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# DESIGN AND ANALYSIS OF MULTISTORY BUILDING WITH AND WITHOUT FLOATING COLUMN

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**Abstract -** *The floating column is a vertical member which rest on a beam but doesn't transfer the load directly to the foundation. Floating column act as the point load which act over a beam and thid beam tranfer its load to other adjecnt column. The column may start off on any of the intermideate floor beam while it is resting over a beam.*

***Key Words***: Columns, Floating Columns ,G+12, STADD Pro.

## 1.INTRODUCTION

A floating column is a structural element in a building that is not rigidly connected to the foundation or the structure below it. Instead, it is supported by other structural elements such as walls or beams. Floating columns are often used in construction to accommodate changes in the layout of a building or to create open spaces with fewer obstructions. They can also be used to transfer loads from upper floors to the foundation while allowing flexibility in the arrangement of the lower levels. This flexibility can be advantageous in architectural design and space planning.

## 2. METHODOLOGY

### 2.1 Architectural Drawings:

Obtain or create detailed architectural drawings. These will serve as the basis for your structural design. Pay close attention to elements like beams, columns, slabs, walls, openings, and building dimensions..

### 2.2 Creating the Model in STAAD Pro:

•Launch STAAD Pro and start a new project. Import or draw the structural geometry based on the architectural plans. This involves defining nodes, beams, columns, slabs, walls, and other structural elements.

### 2.3 Define Material Properties:

Assign specific material properties to the elements. For example, specify parameters like concrete grade, steel grade, density, Young's Modulus, Poisson's ratio, etc.

### 2.4 Load Application:

• Apply all the relevant loads to the model. This includes:

• Dead loads.

• Live loads .

• Snow loads, if applicable.

• Wind loads, as per local codes.

• Earthquake loads, if the project is in a seismic zone.

### 2.5 LOAD COMBINATION

Following load combinations were considered in analysis of the building as per IS 1893(Part 1):2002

- **Dead Loads (DL):**
  - Self-weight of structural elements, including beams, columns, slabs, etc.
  - Fixed loads like permanent equipment, finishes, and other non-moving loads.
- **Live Loads (LL):**
  - Occupancy loads based on the intended use of each floor (e.g., residential, commercial, industrial).
  - Variable loads such as furniture, storage, and people.
- **Wind Loads (WL):**
  - Wind forces acting on the structure, considering the local wind speed, exposure category, and building shape.

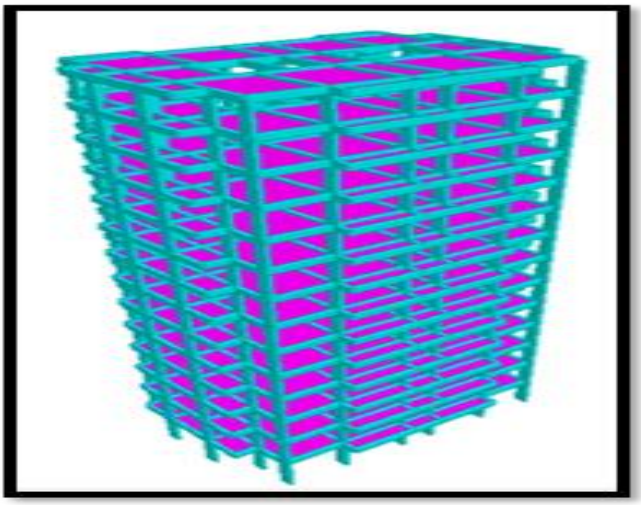
- Include windward and leeward forces, as well as lateral loads on the façade.
  - **Seismic Loads (SL):**
- Earthquake forces based on the seismic zone where the building is located.
- Consider the seismic design parameters such as spectral acceleration, importance factor, and response reduction factor.

## 3. MODELING AND PROBLEM STATEMENT

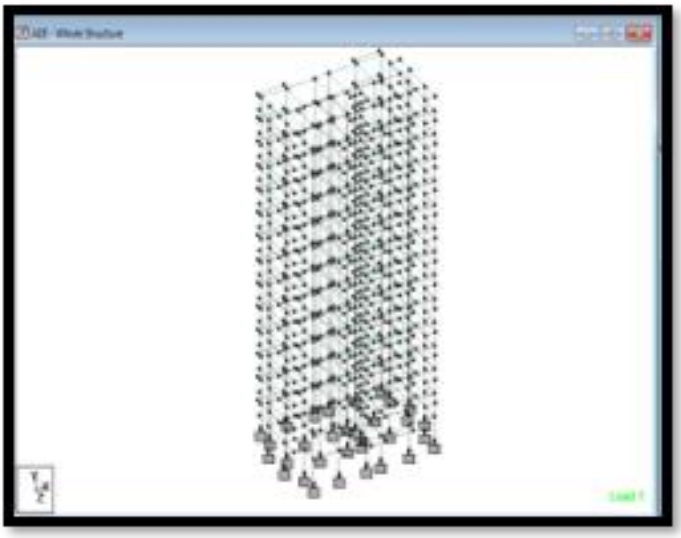
| | |
|---|---|
| I) Material Data | |
| Grade of concrete | M35 |
| Grade of Steel | Fe500 |
| Unit weight of RCC | 25kN/m2 |
| II) Structural Data | |
| Type of structure | SMRF |
| Type of soil | Medium soil |
| Size of beam | 450mm X350mm |
| Size of column | 350mmX600mm |
| Depth of slab | 200mm |
| III) Architectural Data | |
| Number of stories | G+12 |
| Floor height | 3mt |
| Dimension of plan | 22.2m x 17m |
| IV) Seismic Data | |
| Seismic Zone | III |
| Response reduction factor | 5 |
| Importance factor | 1 |
| Damping ratio | 5% |
| V) Loads | |
| Live load | 3kN/m2 |
| Floor finish | 1.5kN/m2 |
| Wall load on exterior frame | 13.11kN/m |
| Wall load on interior frame | 8.55kN/m |

### MODEL DETAILS

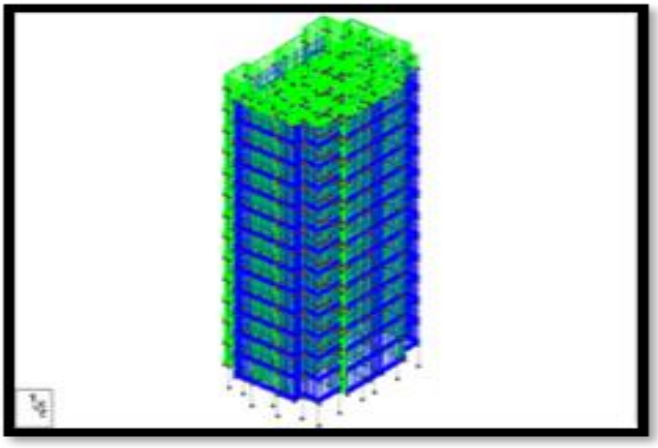
| | |
|---|---|
| MODEL 1 | RCC structure without Floating column i.e., Normal (G+13) storey building |
| MODEL 2 | RCC structure with floating column, Columns removed in corner of exterior frame **(floating column at first floor )** |
| MODEL 3 | RCC structure with floating column, Columns removed in corner of exterior frame **(floating column at 6th floor )** |
| MODEL 4 | RCC structure with floating column, Columns removed in corner of exterior frame **(floating column at 11th )** |



3D RENDERING VIEW



GEOMETARY OF MODEL



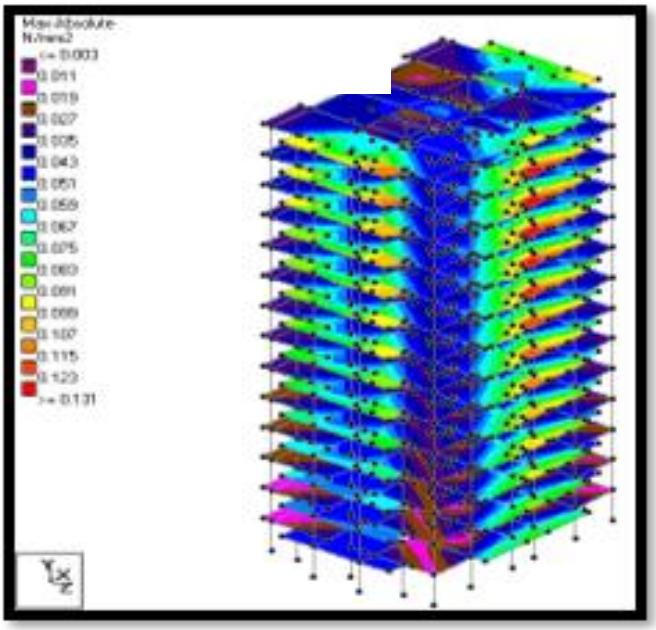
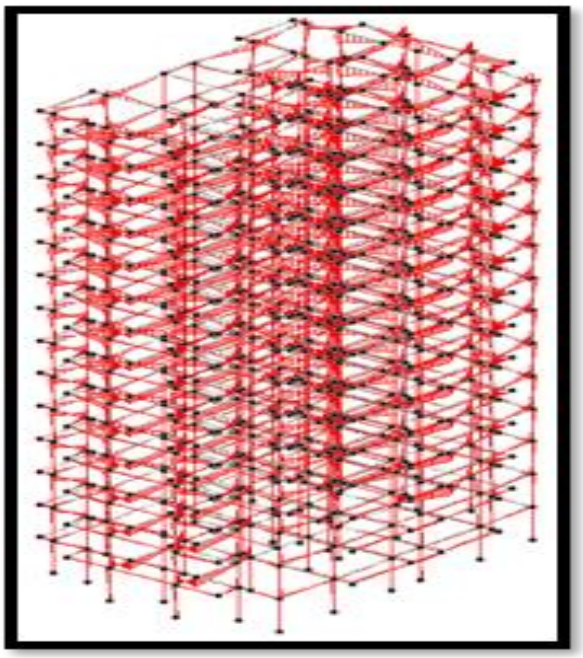
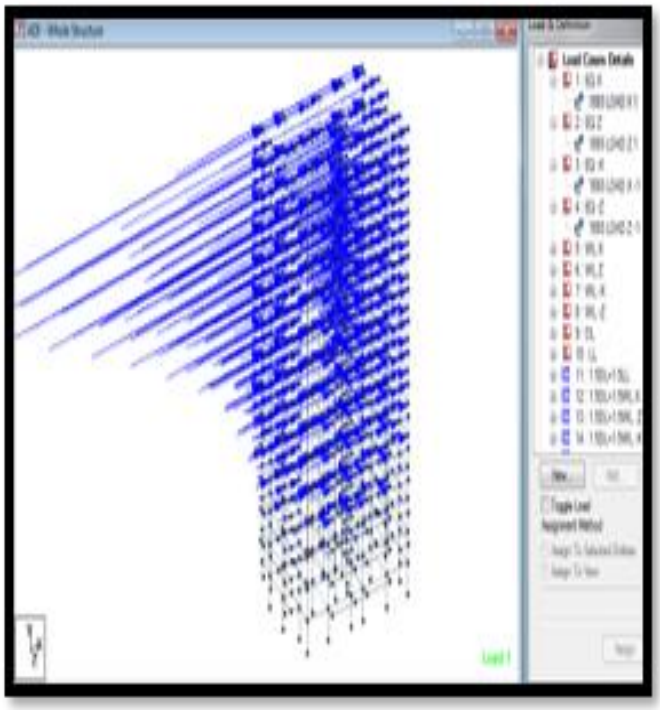


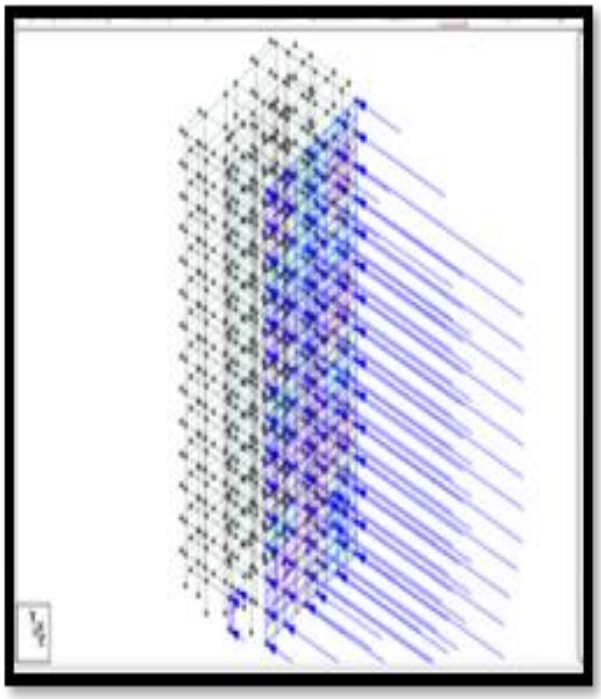
PLATE RESULTS



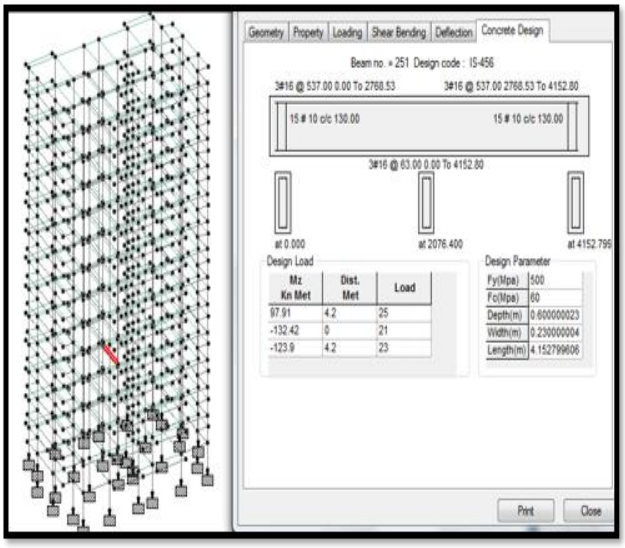
BEAM RESULTS



EARTHQUAKE LOAD



WIND LOAD




CONCRETE DESIGN

## 4 RESULT AND DISCUSSION

### 4.1 Shear Force

Shear force, on the other hand, pertains to the internal force that acts parallel to the cross-section of a structural element, like a beam or column. It emerges as a result of external loads application, such as gravity loads, live loads, or lateral loads.

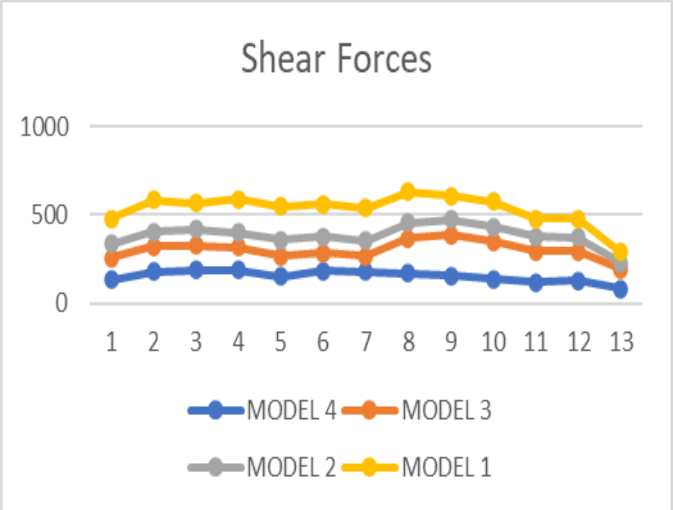



Fig. 1: Shear Force Graph

### 4.2 Displacement Of Earthquake Load

The Maximum displacement in the building along the x direction is obtained for seismic load combination. 1.5(DL+EQX) and along Z- direction is obtained for the seismic load combination 1.5(DL +EQZ) .

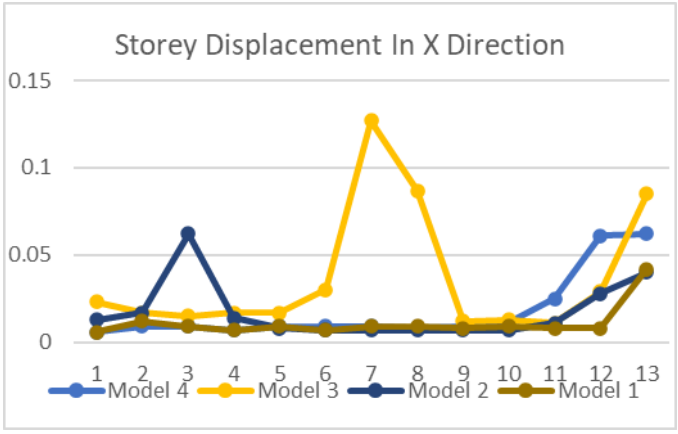



Fig.2: Story Displacement In X Direction

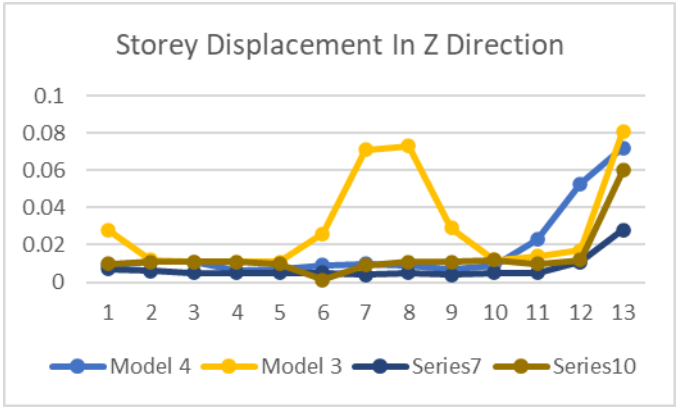



Fig. 3: Story Displacement In Z Direction

## 5. CONCLUSIONS

In the research, a standard building and a building with floating columns at various floor levels are contrasted and compared to one another.

- There is a correlation between the amount of storey displacement and the height of the building.
- For floating column structures, every single model displacement value goes up, but most noticeably for the corner floating column building.
- As a result of the gradual decrease in weight from lower to higher floors, storey shear will be greater for lower floors than it will be for higher levels.

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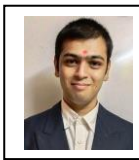

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