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STRUCTURAL ANALYSIS OF R.C.C FRAMED BUILDING WITH FLOATING COLUMNS

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Abstract: The concept of floating columns has been studied in the present investigational study. Floating column is a column through which the load transfers to beam instead of column or footing. In present study, 8 storey and 10 storey RCC building was modeled and they were analyzed with dynamic seismic analysis under IS: 1893:2016. The buildings were evaluated in terms of forces and moments, lateral displacement and total quantities of material used in the structures. After collecting results, the graphical representation has been carried out through which the comparison between similar type of building was done.

***Keywords*: Dynamic Seismic Analysis, Staad.Pro, struts, high-rise building.**

I. INTRODUCTION

The floating column is a vertical member which rest on a beam but doesn't transfer the load directly to the foundation. The floating column acts as a point load on the beam and this beam transfers the load to the columns below it.

The column may start off on the first or second or any other intermediate floor while resting on a beam. Usually columns rest on the foundation to transfer load from slabs and beams. But the floating column rests on the beam. This means that the beam which supports the column acts as a foundation. That beam is called as a transfer beam.

This is widely used in high storied buildings for both commercial and residential purpose. This helps to alter the plan of the top floors to our convenience. The transfer beam which supports the floating column, transfers the loads up to foundation. Hence this has to be designed with more reinforcement.

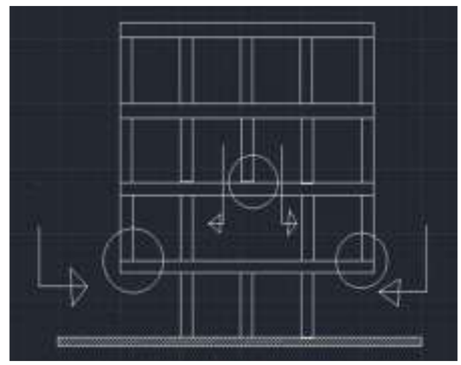

Figure 1.Floating Column

II. METHODS

In order to perform the present study following models were prepared in the design and analysis software Staad.Pro by Bentley's:Type 1: 15 storey building without Bracing analyzed with Seismic Forces.

- Type 1: 8 Storey Building without Floating Columns
- Type 2: 8 Storey Building with Floating Columns
- Type 3: 10 Storey Building without Floating Columns
- Type 4: 10 Storey Building with Floating Columns

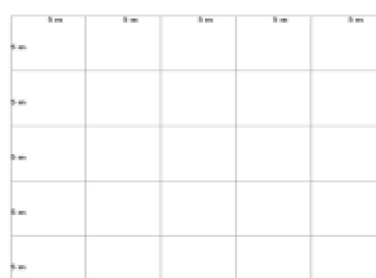

Figure 2.Plan of Building

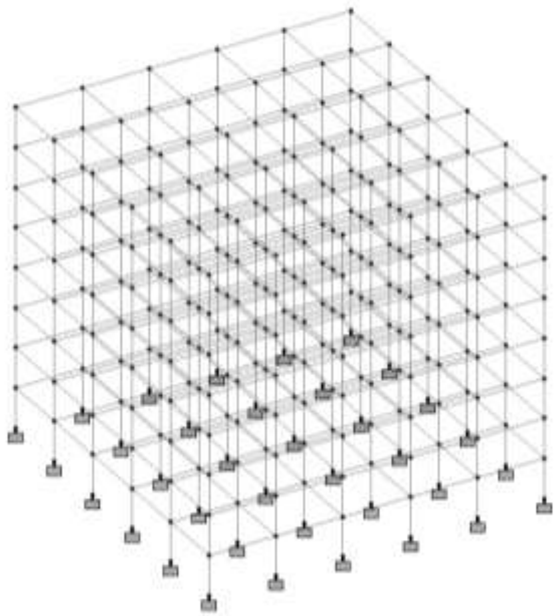

Figure 3. 3D View of 8 Storey Building without Floating Column.

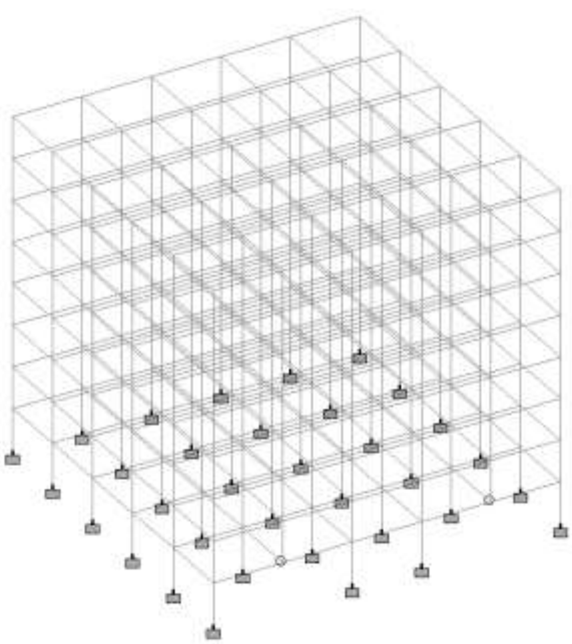

Figure 4. 3D View of 8 Storey Building with Floating Column.

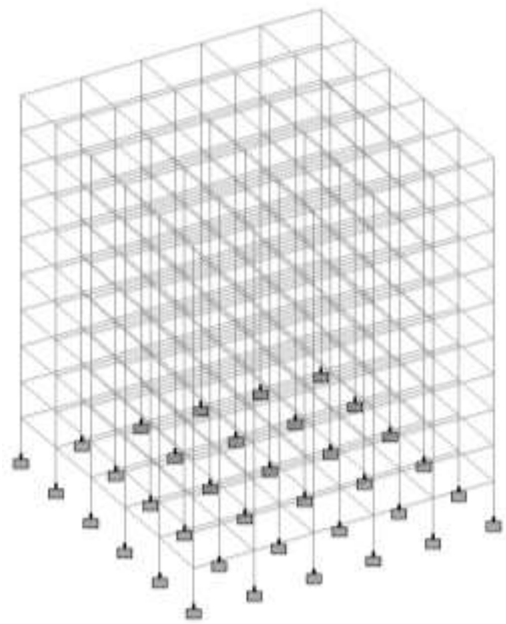

Figure 5. 3D View of 10 Storey Building without Floating Column.

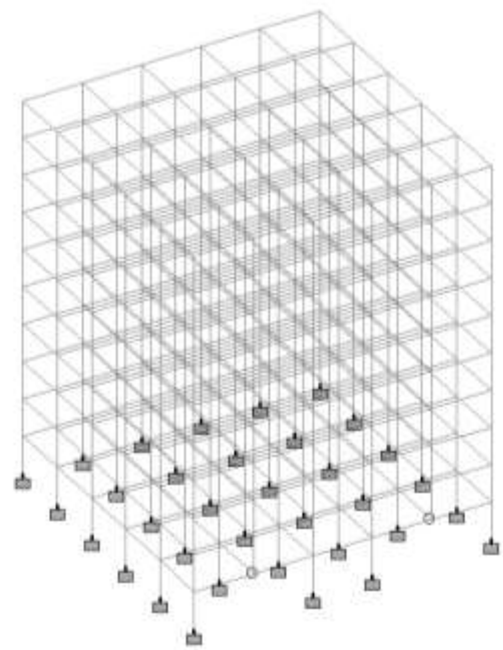

Figure 6. 3D View of 10 Storey Building with Floating Column.

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Dead load and live load has been taken from their respective Indian Standard codes which is mentioned as under:

- Dead Load:(As per actuals from calculations)
    - Dead load Brick walls: 12 kN/m.
    - Dead load on slab: 6 kN/sqm.
- Live Load:(As per Codal Provisions)
    - Live load on all floors: 3 kN/sqm.

Dynamic Seismic Analysis: Dynamic seismic analysis was performed as per the codal provisions of IS: 1893-2016. Various seismic factors, were considered during the analysis, which are mentioned in the following section:

- Seismic Zone : III
- Type of Structure : RCC type
- Response Reduction Factor : 5 (SMRF)
- Damping Ratio : 5%
- Importance Factor : 1.2
- Soil Type : Medium Soil

III. RESULTS AND DISCUSSION

Results of Staad.Pro for 8 Storey Building

The beams on which floating column rests were observed and their forces and moments were recorded. The results are shown in fig 7.

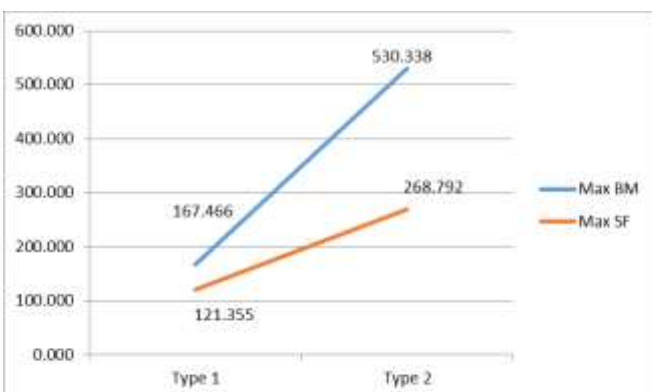

Figure 7.Variation in Bending Moment and Shear Force in Beams.

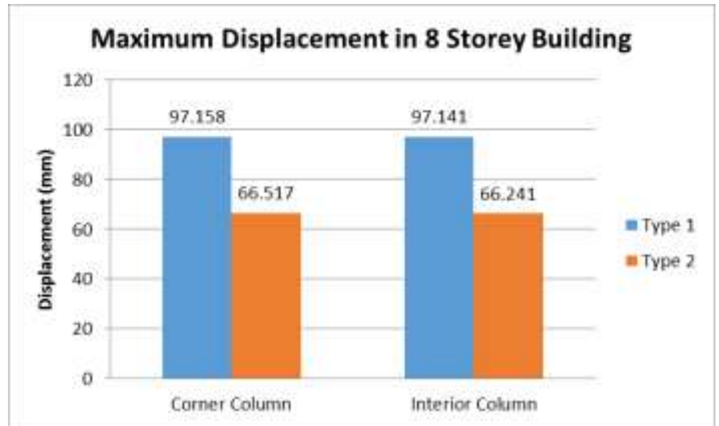

Figure 8.Variation in Maximum Displacement in 8 Storey Building.

Table: 1. Total Quantity of 8 Storey Building

	Type 1	Type 2
Concrete Quantity (m^3)	422.4 m^3	499.1 m^3
Steel Quantity (Kn)	617.976 Kn	606.006 Kn

Results of Staad.Pro for 10Storey Building

The beams on which floating column rests were observed and their forces and moments were recorded. The results are shown in fig 9.

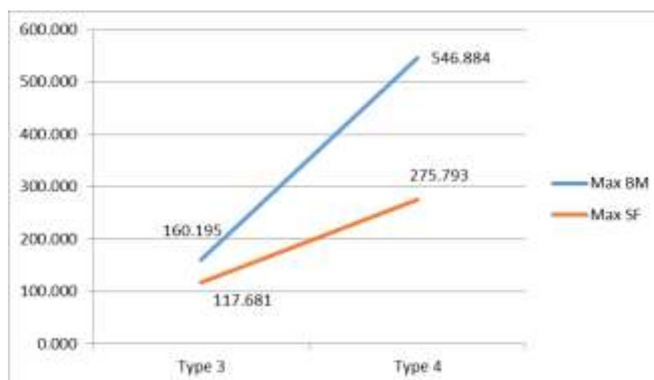

Figure 9.Variation in Bending Moment and Shear Force in Beams.

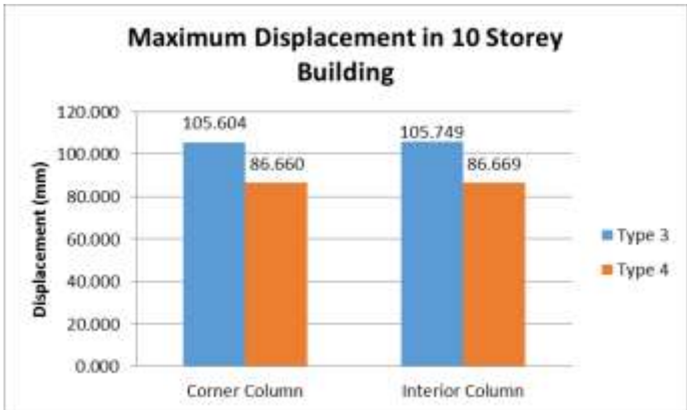

Figure 10.Variation in Maximum Displacement in 10 Storey Building.

Table: 2. Total Quantity of 10 Storey Building

	Type 3	Type 4
Concrete Quantity (m^3)	543.6 m^3	609.8 m^3
Steel Quantity (Kn)	758.034 Kn	811.255 Kn

IV. CONCLUSION

Inferences Drawn for 8 Storey Building Are:

- With the introduction of floating column, the shear force and bending increased drastically up to 2.21 % and 3.17 % respectively.
- The cross-sectional properties of structural members were increased when floating columns was introduced as the normal sizes of column and beams were failed to bear the load. Therefore, due to increased cross-sectional properties, the maximum displacement of column was reduced up to 32%.
- The total quantity of Concrete increases up to 18% as the cross-sectional properties were increased due to failure. Whereas, the quantity of steel decreases slightly up to 2%.

Inferences Drawn for 10Storey Building Are:

- With the introduction of floating column, the shear force and bending increased drastically up to 2.34 % and 3.41 % respectively.
- The cross-sectional properties of structural members were increased when floating columns was introduced as the normal sizes of column and beams were failed to bear the load. Therefore, due to increased cross-sectional properties, the maximum displacement of column was reduced up to 18%.
- The total quantity of Concrete increases up to 12% as the cross-sectional properties were increased due to failure. Whereas, the quantity of steel increases up to 7%.

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