# Time History Analysis of High Rise Building with Different Shapes in Plan

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*Abstract*— This paper aims to analyze ten sorey high rise building with different shapes in plan, using Time history method. Several frames were modeled in ETABS software and analyzed considering El Centro earthquake 1940. Various response parameters like base shear, storey drift and lateral displacement were found. It was observed that the various parameters such as base shear, storey drift and lateral displacement varies with different shapes of building.

***Key words:*** High Rise Building, ETABS, Time History Analysis

## I. Introduction

Now a days there a new generation of tall buildings which are slender and light. This is possible because of high strength materials, design procedures and computational methods. These buildings usually designed for commercial use as well as offices, by consuming very small space. With this architectural history also changing rapidly, this leads to the rapid growth of population in urban areas, which results in increasing demands in business activities leads to the change in shapes of the structure to do large quantity of things in small space. The high costs of the land in urban areas and to prevent agricultural production and disorganized expansion, the concept of tall buildings are implemented. Today all major cities consist of tall buildings. Irregularities in plan is related to in plan asymmetrical mass, stiffness and/or strength distributions, causing a substantial increase of the torsional effects when the structure is subjected to lateral forces, on the other hand irregularities in elevation involves variation of geometrical and/or structural properties along the height of the building, generally leading to an increase of the seismic demand in specific storey.

## II. Analysis

I have developed 5 models in ETABs software. The geometrical loading data, plan area, seismic data for each of the six models are kept sameto achive a behaviour pattern . These 5 models are shaped by considering Plan irregularities i.e. plan area for each structure is same only there is difference in geometry.

| | |
|---|---|
| L shape | T shape |
| I shape | H shape |
| U shape | |

Table 2.1: The specified shapes of models are as follows:

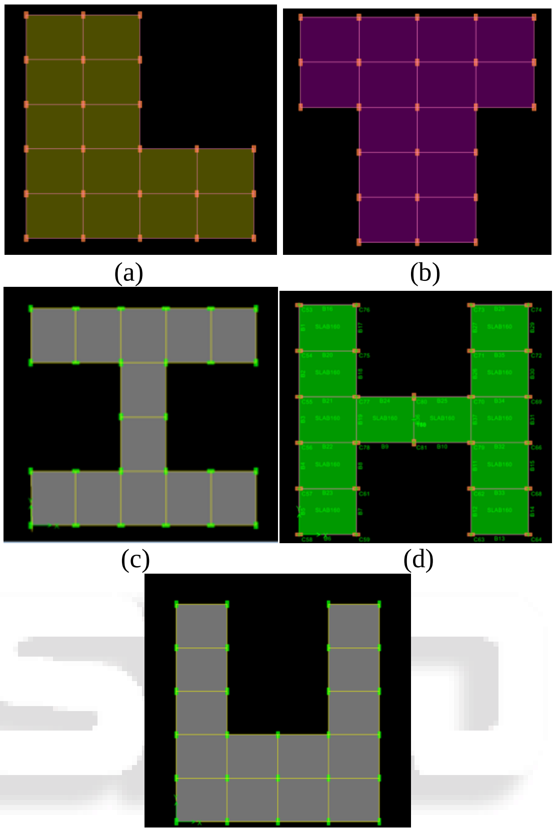



Fig. 2.1: Plan (a) L shape (b) T shape (c) I shape (d) H shape (e) U shape of the Building

Specifications for all models are same and are given as follows:

| | |
|---|---|
| Live Load | 3 KN/m$^2$ |
| Roof Live Load | 1 KN/m$^2$ |
| Floor Finish | 1 KN/m$^2$ |

Table 2.2: loading data

| | |
|---|---|
| Earthquake Zone | III |
| Damping Ratio | 5% |
| Importance factor | 1 |
| Type of Soil | Medium Soil |
| Type of structure | All General RC frame |
| Response reduction Factor | 5 [SMRF] |
| Time Period | As per IS 1893-2002 |

Table 2.3: Seismic data

| | |
|---|---|
| Density of RCC considered | 25 kN/m$^3$ |
| Thickness of slab | 160 mm |
| Depth of beam | 380 mm |
| Width of beam | 300 mm |
| Dimension of column | 300mm x 450 mm |
| Density of infill | 20 kN/m$^3$ |
| Thickness of wall | 230 mm |

| | |
|---|---|
| Height of each floor | 3m |
| Conc. Cube Comp. Strength, fy | 20000 N/mm$^2$ |
| Reinforcement yield strength, fy | 415000 N/mm$^2$ |

Table 2.4: Geometric data

## III. MODELLING IN ETABS

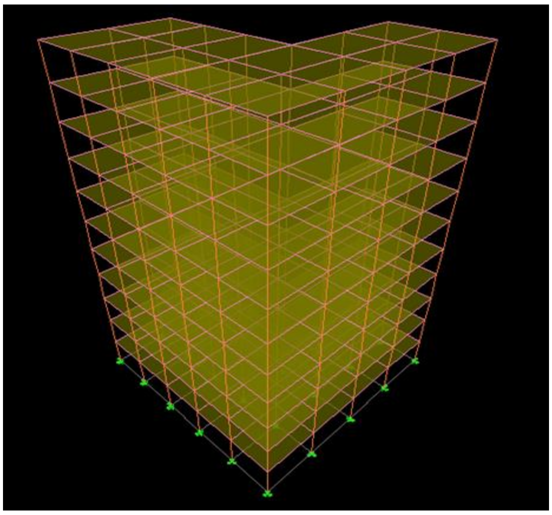


Fig. 3.1: 3-D View of L shape building

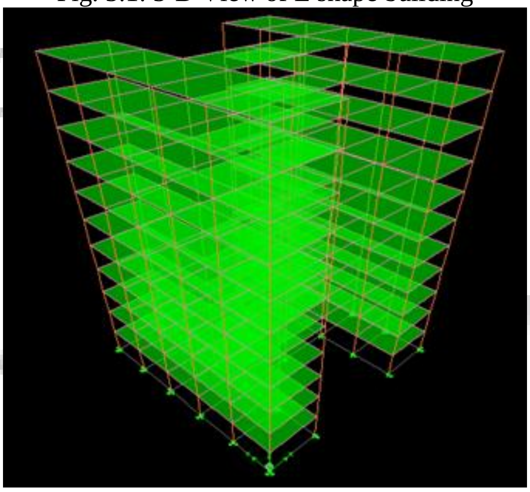


Fig. 3.2: 3-D View of H shape building

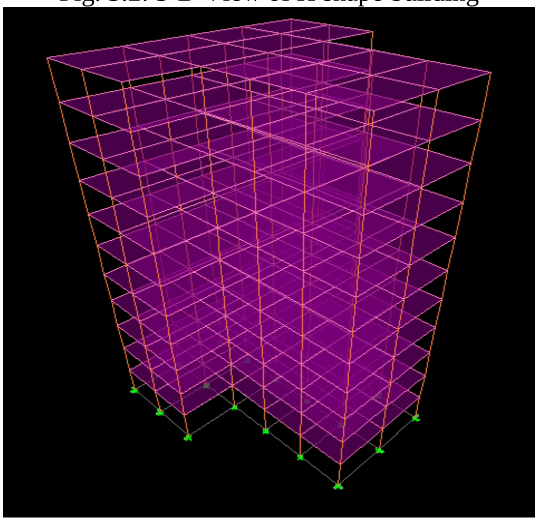


Fig. 3.3: 3-D View of T shape building

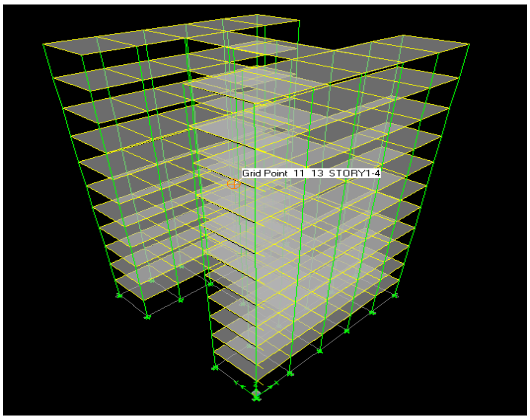



Fig. 3.4: 3-D View of the I shape building

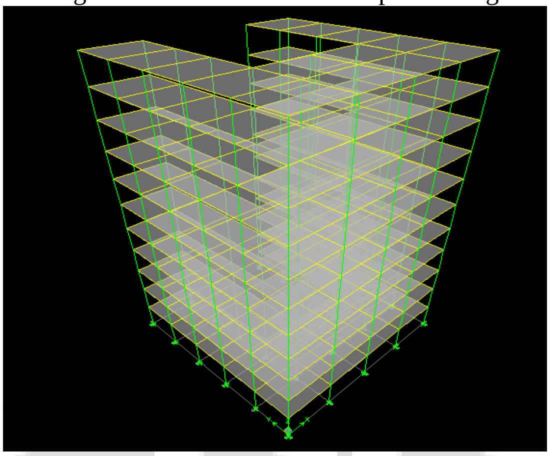
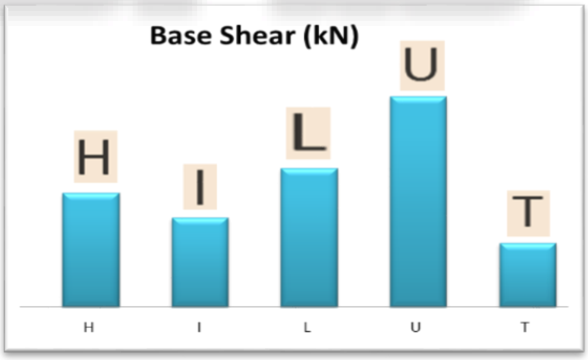


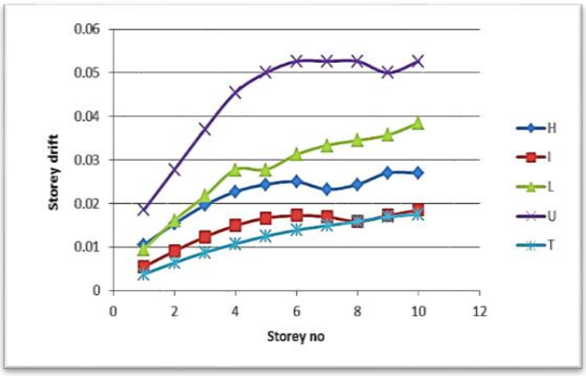
Fig. 3.5: 3-D View of U shape building

## IV. RESULTS

### *A. Comparison of Base shear for all models*

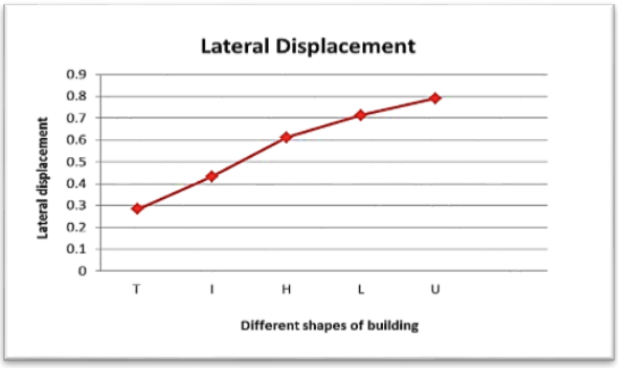



### *B. Comparison of Storey Drift for all models*



### C. Lateral displacement for all models




## V. CONCLUSION

- It is observed that, base shear for U shape model is maximum and for T shape model, it is minimum as compare to all other models.
- It is observed that, storey drift for U shape model is maximum and for T shape it is minimum as compare to all other models. From this it is observed that, storey drift increases with storey height.
- It is observed that, Lateral displacement for U shape model is maximum and for T shape it is minimum as compare to all other models.
- It is observed that base shear and storey drift increases as the no of storey increases. About time period it is observed that as mode no increases time period decreases.

## REFERENCES

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