# Analysis of An Unsymmetrical Building Subjected to Wind Loading Using E-TABS

Siddharth Jain[1], Prof. Vijay Kumar Shrivastava[2], Prof. Yogesh Kumar Bajpai[3]

[1]*M-Tech Student of Structural Engineering in Gyan Ganga Institute of Technology & Sciences Jabalpur, RGPV University Bhopal, India*
[2]*Asst.Prof. Department of Civil Engineering in Gyan Ganga Institute of Technology & Sciences, Jabalpur*
[3]*HOD, Department of Civil Engineering Gyan Ganga Institute of Technology & Sciences , Jabalpur*

***Abstract – This research paper present the comparative analysis between different parameters for an unsymmetrical multi-storey building subjected to wind forces . In this study two different cases are prepared and the comparative discussion between different parameters such as lateral displacements, storey drift index are discussed. Whole analysis is done on E-TABS 9.7.4***

***Keywords: Multi-storey building, Storey drift index, Lateral displacement.***

## I. INTRODUCTION

This research paper shows the shear wall importance in multi-storey building. In this work analysis of G+13 unsymmetrical planned multi-storey building is considered. Complete analysis is done on E-TABS 9.7.4 . Two different models are prepared for the analysis, The models are-

MODEL-1 BEAM COLUMN FRAMED STRUCTURE (BARE FRAME)

MODAL-2 SHEAR WALL STRUCTURE

## II. PROBLEM FORMULATION

The bare frame of G+13 R.C.C. structure in medium soil has different sizes of parameters are shown table-1.1

| Sr. No. | Structural Data | Property |
|---|---|---|
| 1 | Concrete Grade | M30 |
| 2 | Type OF Material | Isotropic |
| 3 | Mass Per Unit Volume | 2.5KN/$m^3$ |
| 4 | Modulus of Elasticity | 27 KN/$m^3$ |
| 5 | Poisson's Ratio | 0.2 |
| 6 | Concrete Strength | 30 Mpa |
| 7 | Shear Wall Thickness | 200 mm |
| 8 | R C wall above door in structural wall system | 200mmx900 mm |
| 9 | Slab Thickness | 125 mm |
| 10 | Sunk Slab Thickness | 145 mm |
| 11 | Stair Slab Thickness | 150 mm |
| 12 | Tensile Reinforcement | 500 |
| 13 | Shear Reinforcement | 500 |
| 14 | Number of Stories | G+13 |
| 15 | Depth of Foundation | 2m |
| 16 | Storey Height | 3m |
| 17 | Beam size in Conventional system (B1) | 200mmx600 mm |
| 18 | Seismic coefficient as per IS :1893-2000 | |
| | Seismic zone | III |
| | Seismic Zone Factor | 0.16 |
| | Soil Type | II (Medium) |
| | Importance Factor (I) | 1 |
| | Response Reduction Factor | 3 |
| 19 | Wind Coefficient as per IS :875 | |
| | Risk Coefficient (k1) | 1 |
| | Terrain Category , Height , Structure Size (K2) | 2 |
| | Structure Class | B |
| | Topography Factor (K3) | 1 |
| | Location | Jabalpur |
| | Basic Wind Speed | 47 m/s |
| 20 | Dead Load | |
| | SDL (Super imposed dead load)on all Slabs | 1.5 KN/$m^2$ |
| | SDL (Super imposed dead load) on sunk & Stair case | 4 KN/$m^2$ |
| 21 | Live Load | |
| | Live Load on Slab or FLoors | 2 KN/$m^2$ |
| 22 | Live Load on Sunk Slab, Stair Slab | 2 KN/$m^2$ |

Figure 1.1 Beam column framed structure (Bare frame structure)

Figure 1.2 Shear wall Structure

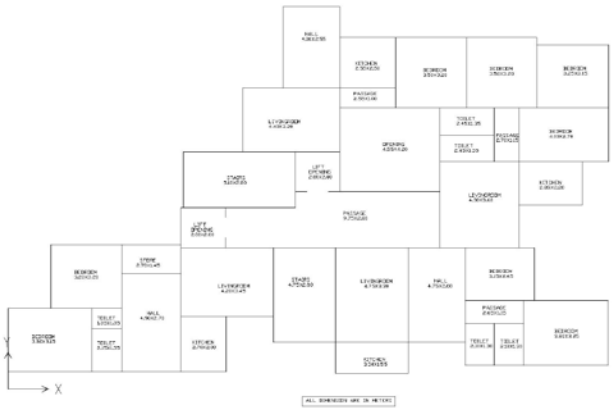

Figure 1.3 Structure showing dimensions

## III. PROPOSED METHODOLOGY

i. The complete analysis is done on E-tabs software packages.

ii. Changes the unit in unit window which is located at bottom-right corner of the E-TABS main window.

iii. In this software a centerline drawing of plan which is drawn on auto cad and imported in ETABS.

iv. After the gridlines are made for different co-ordinates system boundary conditions are assigned on the nodes.

v. Giving material properties for concrete and steel for different beam column sections.

vi. Defining wind parameters as stated in problem formulation.

There are two models are used for the analysis as shown below–

MODEL-1 BEAM COLUMN FRAMED STRUCTURE (BARE FRAME)

MODAL-2 SHEAR WALL STRUCTURE

## IV. RESULTS

1. Table 1.2 shows the comparative results between lateral displacements and storey drift index.

Table 1.2

| COMPARATIVE RESULTS OF DIFFERENT MODELS SUBJECTED TO WIND FORCES | | | | |
|---|---|---|---|---|
| S.NO. | MODEL NO. | MODEL TYPE | MAXIMUM DISPLACEMENT AT TOP IN mm | STOREY DRIFT INDEX AT TOP |
| 1 | MODEL -1 | BARE FRAME | 39.5 | 0.000434216 |
| 2 | MODEL -2 | SHEAR WALL STRUCTURE | 0.5 | 0.000109195 |

2. In figure 1.4 shows the graphical representation of lateral displacements due to wind forces.

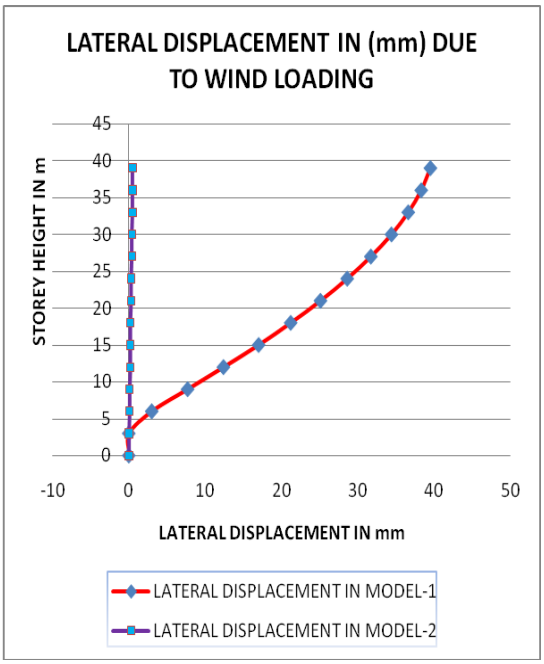


Figure 1.4 Lateral displacements in mm due wind loading

3. In figure 1.5 shows the graphical representation of storey drift index due to wind forces.

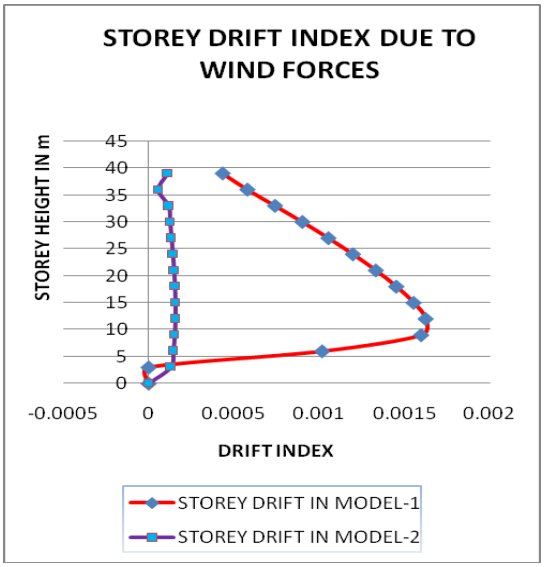


Figure 1.5 Storey drift index due to wind loading

## V. CONCLUSION

1. The result showing maximum lateral displacement in model-2 is 0.5mm and in model-1 it is 39.5mm ,these results shows that model-2 is more stiff against the lateral loads.
2. In model-2, about 98.% less displacement than model-1.
3. In Model-2 the storey drift index is 74% less than model -1 which is very important in multi-storey building preventing the damage of internal partition.
4. It is concluded that shear wall frame structure is more reliable against lateral displacements and storey drift index.

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