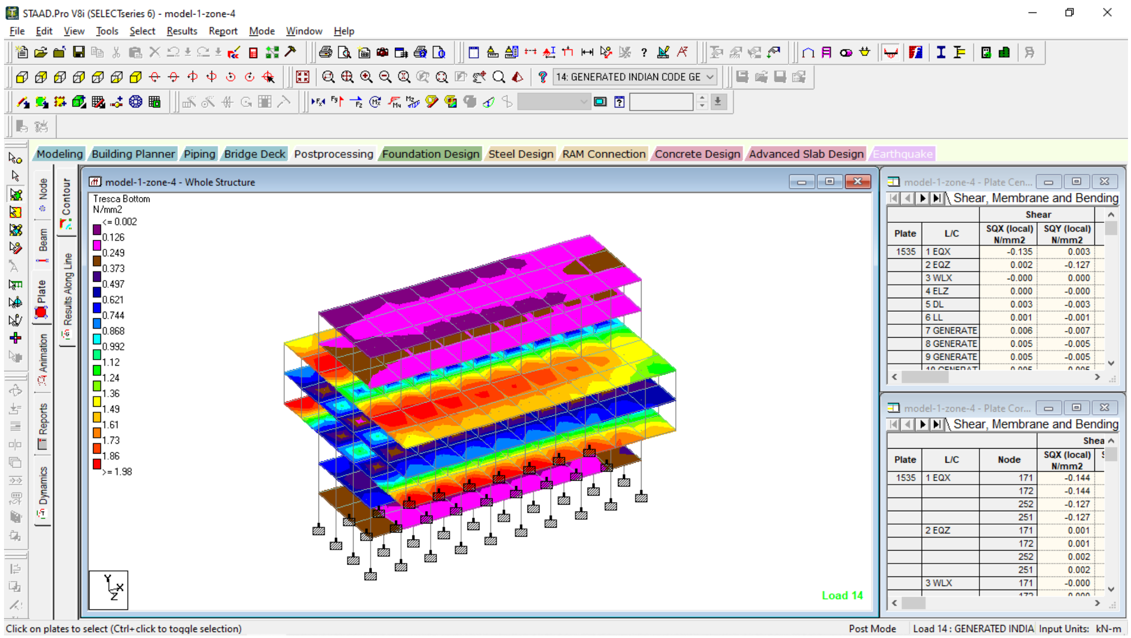

Figure 5:Tresca bottom stress for the model-III

The above figure shows Tresca bottom stress for the model-III and the maximum value obtained is 1.98 N/mm^2.

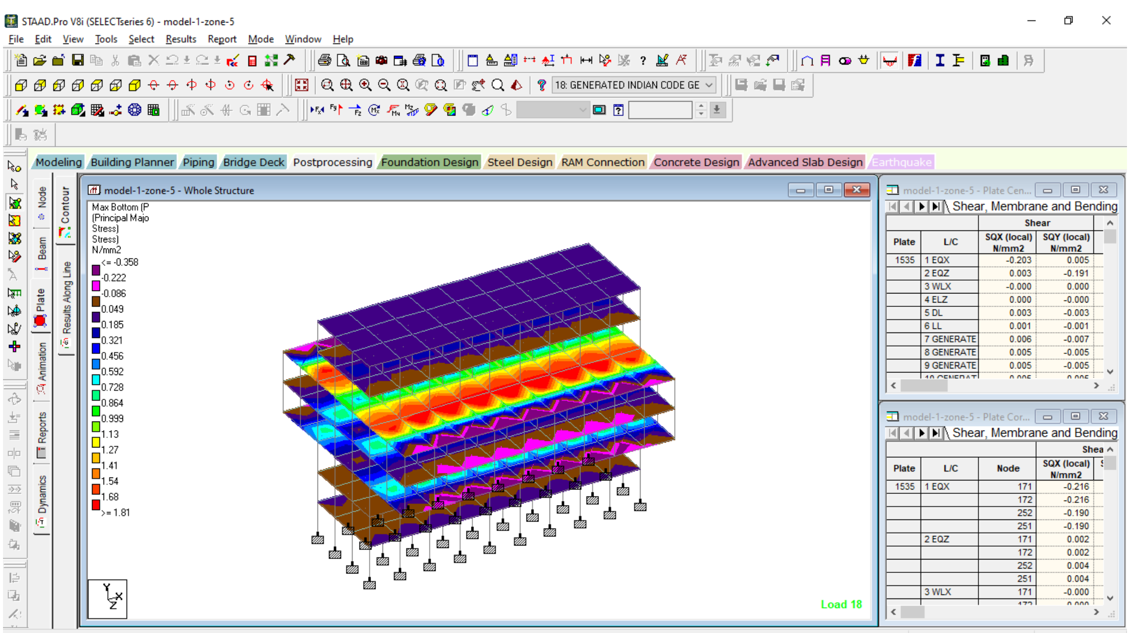

Figure 6:Maximum bottom principal major stress for the model-IV

The above figure shows Maximum bottom principal major stress for the model-IV and the maximum value obtained is 1.81 N/mm^2.

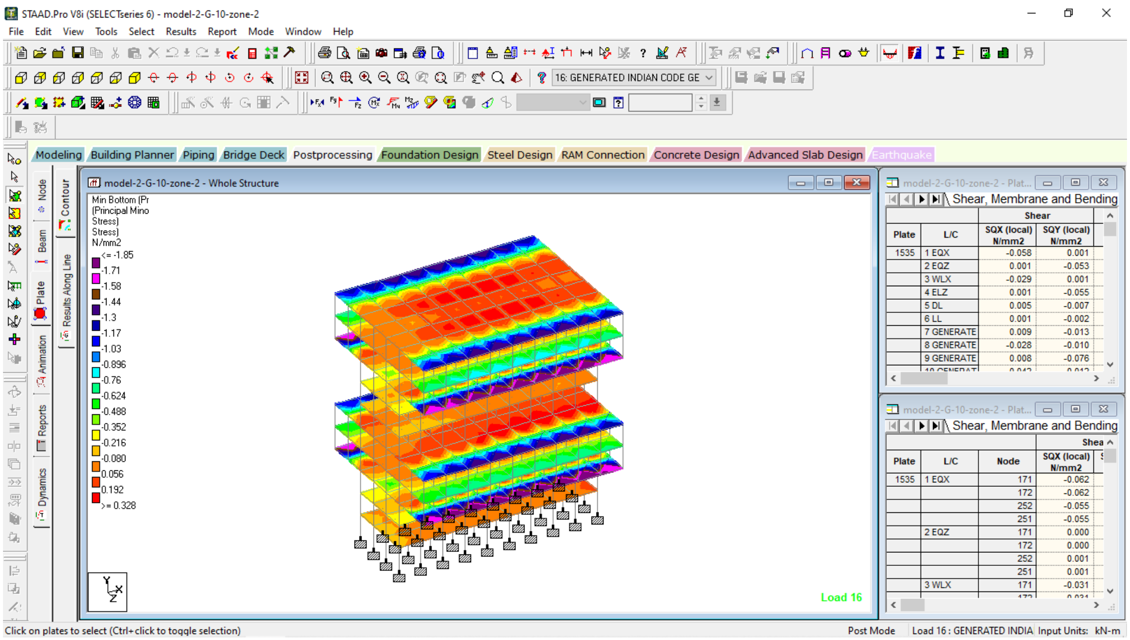

Figure 7:Minimum bottom principal major stress for the model-V

The above figure shows Minimum bottom principal major stress for the model-V and the maximum value obtained is 0.328 N/mm^2.

5 CONCLUSION:

The conclusions from the above study are as follows:

i.) FromThe above graph it shows Minimum bottom principal major stress for the model-V and the maximum value obtained is 0.328 N/mm2.

ii.) The above results show Maximum bottom principal major stress for the model-IV and the maximum value obtained is 1.81 N/mm2.

iii.) The above result shows Tresca bottom stress for the model-III and the maximum value obtained is 1.98 N/mm2.

iv.) The above results shows the Comparison of Average Drift for all models for all models and it is observed that the Average Drift is maximum in the model-5.

v.) The above results shows the Comparison of Mass participation factor (%) for all models and it is observed that the Mass participation factor (%) is maximum in the model-5

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