



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 12, December 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com



Comparative Analysis & Design of Regular R.C.C Building G+10 with Floating Columns and Without Floating Columns in Various Seismiczones using E-Tabs

D.Sasidhar¹, A.Srikanth²

M.Tech Scholar, Dept. of Civil Engineering, VasireddyVenkatadri Institute of Technology, Nambur, Peddakakani, Guntur, A.P., India¹

Associate Professor, Dept. of Civil Engineering, VasireddyVenkatadri Institute of Technology, Nambur, Peddakakani, Guntur, A.P., India²

ABSTRACT: In the present situation, the multi-storey buildings with floating columns will provide much larger spaces that are required for community halls, shopping malls, and hospitals. The column which is supported on a beam instead of a rigid foundation is known as the floating column. By providing these type of columns, they may satisfy the functional requirements of the buildings but the structural behavior changes abruptly due to the floating columns and while considering the seismic load with different zones the behavior may cause major accidents of multi storey buildings. In this dissertation, the seismic execution of the regular shaped R.C.C structure with floating columns introduced in different boundaries of the structure. The structure is analyzed by utilizing ETABS programming with various seismic zones- II,III,IV&V. In this structure the floating columns are set at different areas at various stories that are considered for the examination. The fundamental point of this exposition is to assess the seismic reaction of the regular shaped R.C.C structure under different zones and with floating columns and comparing it with a normal regular shaped R.C.C building which does not contains floating columns.

KEYWORDS: Story Drifts, Story Displacement, Base Shear and Axial Forces.

I. INTRODUCTION

In urban areas nowadays many multi-story structures in India, today have an empty storey as a dis comfortable feature. This is being adopted to accumulate parking or reception lobby in the lower storey. To study the behavior of the structure during seismic forces (ie earthquake forces) are carried on the ground. The behavior of a structure during earthquake load depends critically on its structural shape, size, geometrical appearance in addition to reduce the axial force developed on the structure due to earthquake forces. The earthquake forces carried out on the structure developed at different storey levels in the building. The seismic forces are created at different floor levels in a structure need to be brought down along the height of the lower ground level of the building by the short path, any deflection or disintegrate in this load transfer path results causesstorey displacement, story drift, the poor performance of the structure. The multi-storey buildings with vertical backups like ieHotel buildings, Multiplex buildings, Shopping Malls with a few storeys wide than the rest buildings. Due to sudden cause in seismic forces at the level where the structure got discontinue. Buildings that have fewer columns or walls in a particular floor storey or with un discontinuity tall storey building which tends to cause damage or collapse which is initiated in that storey, due to the openings of the building which may cause a pounding effect which is initiated in that storey , In many structures with the open ground storey is accumulated for parking of vehicles. Due to the open storeys the stiffness of the building may decrease which may cause a collapse of the structure.

Floating column: A column is a vertical member which transfers load caused due to ie(floor, beams) and transfers the load directly to the foundation. In the case of floating columns is a vertical member that rests on a horizontal beam and doesn't have a foundation. The floating columns don't transfer the load directly to the foundation due to discontinuity. Of the column, it transfers the load to below the beam on which it's resting it. The floating column acts as a point load on the beam and this beam transfers the load to the column below it.



II. LITERATUREREVIEW

1. SukumarBehera(2012) In this paper, we explained the stiffness balance of the first storey and the storey above observed to decrease irregularity occurs due to the floating column. To analysis the response of the structure under different seismic zones excitation having a different frequency, time period, drifts, displacement. The response of the building frame with and without floating column is analyzed by using different methods Static method, Response spectrum analysis, time period analysis. The finite element method has been used in MATLAB as a platform, the time history of floor displacement, storey drift, base shear, moments, torsion moments, etc., are displayed compared with the building with floating columns & without floating columns. The dynamic analysis of the building is analyzed by varying column dimensions. It is concluded that with increasing in base floor column occurs maximum displacement, internal storey drift values decreased. The base shear and overturning moments varying with the change of column dimension.

2. ShrikanthM.K.Yogendra,R.Holebailu(2014) In this paper we discuss all the comparisons of a structure having only floating columns and complexities. A High-rise building is an analysis of seismic forces. For that reason created four structures and analyzed for lower to high earthquake zones for general soil conditions. The analysis was carried out by E-Tabs software, the results are displayed in terms of story displacement, storey drifts for these four structures and calculated based on the linear seismic analysis.

3. Mr.P.V. Prasad&T. Raja Sekhar, (2014) In this study, we learn about the behavior of building structures without & with floating columns is analyzed under equivalent static load, free vibration, and forced vibration. The results are plotted for the structures with and with floating columns by comparing both by using storey displacement, storey drift, base shear. The static analysis is analyzed on the entire project mathematical 3D model using the software STAAD Pro and the comparison of these structures are been displayed. This will help to find the various analytical solutions of the structure and we may also have a very systematic and economical design of the structure.

III. DESIGN PROGRAMMING

In this chapter, we are discussing the basic procedure involved in the study behavior of RCC multi storey buildings with floating columns and without floating columns. It is carried out in the Computer Laboratory of Civil engineering department of VASIREDDY VENKADRI INSTITUTE OF TECHNOLOGY. ETABS is the software used in comparison Bending moments, Shear forces, Deflections, Storey drift, Base shear, Storey displacements are analyzed here.

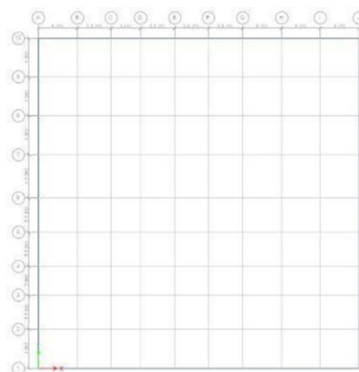


Fig- Plan

Analysis of R.C.C structure without floating columns & with floating columns:

For selected plan analysis is done for regular square-shaped R.C.C structure without floating columns and with floating columns. The square-shaped regular R.C.C structure is analyzed for seismic loading for Zone-II, Zone-III, Zone-IV, Zone-V with different loading conditions step-by-step procedure carried out as demonstrated below. For selected plan analysis is done for both Reinforced Cement Concrete structures with floating columns & without floating columns. Here R.C.C structure with floating columns is analyzed for various seismic loading Zone-II, Zone-III, Zone-IV, and Zone-V with different loading conditions step-by-step procedure demonstrated



Particulars	Dimension/Value for RCC structure without floating columns
Plan Dimension	33mx34m
Number of stories	G+10
The total height of the building	33.5m
Height of each storey	3m
Height of parapet	1.3m
Size of beams	300mmx530mm
Size of columns	400mmx600mm
Thickness of walls	2brick, 1brick thickness
Interior wall loads	6kN/m ²
Exterior wall loads	12kN/m ²
Seismic zone	2,3,4,5
Floor finish	1.5kN/m ²
Live load at all floors	6kN/m ²
Density of concrete	25kN/m ³
Density of brick	20kN/m ³
Density of steel	7850kg/m ³
Grade of concrete	M40
Grade of reinforcing steel	Fe415
Soil condition	Hard, Medium, Soft condition Depending upon Zone
Response reduction factor	5
Importance factor	1.5

Table- Consideration data for R.C.C Structure without floating column

Particulars	Dimension/Value for RCC structure with floating columns
Plan Dimension	33mx34m
Number of stories	G+10
The total height of the building	33.5m
Height of each storey	3m
Height of parapet	1.3m
Size of beams	300mmx530mm
Secondary beams	230mmx450mm
Size of columns	400mmx600mm
Thickness of walls	2brick, 1brick thickness
Interior wall loads	6kN/m ²
Exterior wall loads	12kN/m ²

Table- Consideration data for R.C.C Structure with floating column

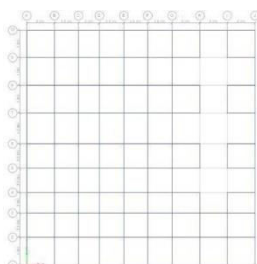


Fig- Showing beam alignment

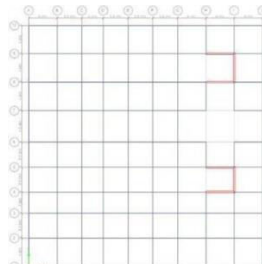


Fig- Showing beams with lift

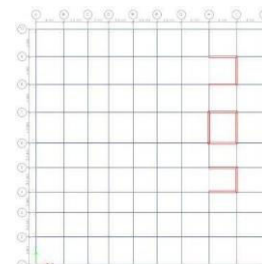


Fig- Showing beams with staircase and lift

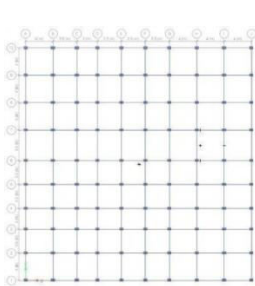


Fig-Showing Columns alignment

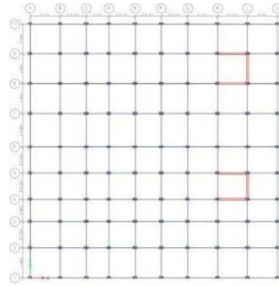


Fig- Showing Columns with lift

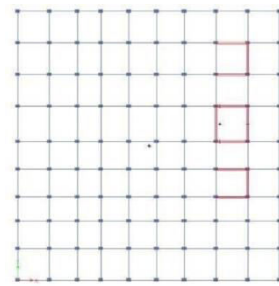


Fig- Showing Columns with lift and Stair case

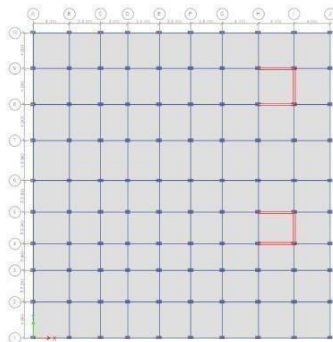


Fig-Showing plan of Square shape of RCC structure

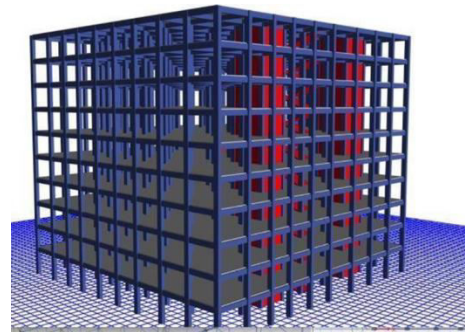


Fig-Showing full Square shape RCC Structure

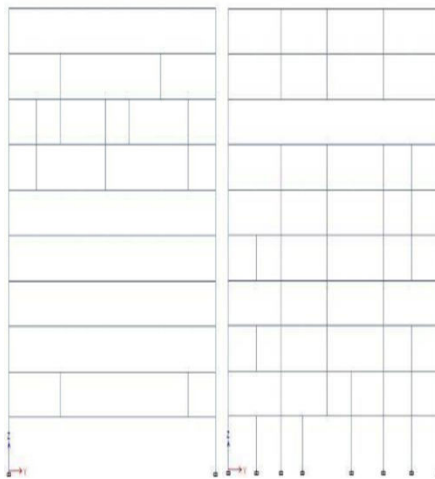


Fig-Showing elevation of R.C.C structure with floating columns

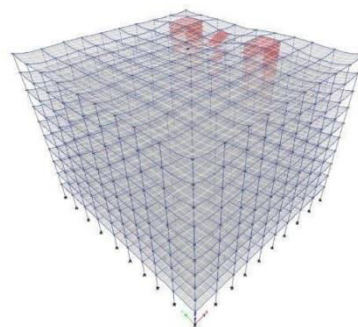


Fig-Showing Deflections of R.C.C structure with the floating column in seismic zones



IV.RESULTS AND DISCUSSIONS

Consequence of Reinforced Cement Concrete structure without floating columns & Reinforced Cement Concrete structure with floating columns are compared for deflections, storey drift, seismic loading, and movement about it. Graphs and tables are plotted to get the difference.

Comparison of R.C.C without floating columns & withfloating columns for Zone-II:

Comparison Property(Base Reactions)	RCC structure without floating Columns	RCC structure with floating columns
Max.Shear Force(kN)	1498.543	1943.470

Table- Base Reactions

Storey Drifts Comparison of R.C.C without floatingcolumns&R.C.C with floating columns:

Storey no	RCC structure without floating columns	RCC structure with floating columns
10(x-axis)	0.001144	0.001284
(y-axis)	0.000589	0.000919
9(x-axis)	0.001147	0.001311
(y-axis)	0.000591	0.000941
8(x-axis)	0.001100	0.001322
(y-axis)	0.000585	0.00095
7(x-axis)	0.001100	0.001307
(y-axis)	0.000567	0.000942
6(x-axis)	0.001037	0.001258
(y-axis)	0.000534	0.000910
5(x-axis)	0.000943	0.001169
(y-axis)	0.000485	0.000848
4(x-axis)	0.000815	0.001034
(y-axis)	0.000418	0.000752
3(x-axis)	0.000651	0.000849
(y-axis)	0.000332	0.000619
2(x-axis)	0.000449	0.000610
(y-axis)	0.000226	0.000446
1(x-axis)	0.000169	0.000284
(y-axis)	0.000070	0.000207

Table-Showing storey drifts for Zone-II

Storey displacement at each storey for R.C.C without floating columns & R.C.C withfloatingcolumns:

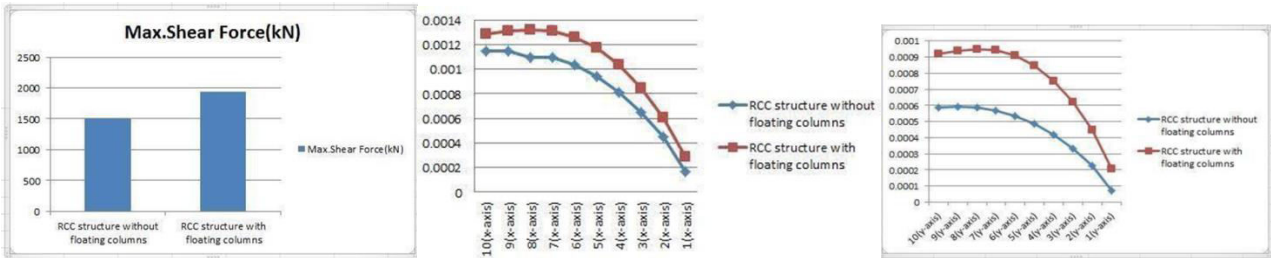
Storey no	X-axis(mm)		Y-axis(mm)	
	RCC structure without floating columns	RCC structure with floating columns	RCC structure without floating columns	RCC structure with floating columns
10	18.75	25.85	10.40	13.22
9	16.43	22.42	9.14	11.46
8	14.07	18.98	7.84	9.68
7	11.70	15.57	6.53	7.93



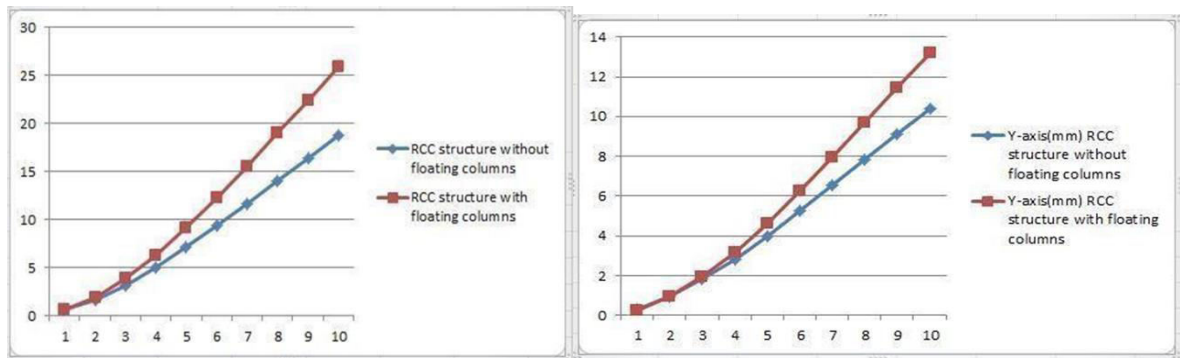
6	9.36	12.27	5.24	6.23
5	7.10	9.16	3.99	4.63
4	5.02	6.33	2.82	3.17
3	3.17	3.89	1.79	1.92
2	1.66	1.89	0.93	0.92
1	0.58	0.59	0.32	0.24

Table no- Showing storey displacement for Zone-II

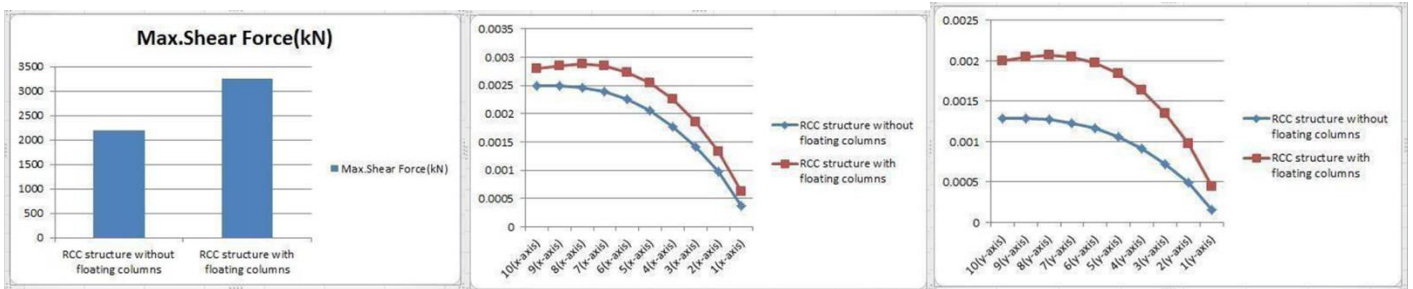
Comparative results zonalwise
For Zone-II seismic zone:



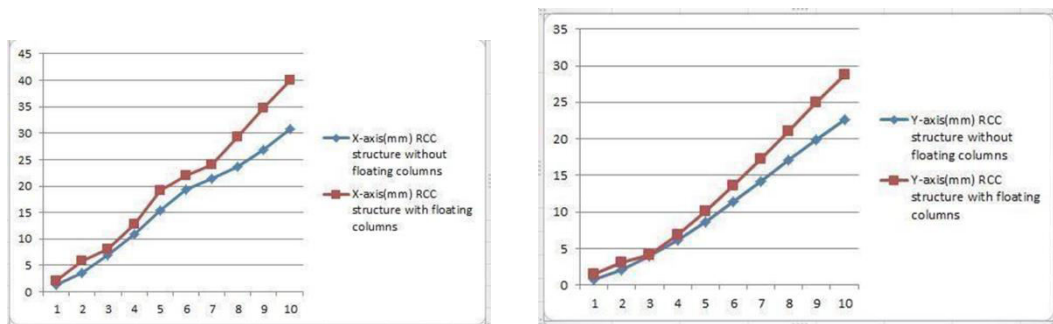
Storey drifts on X-axis & Y-axis



Story Displacements along X-axis & Y-axis
For Zone-III seismic zone:



Storey drifts along X-axis & Y-axis



Story Displacements along X-axis & Y-axis

V. CONCLUSIONS

1. The analysis of R.C.C structures with floating columns shows that the axial force, base shear, storey displacements, storey drifts of the structure are very high as compared to the R.C.C structure without floating columns.
2. Hence here we can conclude that the R.C.C structure without floating columns is more economical than the conventional R.C.C structure with floating columns due to building with floating columns we use secondary beams.
3. Under earthquake consideration because of inherent ductility characteristics, an R.C.C structure without floating columns performs better than an R.C.C structure with floating columns. Hence here the energy dissipation through structure with floating columns doesn't behave properly.
4. The optimum position provides floating column is at first floor alternatively so that storey displacements & storey drifts of the whole building can be minimized.
5. It is observed that the base shear of the R.C.C structure with floating columns increased for Zone-II, III, IV, V is 62%, 73%, 77%, 80% more when compared R.C.C structure without floating columns in Zone-II, III, IV, V.
6. Hence Storey drift for R.C.C structure with floating columns values increases for Zone-II, III, IV, V 50%, 60%, 70%, 80% more compared to R.C.C structure without floating columns in Zone-II, III, IV, V.
7. Hence Storey displacement for R.C.C structure with floating columns values increases for Zone-II, III, IV, V 60%, 70%, 80%, 90% more compared to R.C.C structure without floating columns in Zone-II, III, IV, V.
8. Hence here we have observed that storey displacement for R.C.C structure with floating columns in Zone-V has been beyond storey displacement limitation as per IS 1893:2002.

REFERENCES

1. Criteria for earthquake resistant design of structures, Part 1: General provisions and buildings, Indian Standard Code 1893:2002, Bureau of Indian Standards, New Delhi.
2. Indian Standard Code of practice for Design loads for Building and Structures; Dead Load – Unit Weights of Building Materials and Storey Materials. IS 875:1987 (Part-1)
3. "Earthquake Resistance Design of Structure", Four Edition.
4. "Oxford University Press, New Delhi, Shiwli Roy Agarwal Pankaj, Shrikhande Manish (2009), Earthquake resistant design of structures PHI learning privately limited, New Delhi.
5. Patyush Malaviya (2014) "Comparative study of floating columns on the cost analysis of a structure designed on staad pro, International journal of scientific research and engineering research.



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details