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# Critical Study of Behavior of RC Structural Frame with Floating Column

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***Abstract:*** *The infrastructural boom during last decade as resulted in construction of many high rise structures in all mega cities Due to the existence of architect and structural designer have provided floating column in many location in structure. The building become vulnerable to earthquake hazard due to improper way of flow of earthquake force to ground due to discontinuity in the form of floating column brought into structure floating column provided at some location such as balcony result in close loop and redistribution of moment and forces mayprove to be beneficial in restricting dimension of beam and column it may also hell in achieving in desire economy larger spans would be designed and constructed with greater careA G+14storied building with different Architectural complexities such as floating column at balcony is analyzed for variousearthquake zones. Details of the structure are given in table 1The present paper deals with comparison of axial forces, shear forces, moment, torsion and displacement in selected few columns&beams in the structure with or without floating column in four zones through different graphs the comparison is explain in the paper*

***Key Words -*** *Floating Columns, Seismic Zones, Critical Load Combinations, response spectrum*

## I. Introduction

A column is supposed to be a vertical member starting from foundation level and transferring the load to the ground. The term floating column is also a vertical element which ends (due to architectural design/ site situation) at its lower level (termination Level) rests on a beam which is a horizontal member. The beams in turn transfer the load to other columns below it such columns where the load was considered as a point load. Theoretically such structures can be analyzed and designed. In practice, the true columns below the termination level [usually the stilt level] are not constructed with care and more liable to failure. Hypothetically, there is no need for such floating columns – the spans of all beams need not be nearly the same and some spans can be larger than others. This way, the columns supporting beams with

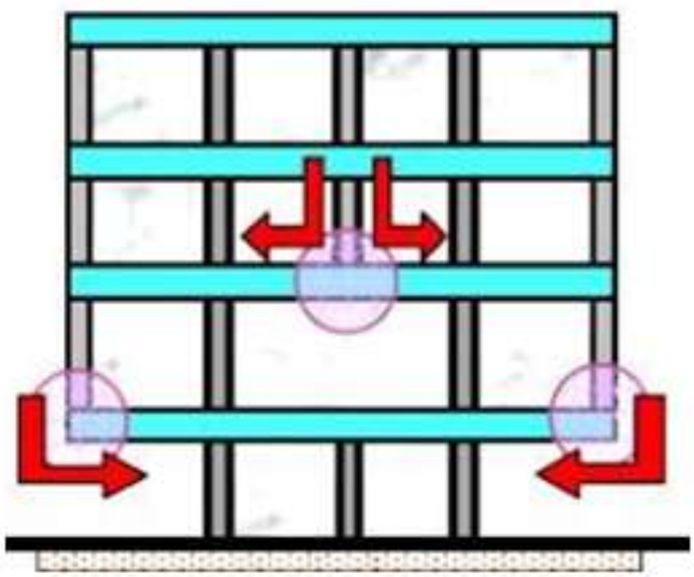


**Fig. 1**: Building with floating columns

**Table 1**

| | |
|---|---|
| Type of Structure | R.C. G+14 Building |
| Storey Height | 3 m |
| Earthquake Zone | II, III, IV, V |
| Type of soil | Medium |
| Lateral Load Resisting System | Special RC moment-resisting frame (OMRF) |
| Response Reduction Factor, R | 5.0 |
| Live Load | 3 KN/m2 |
| Dead load | 1. Self Wt. of whole Structure<br>2. Wt .of Brickwork = 13.34 KN/m<br>3. Slab Load = 3 KN/m2 |

Seismic Response of Vertically Irregular RC Frame with Stiffness Irregularity at Fourth Floor: [Shaikh Abdul Aijaj Abdul Rahman] [4] In this paper two frame having different irregularities but with same dimension have been analyzed to study their behavior when subjected to lateral loads the frame The result remarks the conclusion that, a building structure with stiffness irregularity provides instability and attracts huge storey shear. A proportionate amount of stiffness is advantageous to control over the storeyand base shear.

**1.3 Analysis**

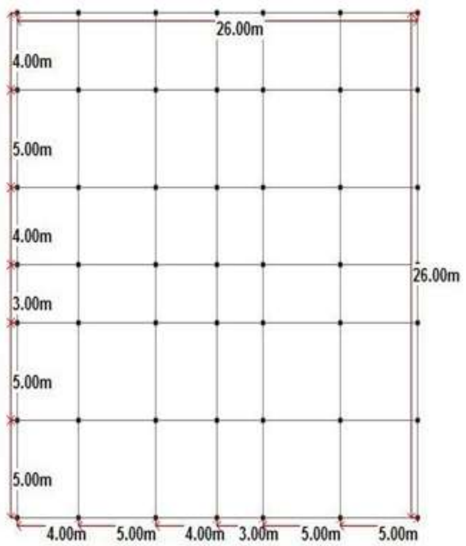



**Fig. 1**

## II. Literature review:

The Building with architectural complexities was analyzed for all the conditions includingEarthquake load by STAAD.Pro. Linear Dynamic Analysis is done for multi storey frame. In this paper study of seismic analysis, critical load combinations are found out. The building chosen was 47 m high building. To study the effect of various loads in various Earthquake zone the building was modeled as per plan and floating column are provided at various location in building In analysis four cases consider first without floating column and second case is internal floating column third case is external floating column & fourth case is floating column at alternate

Seismic Response of RC Frame Buildings withSoft First Storey's: [Jaswant N. Arlekar] [1]. In this paper highlights the importance of explicitly recognizing the presence of the open first storey in the analysis of the building .This paper argues for immediate measures to prevent the indiscriminate use of soft first storey's in buildings, which are designed without regard to the increased displacement, ductility and force demands in the first storey columns.

Seismic Response Evaluation of RC frame building with Floating Column considering different Soil Conditions:[PrernaNautiyala] .[2]in this paper high rise building is analyzed for earthquake force by considering two type of structural system. Frame with only floating column and floating column with complexities for reinforced concrete building considering different Soil Condition. Finally, analysis results in the high rise building such as storey drifts, storey displacement, and storey shear were compared in this study.

Qualitative Review of Seismic Response of Vertically Irregular Building Frames: [Devesh P. Soni] [3]. This study summarizes state-of-the-art knowledge in the seismic response of vertically irregular building frames

floor level

**Load Combination**: Following load combinations were considered in analysis of the building **as** perIS 1893(Part 1):2002

1. 1.5DL +1.5LL
2. 1.5DL +1.5EQX
3. 1.5DL-1.5EQX
4. 1.5DL+1.5EQZ
5. 1.5DL -1.5EQZ
6. 1.2DL +1.2LL+ 1.2EQX
7. 1.2DL+1.2LL-1.2EQX
8. 1.2DL+1.2LL+ 1.2EQZ
9. 1.2DL +1.2LL -1.2EQZ
10. 0.9DL +1.5EQX
11. 0.9DL-1.5EQX
12. 0.9DL+1.5EQZ
13. 0.9DL -1.5EQ

**Analysis Of Data Genrated**

The STAAD output generated was analysed in MS- Excel to determine relations between various parameters and develop mathematical models. Relations developed are given below

1 Case Wise variation in X and Z Displacement values for all Cases.

2 Case Wise variation in Axial Force Fx values for all Cases.

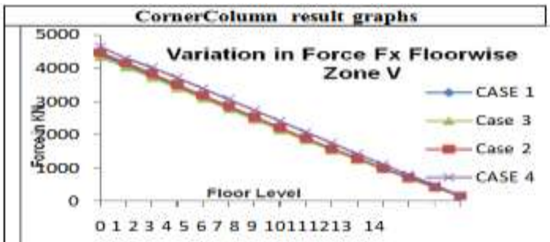
3 Case Wise variation in Shear Fz values for all Cases.

4 Case Wise variation in Moment Mx values for all Cases.

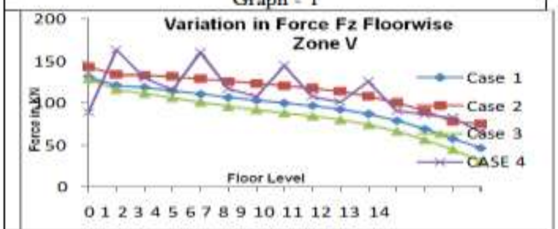
5 Case Wise variation in Moment Mz values for all Cases

**Details Of Graphs Plotted:**

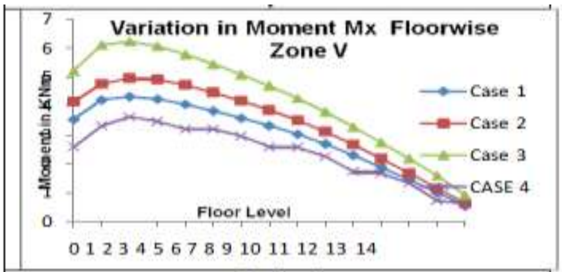
CornerColumn result graphs



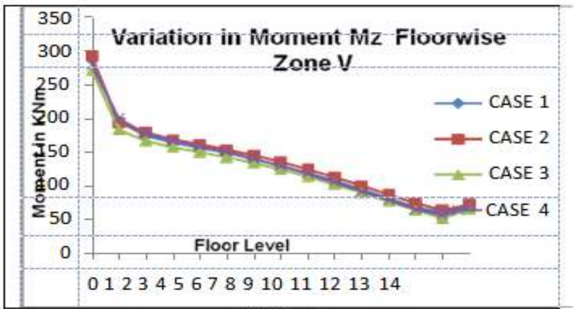

Graph - 1




Graph - 2

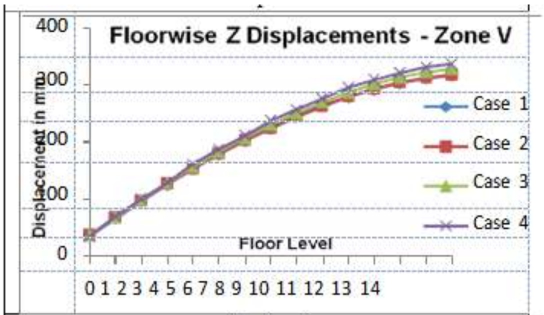



Graph - 3



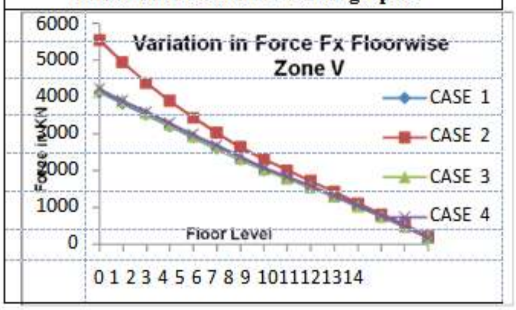

Graph - 4


Graph - 5

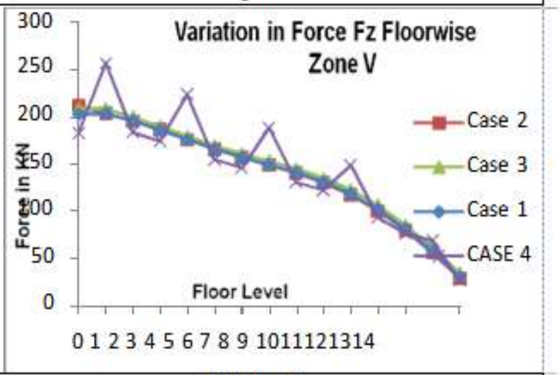



Graph - 6

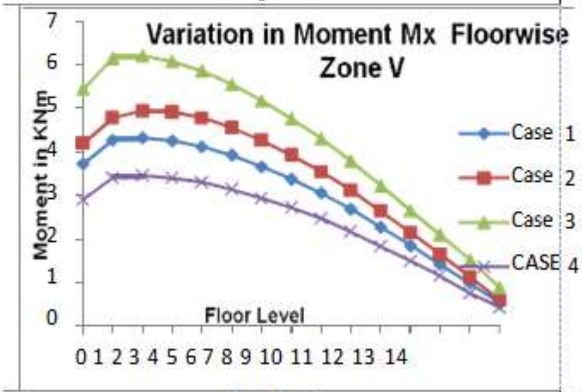
**Intermediate Column result graphs**



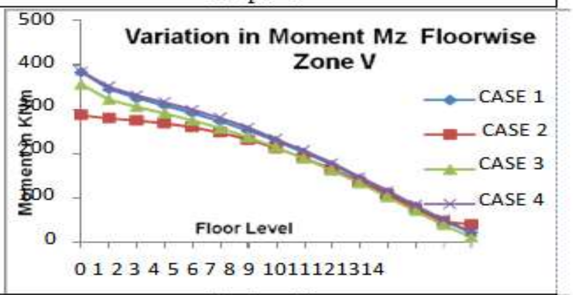
Graph - 7



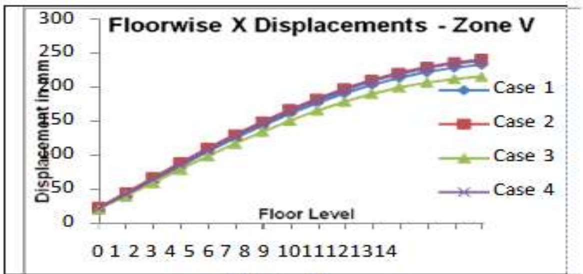

Graph - 8



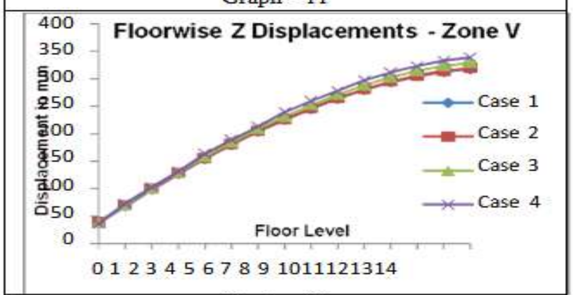

Graph - 9




Graph - 10

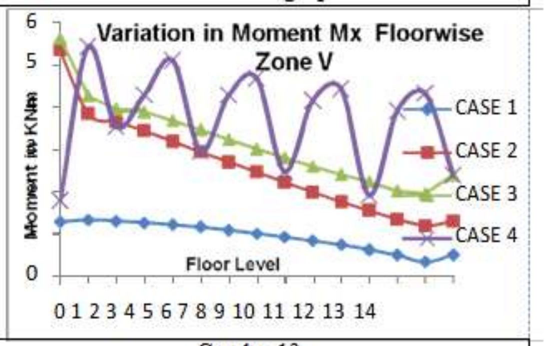



Graph - 11

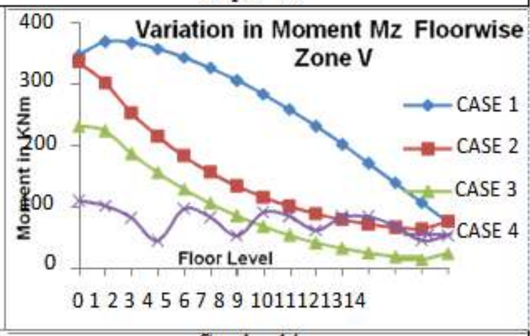



Graph - 12

Beam result graph




Graph - 13




Graph - 14

## III. Conclusion

1. Provision of Case 2 (External Floating columns) and Case 4 (Alternate Floor Floating columns) may Increase Axial Force. And Shear in z direction (Fz) at all floors.
2. Critical load combinations were found, are 1.5(DL+EQX) or 1.5(DL+EQZ) Depending on position of floating columns.
3. With the provision of case 3 (External Floating Columns) and case 2(Internal Floating Columns) May Increase Mxat all floors.& provision of case 4 (Alternate Floor Floating columns) Mx is less at all floor
4. With the provision of case 2(Internal Floating Columns)Mz are very large at all floors &provision of case 3 (External Floating Columns) & case 4 (Alternate Floor Floating columns) may decreases MZ at all floor
5. Provision of Case 2 (External Floating columns) and case 4 (Alternate Floor Floating columns) may Increase displacements at various nodes.
6. With the provision of case 3 (External Floating Columns) and case 2(Internal Floating Columns) May Increase Mx value at beams &Mz values are decrease at beam compare to case1(without Floating Columns)

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