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STUDY OF FLOATING COLUMN ON HIGH RISE BUILDING

Mr. Bhavani Shankar[1], Mr. Dheekshith K[2], Mr. Sreedarsan P V[3]

[1]*Assistant Professor, Srinivas University College of Engineering and Technology, Mangalore, Karnataka, India*
[2]*Assistant Professor, Srinivas University College of Engineering and Technology, Mangalore, Karnataka, India*
[3]*P.G.Student, Srinivas University College of Engineering and Technology, Mangalore, Karnataka, India*

Abstract - *Floating column refers to the column which are made floating between two floors. Nowadays in most of the multi storey building floating column is a very common feature and is introduced mainly with an aim of accommodating the parking facilities which becomes difficult if the columns are continued till the foundation. In this paper G+3, G+5 ,G+7 structures are considered for the study and four models are generated for each type of structure in which one model consists of only normal column and the rest of the models are having floating columns but the position of floating columns were changed . Staad Pro v8i software was employed for the modelling and analysis purpose. All the models are provided with fixed support and only dead load and live load is assigned on the structures. This paper concentrates on comparing the behaviour of the structures on the basis of shear force and bending moment values.*

Key Words: Floating column, Shear force, Bending moment, Staad Pro v8i

1. INTRODUCTION

A column is a vertical structural member which transmits the loads from the superstructure. The load transfer mechanism in a building is generally from slab to beam and from the beam the column takes the load and transfers it safely to the foundation but in the case of floating column the load transfer mechanism is different from a normal column building. Since in a floating column building the columns are not continued till the foundation level the loads which are coming from the beam or which are coming from the superstructure are not directly transferred to the foundation instead these columns transfers the load to the beams on which these floating column rests and these beams transfers the same load to the column below which has a direct contact with the foundation. These beams are often referred to as transfer beam or girder beam. Nowadays in most of the multi storey building floating column is a very common feature and is introduced mainly with an aim of accommodating the parking facilities which becomes difficult if the columns are continued till the foundation level.

1.1 Objectives

The objectives of this paper are

1. To compare the behavior of a structure with and without floating column.

2. To compare the behavior of a structure with floating columns at different locations.

2. METHODOLOGY

1. The building models are generated using Staad pro V8i software as per the dimensions provided.
2. Once the building models are generated the building properties are assigned to the beams columns and slabs.
3. Then the next step is to provide support for the structure and here fixed support is provided for all the models.
4. After provision of the support the very next step is to assign the loads which are expected to act over the structure

3. MODELLING AND ANALYSIS

G+3, G+5 and G+7 structures have been considered for the study and four models are generated for each type of structures

Table -1: Floating column position

Structure	Position of floating column
G+3	Without any floating column
	Central column of all four sides floating
	Edge column floating
	Corner column floating
G+5	Without any floating column
	Central column of all four sides floating
	Edge column floating
	Corner column floating
G+7	Without any floating column
	Central column of all four sides floating
	Edge column floating
	Corner column floating

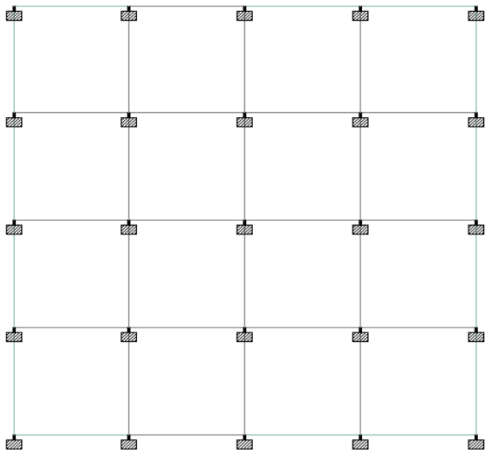

Fig -1: Plan of building without any floating column

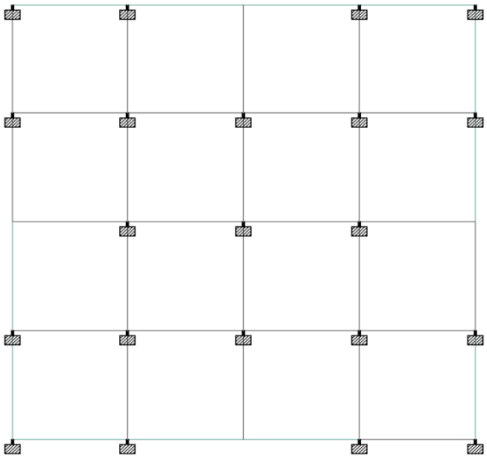

Fig -2: Plan of building with central floating column

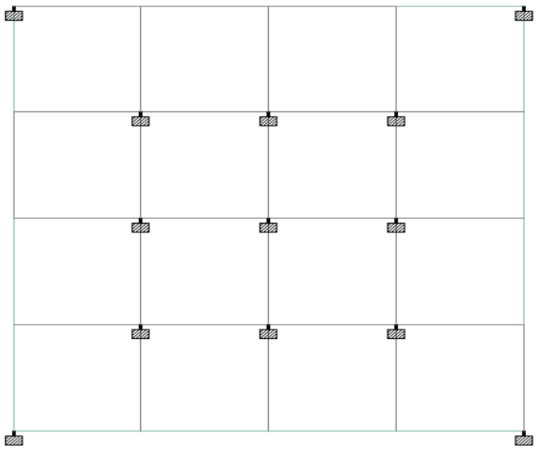

Fig -3: Plan of building with edge floating column

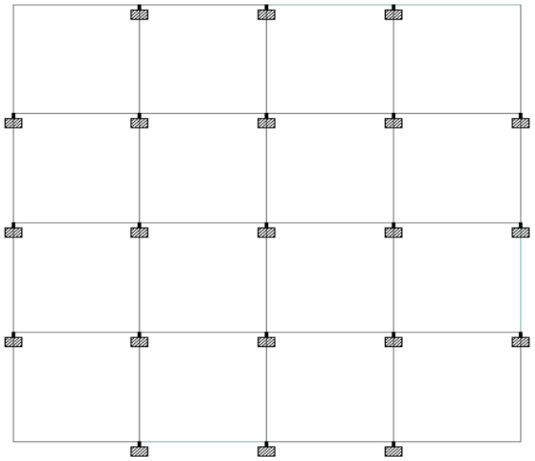

Fig -3: Plan of building with corner floating column

Table -2: Bending moment of G+3 building

Models	BM in X direction kNm	BM in Y direction kNm	BM in Z direction kNm
Model 1	0.045	11.8	22
Model 2	0.098	18.8	47.2
Model 3	0.448	75.6	160
Model 4	0.725	94.2	220

Table -3: Shear force of G+3 building

Models	SF in X direction kN	SF in Y direction kN	SF in Z direction kN
Model 1	1052	12.7	6.96
Model 2	1026	26.7	12
Model 3	1678	88.5	45.8
Model 4	1186	120	58.1

Table -4: Bending moment of G+5 building

Models	BM in X direction kNm	BM in Y direction kNm	BM in Z direction kNm
Model 1	0.088	14.8	28.9
Model 2	0.126	24.1	62.1
Model 3	0.397	90.1	186
Model 4	0.679	102	239

Table -5: Shear force of G+5 building

Models	SF in X direction kN	SF in Y direction kN	SF in Z direction kN
Model 1	1531	16.2	9.5
Model 2	1519	31.5	14.7
Model 3	2547	102	54.3
Model 4	1746	130	62.6

Table -6: Bending moment of G+7 building

Models	BM in X direction kNm	BM in Y direction kNm	BM in Z direction kNm
Model 1	0.128	17.6	41
Model 2	0.167	32.8	82.7
Model 3	0.418	109	225
Model 4	0.705	113	265

Table -7: Shear force of G+7 building

Models	SF in X direction kN	SF in Y direction kN	SF in Z direction kN
Model 1	1976	23.1	11.2
Model 2	1989	41.9	19.2
Model 3	3393	120	65.5
Model 4	2280	143	69.2

4 RESULTS AND DISCUSSIONS

Table -8: Shear force in X direction

Shear force in X direction in kN	Normal column	Central floating column	Edge floating column	Corner floating column
G+3	1052	1026	1678	1186
G+5	1531	1519	2547	1746
G+7	1976	1989	3393	2280

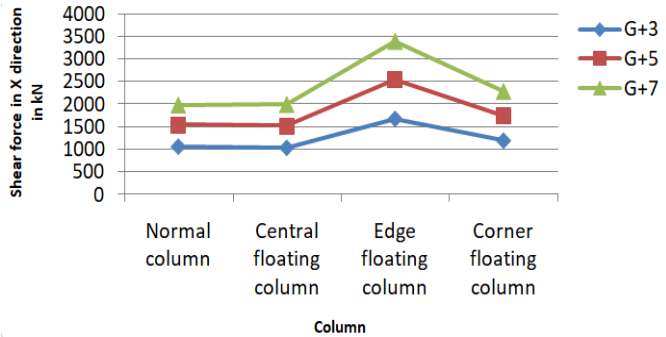

Chart -1: Line graph showing the variation of shear force in X direction.

From the graph it is clear that as the height of the building increases the shear force also increases and also the shear force is maximum when edge columns are made floating.

Table -9: Bending moment in Y direction

Bending moment in Y direction in kNm	Normal column	Central floating column	Edge floating column	Corner floating column
G+3	11.8	18.8	75.6	94.2
G+5	14.8	24.1	90.1	102
G+7	17.6	32.8	109	113

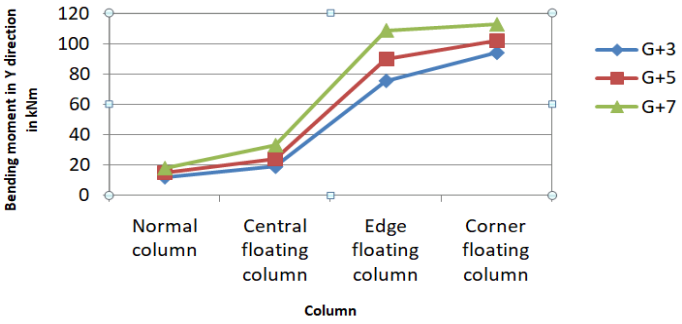

Chart -2: Line graph showing the variation of bending moment in Y direction

From the graph it is clear that as the height of the building increases the bending moment also increases and also the bending moment is maximum when corner columns are made floating and minimum when no floating columns are present.

3. CONCLUSIONS

G+3 , G+5 and G+7 structures were analysed and Various conclusions were drawn which are as follows

1. Shear force and bending moment values of normal column building increases with the increase in height of the building.
2.The difference in shear force values of normal column building of G+3 and G+7 structure is 924kN.
3.The difference in bending moment of normal column building of G+3 and G+7 structure is 5.8 kNm.
4.Buildings in which central column is made floating at the ground floor level the shear force and bending moment increases with the height of the building.
5.The difference in shear force of central floating column building of G+3 and G+7 structure is 913kN.
6.The difference in bending moment of central floating column building of G+3 and G+7 structure is 14 kNm.

7.Buildings having edge columns floating at ground floor level the shear force and bending moment values are found to increases with the height of the building.
8.The difference in shear force of building of G+3 and G+7 structure in which edge columns are floating is 1715 kN.
9.The difference in bending moment of building of G+3 and G+7 structure in which edge columns are floating is 29.4 kNm.
10.Buildings in which corner columns are made floating at the ground floor level the shear force and bending moment values are found to increases with the height of the building.
11.The difference in shear force of central floating column building of G+3 and G+7 structure is 1094 kN.
12.The difference in bending moment of central floating column building of G+3 and G+7 structure is 18.8 kNm.
13.Shear force is maximum when the edge columns are made floating and minimum when central column is made floating.
14.Bending moment is maximum when corner columns are made floating and when minimum when all columns are built normal that is when floating columns are absent.
15.In G+3 building shear force is maximum when the edge columns are made floating and is minimum when the central columns are considered floating.
16.The difference between the maximum value of shear force and minimum value of shear force in a G+3 building is 652 kN.
17.In G+5 building shear force is maximum when the edge columns are made floating and is minimum when the central columns are considered floating.
18.The difference between the maximum value of shear force and minimum value of shear force in a G+5 building is 1028 kN.
19.In G+7 building shear force is maximum when the edge columns are made floating and is minimum in case of normal column building.
20.The difference between the maximum value of shear force and minimum value of shear force in a G+7 building is 1417 kN.
21.In G+3 building bending moment is maximum when the corner columns are made floating and is minimum when there are no floating columns present that is in the case of normal column G+3 building.
22.The difference between the maximum value of bending moment and minimum value of bending moment in a G+3 building is 82.4 kNm.
23.In G+5 building bending moment is maximum when the corner columns are made floating and is minimum when there are no floating columns present that is in the case of normal column G+5 building.
24.The difference between the maximum value of bending moment and minimum value of bending moment in a G+5 building is 87.2 kNm.
25.In G+7 building bending moment is maximum when the corner columns are made floating and is minimum when there are no floating columns present that is in the case of normal column G+7 building.
26.The difference between the maximum value of bending moment and minimum value of bending moment in a G+7 building is 95.4 kNm.

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