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Seismic Analysis of High Rise Building with Soft Stories at Different Locations

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ABSTRACT - Due to increasing population, vehicle parking space in residential apartments as well as in commercial towers, is a matter of major concern. Hence, in modern multistory constructions trend is been to utilize one of the storeys as a parking. But this type of feature is very undesirable in highly earthquake prone zones; this has been verified from past history and study of earthquakes. This open story in building is termed as "SOFT STOREY". In this thesis we are concentrating on finding the best place for soft stories in multistory building. For that, we are considering different positions of soft storey. The various models considered will be compared for shear force, bending moment, deflection and storey drift. Equivalent static analysis will be performed by using STAAD-pro software package.

Keywords: soft stories, high rise, seismic analysis

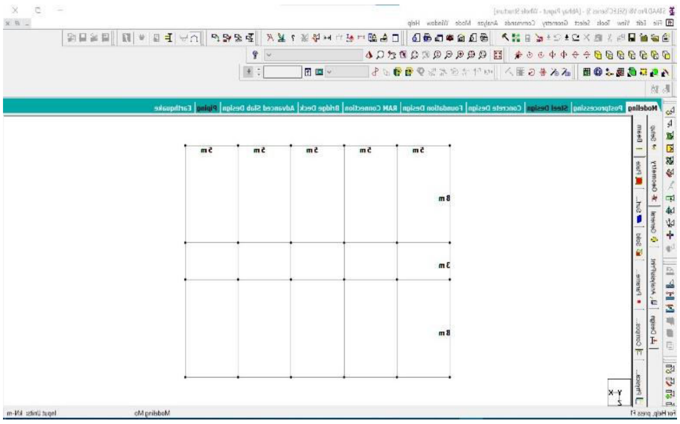
1. INTRODUCTION

The soft story occurrence, which is one of the most hazardous vertical irregularities in buildings, will be investigated in this study. The main objectives of this study is to perform earthquake analysis of G+14 RC framed building with soft storey at ground floor, eighth floor and fifteenth floor.

2. PLANNING & MODELLING

In the Present study it involves to find the optimum location of a single soft story in a G+14 RCC tall building. The project is been carried out using the software STAAD-pro. In total 3 models are created namely T1, T2, T3 are the models with single soft story at different locations in the building. Analysis of each of the models were done and the results were compared with each other and the respective graphs where been obtained.

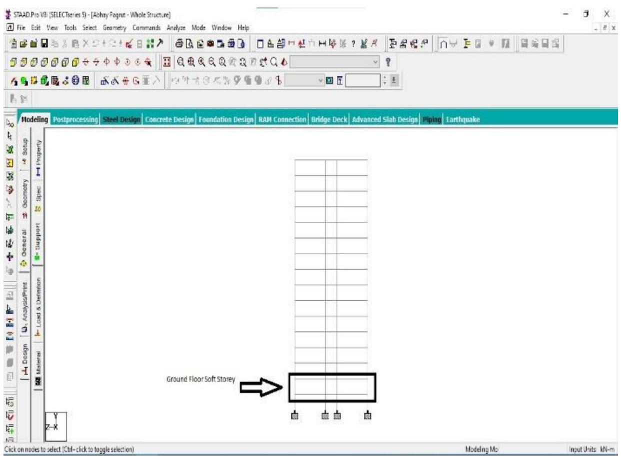
Proposed Plan



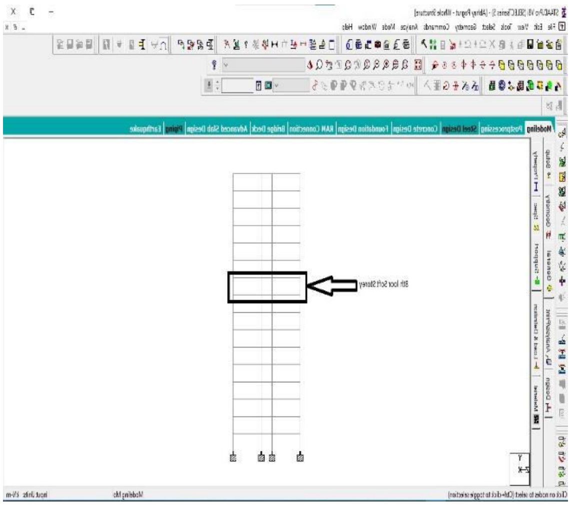
Analytical Models

G+14 RC framed building with soft storey at three different locations as shown in Fig

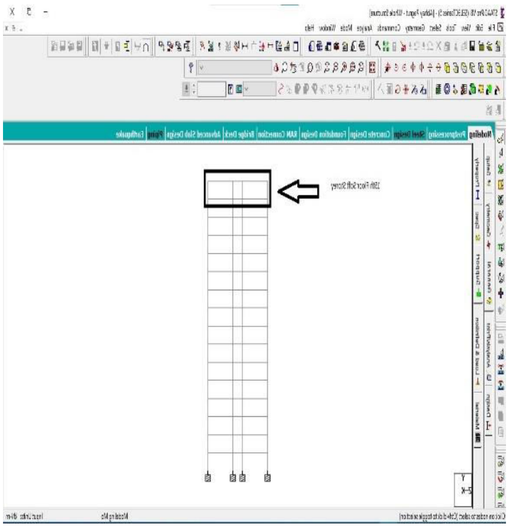
A. Model No.1 with soft storey at Ground Floor



B. Model No.2 with soft storey at Eight Floor



C. Model No.3 with soft storey at Top Floor.



Assigned Loads

After having modeled the structural components, load cases are assigned as follows:

Gravity Loads

Gravity loads on the structure include the self-weight of beams, columns, slabs, walls and other permanent members.

Wall Load

Wall load on floor levels = 20×0.23×2.4 = 11.04 kN/m (wall height = 2.4m)

Live Loads

Live loads = 3 kN/m^2

The Seismic Loads

The seismic loads of each floor is its full dead load plus appropriate amount of imposed load and horizontal earthquake load in both horizontal directions as per IS 1893(Part 1):2002.

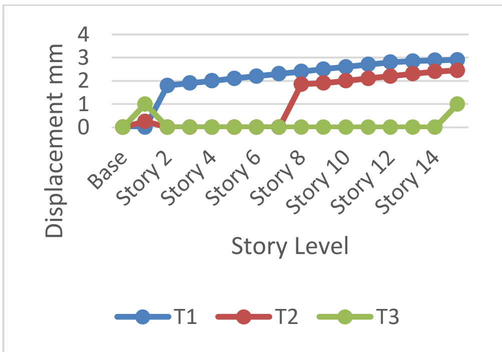
Load Combinations

Here, LL- Live load, DL- Dead Load, EX- Earthquake load in X-direction, EZ- Earthquake load in Z-direction.

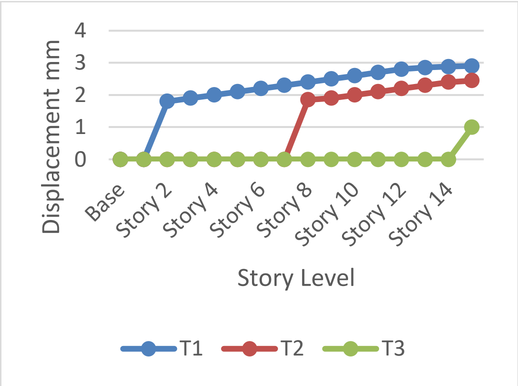
1) 1.5(DL)
2) 1.5(DL+LL)
3) 1.2(DL+LL+EX)
4) 1.2(DL+LL-EX)
5) 1.2(DL+LL+EZ)
6) 1.2(DL+LL-EZ)
7) 1.5(DL+EX)
8) 1.5(DL-EX)
9) 1.5(DL+EZ)
10) 1.5(DL-EZ)
11) 0.9DL+1.5EX
12) 0.9DL-1.5EX
13) 0.9DL+1.5EZ
14) 0.9DL-1.5EZ

3. Analysis & Results

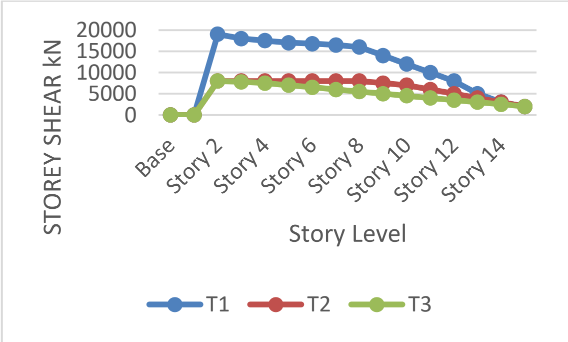
A study is done on the behavior of soft story at different locations of a multistory building. The results are calculated in term of displacement, story drift and story shear



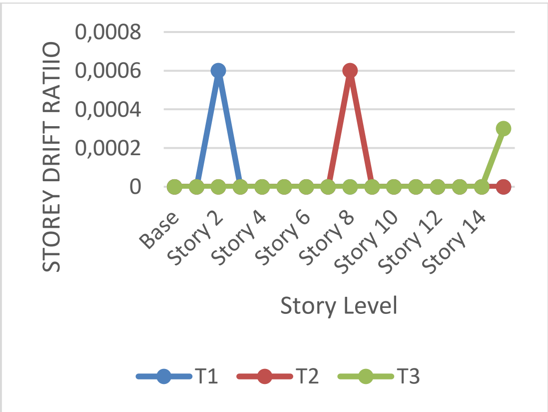
Displacement in X-Direction



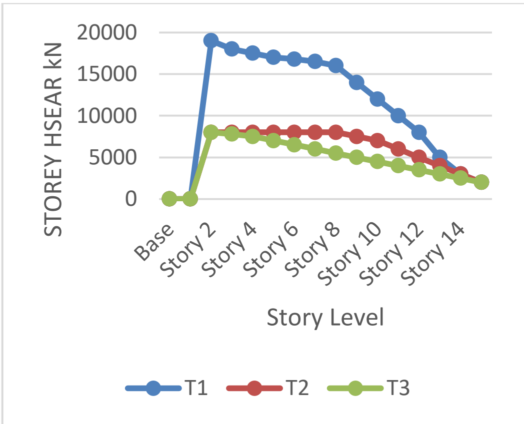
Displacement in Y-Direction



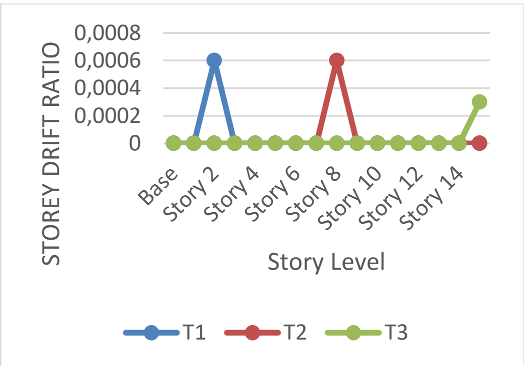
Storey Shear in X-Direction



Storey Drift Ration in X-Direction



Storey Shear in Y-Direction



Storey Drift Ratio in Y-Direction

4. CONCLUSION

RC frame buildings with soft story perform poorly during strong earthquake shaking. Though the soft storey is an unavoidable feature now a day, its location, number and curtailment of infill wall acts an important factor for the soft story structures to displace during earthquake.

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