iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 3 **Issue:** VIII **Month of publication:** August 2015

DOI:

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Comparative studies of Floating Column of different multistoried building

Shiwli Roy[#1], Gargi Danda de[*2]
[#]*Civil Engg, , BIT Durg, CG*
[1] ME Scholar - BIT Durg, [2]Assistant Professor (Civil Engg dept.)

Abstract— Now a day's frame structures are very popular in India, and column plays an important role in these structures. In structural engineering, a column is supposed to be a vertical member starting from foundation level and transfer the structural load to the ground through foundation. The term floating column is also a vertical element which ends at its lower level rests on a beam which is a horizontal member and transfer the load of the structure through column to the beam. In this paper the floating column of G+3, G+5 and G+ 10 structures are analyzed. Comparison will be done on bending moment and shear force between these structures. This paper presents the analysis of floating column by using STAAD PRO V8i.
Keywords— Floating Column, shear force and bending moment.

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 point load. Theoretically such structures can be analyzed and designed. This paper presents the floating column analysis on multistoried building and analyzed by STAAD PRO V8i. Here G+3, G+5 and G+10 structures are analyzed and compared with parameters shear force and bending moment.

II. BUILDING DESCRIPTION

The study is carried out on a building with floating columns. The layout of the building is shown in the figure. The building considered is a multistorey building having G+3, G+5 and G+ 10 structures.

A. G+3 Structure

It is a three storey building with one roof. The span of these structures is 6m. The length and width of each floor is 3m. The total height of structure is 12m.This model has been analyzed by creating fixed support on ground storey, by assigning dead load and live load for floating column.

B. G+5 Structure

It is a five storey building with one roof. The span of these structures is 6m. The length and width of each floor is 3m. The total height of structure is 18 m. This model has been analyzed by creating fixed support on ground storey, by assigning dead load and live load for floating column.

C. G+10 Structure

It is a ten storey building with one roof. The span of these structures is 6m. The length and width of each floor is 3m. The total height of structure is 36 m. This model has been analyzed by creating fixed support on ground storey, by assigning dead load and live load for floating column**.**

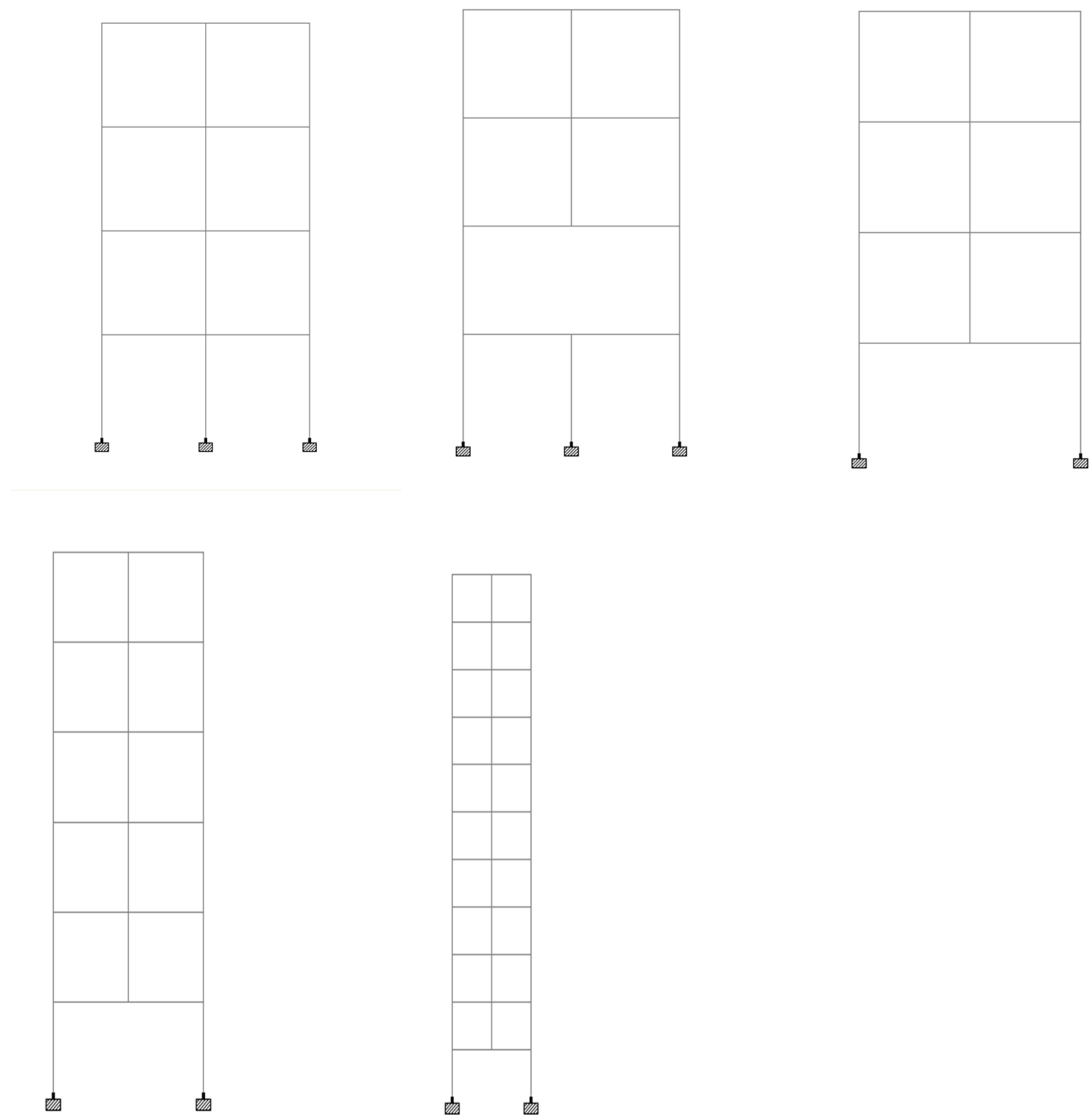


Fig. 1 Front view of G+ 3, G+ 5, G+ 10 structures

III.LOAD COMBINATION

For design of reinforced concrete structures, the load combination 1.5(DL + LL) should be used. Because in this paper DL and LL loads are only taken into consideration.

IV.LOAD CONSIDERED

The dead load on which self weight of factor in Y direction and live load of uniform force 3KN/m are assigned on each floor as shown below:

Volume 3 Issue VIII, August 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

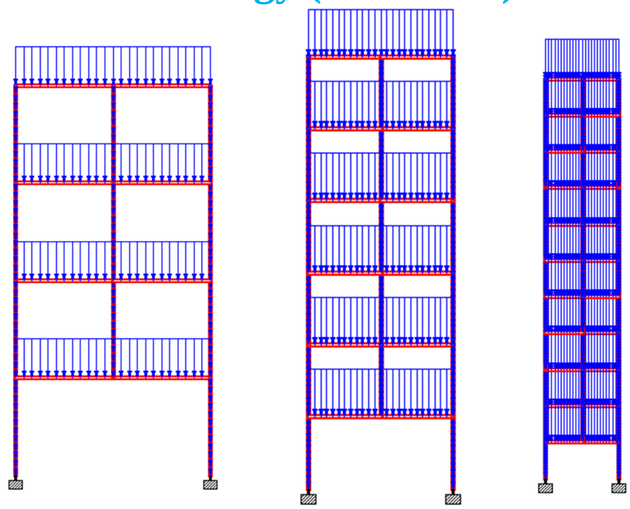


Fig. 2: Loads taken on different Structure

V. ANALYSIS OF G+3, G+5 AND G+10 STRUCTURES ON STAAD PRO V8I

A. Analysis on structures

After the dead load and live load are assigned the analysis on shear force and bending moment are as shown below:

1) Shear force: Shear force of G+3 structure on which ground and first floor column is selected and the table as shown below:

TABLE I*:* SHEAR FORCE OF NORMAL COLUMN OF G+ 3 STRUCTURES**.**

Column	Load	Node	Shear force in X direction(Fx) KN	Shear force in Y direction(Fy) KN	Shear force in Z direction(Fz) KN
77	1 DL	31	7.657	-0.038	-0.043
		34	-6.738	0.038	0.043
	2 LL	31	69.798	-0.319	-0.368
		34	60.798	0.319	0.368
79	1DL	35	7.657	0.038	-0.043
		36	-6.738	-0.038	0.043
	2 LL	35	69.798	0.319	-0.368
		36	60.798	-0.319	0.368

TABLE II: SHEAR FORCE OF FLOATING COLUMN1 OF G+ 3 STRUCTURES

Column	Load	Node	Shear force in X direction(Fx) KN	Shear force in Y direction(Fy) KN	Shear force in Z direction(Fz) in KN
77	1 DL	31	11.273	0.023	-0.044
	2 LL	31	101.704	0.213	-0.377
79	1 DL	33	11.273	-0.023	-0.044
	2 LL	33	101.704	-0.213	-0.377

Volume 3 Issue VIII, August 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

TABLE III

SHEAR FORCE OF FLOATING COLUMN OF G+ 3 STRUCTURES.

Column	Load	Node	Shear force in X direction(Fx)in KN	Shear force in Y direction(Fy) KN	Shear force in Y direction(Fz) KN
12	1 DL	5	12.025	-0.357	-0.039
	2 LL	5	110.321	-3.185	-0.328
79	1 DL	33	12.025	0.357	-0.039
	2 LL	33	110.321	3.185	-0.328
25	1 DL	11	8.997	-0.659	-0.078
	2 LL	11	82.547	-5.886	-0.665
84	1 DL	36	8.997	0.659	-0.078
	2 LL	36	82.547	5.886	-0.665

2) Shear force of G+5 structure on which ground and first floor column is selected and the table as shown below:

TABLE IV

SHEAR FORCE OF G+ 5 STRUCTURES FOR FLOATING COLUMN

Column	Load	Node	Shear force in X direction(Fx)KN	Shear force in Y direction(Fy)KN	Shear force in Z direction(Fz) KN.
109	1 DL	43	18.8	-0.38	-0.041
	2 LL	43	169.784	3.367	-0.344
111	1 DL	45	18.8	0.38	-0.041
	2 LL	45	169.784	3.367	-0.344
114	1 DL	46	15.660	-0.693	-0.080
	2 LL	46	141.423	-6.143	-0.681
116	1 DL	48	15.660	0.693	-0.080
	2 LL	48	141.423	6.143	-0.681

3) Shear force of G+ 10 structures on which ground and first floor columns is selected and table are shown below:

TABLE V

SHEAR FORCE OF G+ 10 STRUCTURES FOR FLOATING COLUMN ON COLUMNS

Column	Load	Node	Fx KN	Fy KN	Fz KN
189	1 DL	73	35.404	-0.413	-0.041
	2 LL	73	319.720	-3.672	-0.349
191	1 DL	75	35.404	0.413	-0.041
	2 LL	75	319.720	3.672	-0.349
194	1 DL	76	32.144	-0.750	-0.082
	2 LL	76	290.266	-6.660	-0.699
196	1 DL	78	32.144	0.750	-0.082
	2 LL	78	290.266	6.660	-0.699

Volume 3 Issue VIII, August 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

4) Bending moment: Bending moment diagram of G+3 structure for floating column has been analyzed and on which ground and first floor column is selected and the table is as shown below:

TABLE VI
BM OF G+ 3 STRUCTURES FOR NORMAL COLUMN ON COLUMNS

Column	Load	Node	BM in X direction(Mx) KN-m	BM in Y direction(My) KN-m	BM in Z direction(Mz) KN-m
77	1 DL	31	0	0.043	-0.038
		34	-0	0.087	-0.075
	2 LL	31	-0	0.387	-0.319
		34	0	0.737	-0.639
79	1 DL	33	0	0.043	0.038
		36	-0	0.087	0.075
	2 LL	33	-0	0.387	0.319
		36	0	0.737	0.639

TABLE VII
BM OF G+ 3 STRUCTURES FOR FLOATING COLUMN 1 ON COLUMNS

Column	Load	Node	BM in X direction(Mx) KN-m	BM in Y direction(My) KN	BM in Z direction(Mz) in KN
77	1 DL	31	-0	0.044	0.022
	2 LL	31	-0	0.376	0.211
79	1DL	34	0	0.044	-0.022
	2 LL	34	0	0.376	-0.211

TABLE VIII
BM OF G+ 3 STRUCTURES FOR FLOATING COLUMN ON COLUMNS

Column	Load	Node	BM in X direction(Mx) KN-m	BM in Y direction(My) KN-m	BM in Y direction(Mz) in KN-m
12	1 DL	5	0.002	0.039	-0.355
	2 LL	5	0.019	0.328	-3.182
79	1 DL	33	-0.002	0.039	0.355
	2 LL	33	-0.019	0.328	3.182
25	1 DL	11	-0.002	0.117	-1.015
	2 LL	11	-0.018	0.992	-9.068
84	1 DL	36	0.002	0.117	1.015
	2 LL	36	0.018	0.992	9.068

5) Bending moment diagram of G+5 structure for floating column has been analyzed and the on which ground and first floor column is selected as shown below:

Volume 3 Issue VIII, August 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

TABLE IX

BM OF G+ 5 STRUCTURES FOR FLOATING COLUMN ON COLUMNS

Column	load	Node	BM in X direction(Mx)KN-m	BM in Y direction(My)KN-m	BM in Z direction(Mz) KN-m.
109	1 DL	43	0.002	0.040	-0.380
	2 LL	43	0.020	0.344	-3.363
111	1 DL	45	-0.002	0.040	0.380
	2 LL	45	-0.020	0.344	3.363
114	1 DL	46	-0.002	0.121	-1.073
	2 LL	46	-0.019	1.024	-9.506
116	1 DL	48	0.002	0.121	1.073
	2 LL	48	0.019	1.024	9.506

6) Bending moment diagram of G+10 Structure for floating column and the on which ground and first floor columns are selected and the results are as follows:

TABLE IX

BM OF G+ 10 STRUCTURES FOR FLOATING COLUMN ON COLUMNS

Column	Load	Node	Mx KN-m	My KN-m	Mz KN-m
189	1 DL	73	0.002	0.041	-0. 413
	2 LL	73	0.020	0.349	-3.668
191	1 DL	75	-0.002	0.041	0. 413
	2 LL	75	0.020	0.349	3.668
194	1 DL	76	-0.002	0.123	-1.163
	2 LL	76	-0.019	1.047	-10.328
196	1 DL	78	0.002	0.123	1.163
	2 LL	78	0.019	1.047	10.328

VI. RESULT AND DISCUSSION

The G+3, G+5 and G+ 10 structures are compared with tables and graphs of shear force and bending moment as shown below:

TABLE I

SHEAR FORCE IN X DIRECTION

Column	G+3	G+5	G+10
Column 1	12.025	18.8	35.404
Column 2	8.997	15.66	32.144

Volume 3 Issue VIII, August 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

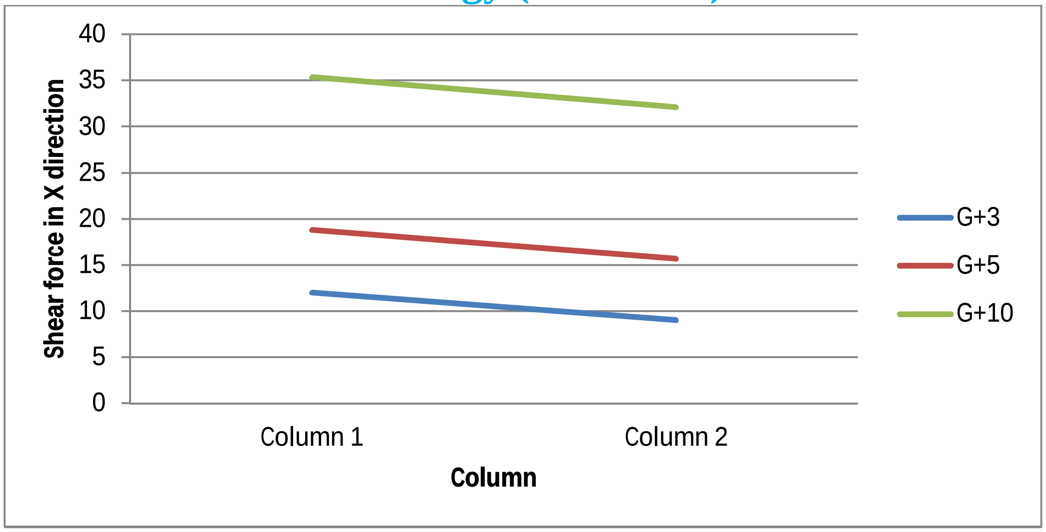


Fig. 1 Variation of shear force in X direction

Here column1 is considered as ground floor and column 2 is first floor column. The variation in shear force shows that the shear force is maximum in column1 for G+10 structure and the shear force increases by 56.34% for G+ 10 structures in column1 and in column2 it increases by 74.05% for G+ 10 structures. This means that if the height of structure increases the shear force also increases .

TABLE II

BENDING MOMENT IN Y DIRECTION

Column	G+3	G+5	G+10
Column 1	0.039	0.040	0.041
Column 2	0.117	0.121	0.123

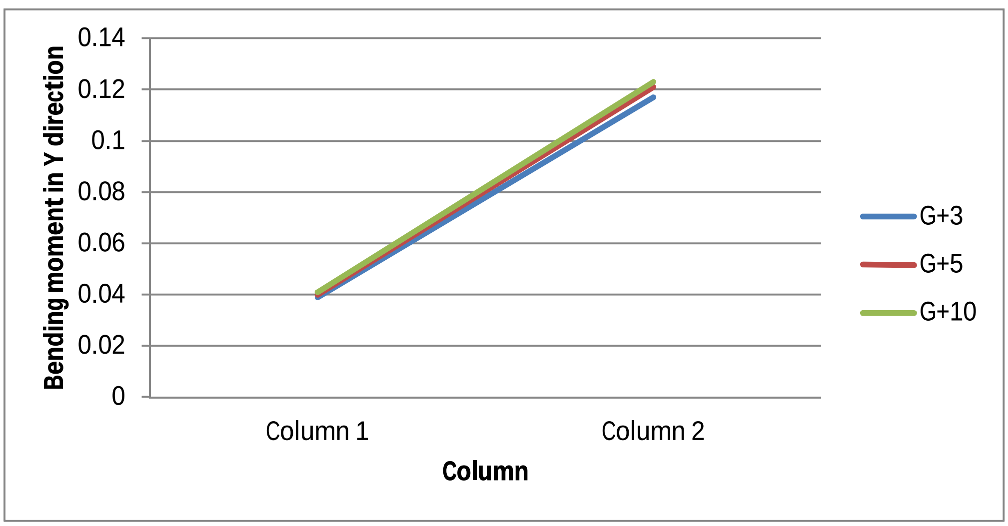


Fig. 2: Variation of bending moment in Y direction

The variation in bending moment shows that the bending moment is maximum for column 1 in G+ 10 structures. The bending moment increases by 2.56% in column1 and increases by 3.41% for G+ 10 structures. This means that if the height increases the bending moment also increases.

Comparison of Shear force and bending moment of G+3 structure in normal column, floating column(column removed from ground

Volume 3 Issue VIII, August 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

floor) and floating column 1(column removed between first floor and second floor) through tables and graphs as shown below:

TABLE III

SHEAR FORCE IN X DIRECTION FOR G+3 STRUCTURE IN NORMAL AND FLOATING COLUMN.

Column	G+3(normal column)	G+3(floating column)	G+3(floating column 1)
Column 1	7.657	12.025	11.273
Column 2	5.745	8.997	9.305

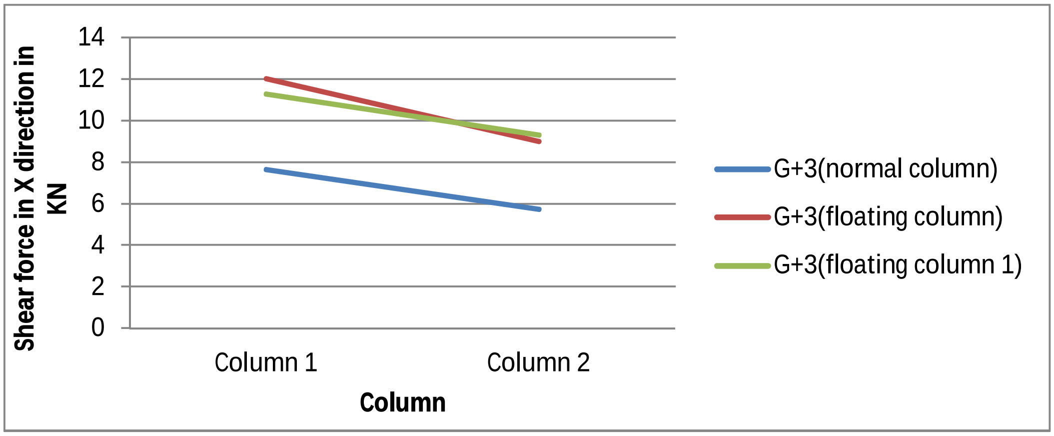


Fig. 3: Variation of shear force in X direction for G+3 structure in normal and floating column.

TABLE 6.4:

BENDING MOMENT IN Y DIRECTION FOR G+3 STRUCTURE IN NORMAL AND FLOATING COLUMN

Column	G+3(normal column)	G+3(floating column)	G+3(floating column 1)
Column 1	0.043	0.039	0.044
Column 2	0.124	0.117	0.131

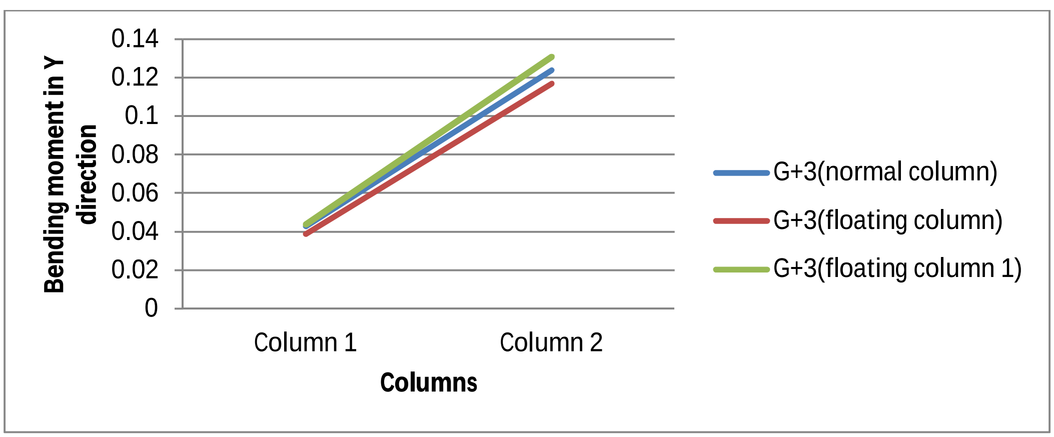


Fig. 4: Variation of Bending moment in Y direction for G+3 structure in normal and floating column.

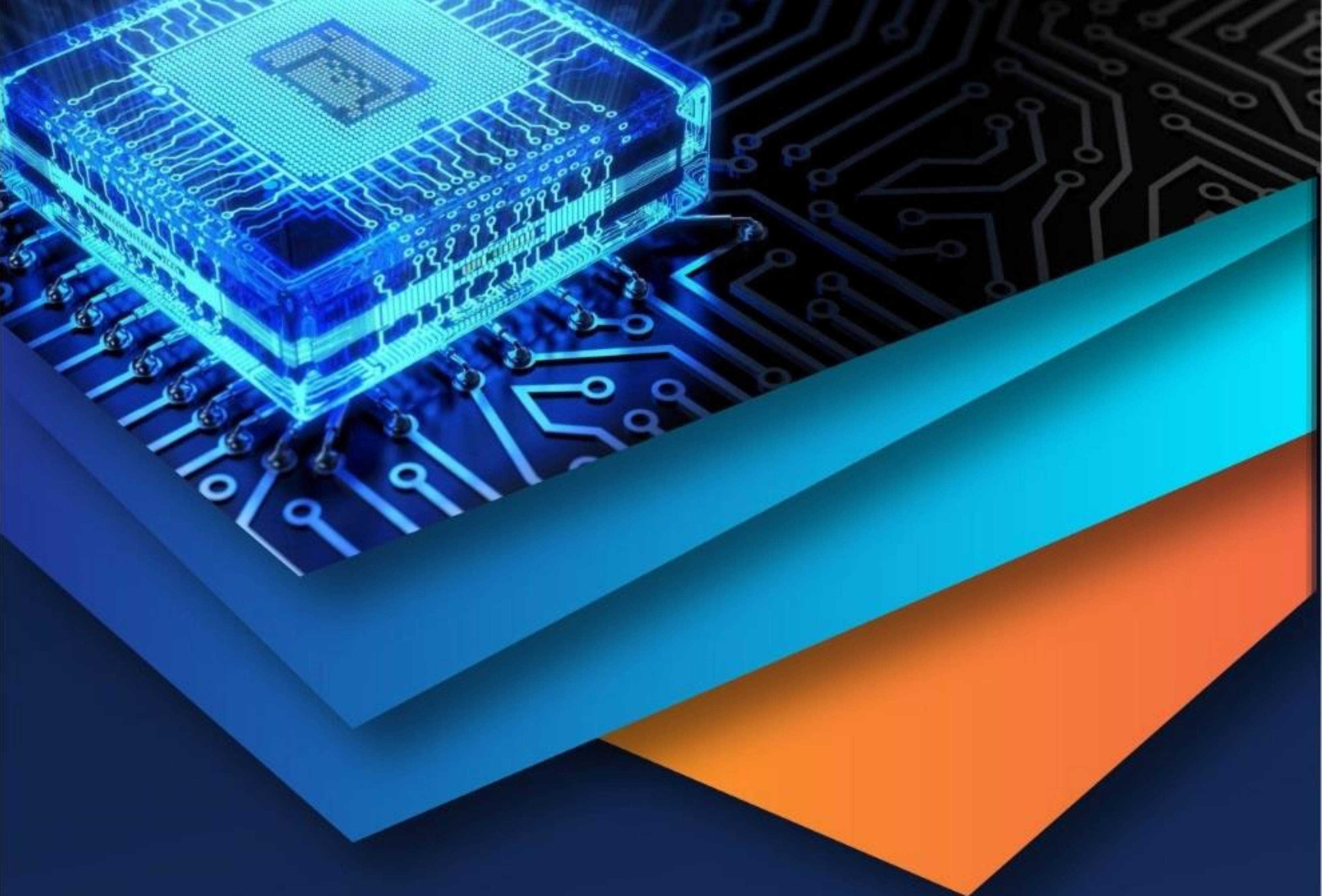
VII. CONCLUSION

The analysis on floating column for G+3, G+5 and G+ 10 structures shows that if the height of the structure increases, the shear force and bending moment also increases. Following are some conclusion as done on above study:

A. The column shear varies according to the situation and the orientation of columns.
B. The moment at every floor increases and shear force increases but it is same for each floor column.
C. The variation in shear force shows that the shear force is maximum in column1(column for ground floor) for G+10 structure and the shear force increases by 56.34% for G+3 to G+5 structures and 88.3% for G+5 to G+10 structures in column1(column for ground floor) and in column2(column for first floor) it increases by 74.05% for G+ 3 to G+5 structures and 105% for G+5 to G+10 structures
D. The variation in bending moment shows that the bending moment is maximum for column 1(column for ground floor) in G+ 10 structures. The bending moment increases by 2.56% in column1(column for ground floor) for G+3 to G+5 structures and 2.5% for G+5 to G+10 structures and in column2(column for first floor) increases by 3.41% for G+3 to G+5 structures and 1.65 % for G+5 to G+10 structures.
E. For comparison between shear force for G+3 structure in normal column, floating column(column removed from ground floor) and floating column 1(column removed between first floor and second floor) the variation in shear force shows that the shear force is maximum in floating column(column removed from ground floor) the shear force increases by 57% for G+3 (normal column)to G+3(floating column) structures and 6.67% for G+3(floating column) to G+3(floating column1)structures in column1(column for ground floor) and in column2(column for first floor) it increases by 56% for G+ 3(normal column) to G+3(floating column)structures and 3.42% for G+3(floating column) to G+3(floating column1)structures.
F. For comparison between bending moment for G+3 structure in normal column, floating column(column removed from ground floor) and floating column 1(column removed between first floor and second floor) the variation in bending moment shows that the bending moment is maximum in floating column 1(column removed between first floor and second floor) the bending moment increases by 10.25% for G+3 (normal column)to G+3(floating column) structures and 12.82% for G+3(floating column) to G+3(floating column1)structures in column1(column for ground floor) and in column2(column for first floor) it increases by 5.98% for G+ 3(normal column) to G+3(floating column)structures and 11.96% for G+3(floating column) to G+3(floating column1)structures.

REFERENCES

[1] Behera Sukumar Seismic analysis of multistoried building[Journal]. Rourkela:[s.n.],2012. –May.
[2] A.P. Mundada and S.G. Sawdatkar Comparative Seismic Analysis of Multistorey Building with and without Floating Column[Journal]. Buldana:[s.n],2014. –October.
[3] Sreekanth Gandla Nanabala Seismic Analysis of A Normal Building and Floating Column Building[Journal]. Andhra Pradesh:[s.n],2014. –September.
[4] Prerna Nautiyal Seismic Response Evaluation of RC frame building with Floating Column considering different Soil Conditions[Journal]. Bhopal:[s.n],2014. –February.
[5] Pankaj Agrawal, S.K Thakkar & R.N.Dubey, “Dynamic analysis of a damaged building on floating column”. paper no. 24, vol.39, September 2002
[6] Pratyush Malaviya, Saurav ,”Comparative study of Effect of Floating Columns on the cost analysis of a structure designed ”,Volume 5, Issue 5, May-2014
[7] Srikanth.M.K, Yogendra.R.Holebagilu, “Seismic response of complex building with floating column for zone II and zone V, International journal of Engineering Research, ISSN: 2321-7758 Vol.2., Issue.4, 2014
[8] Dr. Mohammed Y. Fattah & Qutaiba G. Majeed,” Behaviour of Encased Floating Stone Columns”, Eng. & Tech. Journal, Vol.27, No.-7, 2009
[9] Susanta Banerjee, Sanjaya Kumar Patro,” Structural analysis and design” Vol:8 No:6, 2014



10.22214/IJRASET

INDEX COPERNICUS
45.98

IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY