International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

COPY RIGHT

IJIEMR Transactions, online available on 26th Aug 2017. Link :http://www.ijiemr.org/downloads.php?vol=Volume-6&issue=ISSUE-7

Title: **Seismic Response of G+5 and G+10 RCC Building with Floating Column indifferent Zones**

Volume 06, Issue 07, Pages: 254-264.

Paper Authors

G.ACHYUTH, DR.D.VENKATESWARLU,D.S.V.S.RAM SAGAR.

Godavari Institute of Engineering &Technology (Autonomous),Rajahmundry,A.P,India .

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

Seismic Response of G+5 and G+10 RCC Building with Floating Column indifferent Zones

[1]G.ACHYUTH, [2]DR.D.VENKATESWARLU,[3]D.S.V.S.RAM SAGAR.

PG Scholar,Dept of Civil Engineering,Godavari Institute of Engineering &Technology (Autonomous),Rajahmundry,A.P,India
Professor & Head of the Department of civil Engineering,Godavari Institute of Engineering &Technology (Autonomous),Rajahmundry,A.P,India .
Assistant professor,Dept of civil Engineering, Godavari Institute of Engineering &Technology (Autonomous),Rajahmundry,A.P,India .

ABSTRACT At present buildings with floating column is a typical feature in the modern multi-storey construction in urban India. There are many projects in which floating columns are adopted, especially above the ground floor, where transfer girders are employed, so that more open space is available in the ground floor. As the load path in the floating columns is not continuous, they are more vulnerable to the seismic activity. Sometimes, to meet the requirements these type of aspects cannot be avoided though these are not found to be of safe. Hence, an attempt is taken to study response of a G+5 and G+10 RC buildings with Floating Columns in different Zones. Finally, analysis & results in the high rise building such as storey drifts, storey displacement, and Base shear were shown in this study. Design and Analysis was carried out by using Staad.pro software. This study is to find whether the structure is safe or unsafe with floating column when built in seismically active areas and also to find floating column building is economical or uneconomical.

Key words: Stadd.pro, Seismic Analysis , Floating Columns , Rcc Buildings

1.INTRODUCTION Many urban multi-storey buildings in India today have open first storey as an unavoidable feature. This is primarily being adopted to accommodate parking or reception lobbies in the first storey. Whereas the total seismic base shear as experienced by a building during an earthquake is dependent on its natural period, the seismic force distribution is dependent on the distribution of stiffness and mass along the height. The behaviour of a building during earthquakes depends critically on its overall shape, size and geometry, in addition to how the earthquake forces are carried to the ground. The earthquake forces developed at different floor levels in a building need to be brought down along the height to the ground by the shortest path; any deviation or discontinuity in this load transfer path results in poor performance of the building. Buildings with vertical setbacks (like the hotel buildings with a few storeys wider than the rest) cause a sudden jump in earthquake forces at the level of discontinuity. Buildings that have fewer columns or walls in a particular storey or with unusually tall storey tend to damage or collapse which is initiated in that storey. Many buildings with an open ground storey intended for parking collapsed or were severely damaged in Gujarat during the 2001 Bhuj earthquake. Buildings with columns that hang or float on beams at an intermediate storey and do not go all the way to the foundation, have discontinuities in the load transfer path. This type of construction does not create any problem under vertical loading condition. But during an earthquake a clear load path is not available for transferring the lateral forces to the foundation. Lateral forces accumulated in upper floors during the earthquake have to be transmitted by the projected cantilever beams. Overturning forces thus developed overwhelm the columns of the ground floor. Under this situation the columns begin to deform &buckle, resulting in total collapse. This is because of primary deficiency in the strength of ground floor columns, projected cantilever beams & ductility of beam- column joints. The ductile connection at the exterior beam-columns joints is indispensible for transferring these forces. Fig shows damage in residential concrete building due to floating columns. This is the second most notable &sepectular causes of failure in buildings. The 15th August Apartment and Nilima park apartment's buildings in Ahmadabad are the typical example of failure in which, infill walls present walls in the upper floors are discontinued in the lower floors. In this study, two cases of building model G+3 and G+5 were used for whole analysis. 2. METHODOLOGIES There are different methods available for the analysis of framed structures subjected to earthquake loads. The methods of analysis can be broadly classified into the following types. 1. Gravity Analysis 2. Linear Static Method (Equivalent Static Method) 3. Linear Dynamic method (Response Spectrum and Linear Time History Method) 4. Non-Linear Static Method (Pushover Analysis) 5. Non-Linear Dynamic Method (Non-linear Time History Analysis) Out of these four methods, Gravity analysis and Linear static method, is considered for the Analysis and Design of regular & Irregular G+8 Structure. EQUIVALENT STATIC METHOD The equivalent static method is the simplest method of analysis because the forces depend on the code based fundamental period of structures with some empirical modifiers. The design base shear is to be computed as whole, and then it is distributed along the height of the building based on some simple formulae appropriate for buildings with regular distribution of mass and stiffness. The design lateral force obtained at each floor shall then be distributed to individual lateral load resisting elements depending upon the floor diaphragm action. Inherently, equivalent static lateral force analysis is based on the following assumptions, Structure is rigid.• Perfect fixity exit between structure and foundation.• During ground motion every point on the structure experience same accelerations• Dominant effect of earthquake is equivalent to horizontal force of varying magnitude• over the height. Approximately determines the total horizontal force (Base shear) on the structure• However, during an earthquake structure does not remain rigid, it deflects, and thus base shear is disturbed along the height. EARTHQUAKE DEMAND ON BUIDINGS SEISMIC DESIGN FORCE: Earthquake shaking is random and time variant. But, most design codes represent the earthquakeinduced inertia forces as the net effect of such random shaking in the form of design equivalent static lateral force. This force is called as the Seismic Design Base Shear VB and remains the primary quantity involved in force-based earthquake-resistant design of buildings. This force depends on the seismic hazard at the site of the building represented by the Seismic Zone Factor Z. Also, in keeping with the philosophy of increasing design forces to increase the elastic range of the building and thereby reduce the damage in it, codes tend to adopt the Importance Factor I for effecting such decisions (Figure 1.12). Further, the net shaking of a building is a combined effect of the energy carried by the earthquake at different frequencies and the natural periods of the building. Codes reflect this by the introduction of a Structural Flexibility Factor Sa/g. Finally, as discussed in section 1.2 of Chapter 1, to make normal buildings economical, design codes allow some damage for reducing cost of construction. This philosophy is introduced with the help of Response Reduction Factor R, which is larger for ductile buildings and smaller for brittle ones. Each of these factors is discussed in this and subsequent chapters. In view of the uncertainties involved in parameters, like Z and Sa/g, the upper limit of the imposed deformation demand on the building is not known as a deterministic upper bound value.

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

Thus, design of earthquake effects is not termed as earthquake-proof design. Instead, the earthquake demand is estimated only based on concepts of probability of exceedence, and the design of earthquake effects is termed as earthquake-resistant design against the probable value of the demand. As per the Indian Seismic Code IS:1893 (Part 1) - 2007, Design Base Shear VB is given

$$V_B = A_h W$$

$$A_h = \frac{Z}{2}\frac{I}{R}\frac{S_a}{g}$$

where Z is the Seismic Zone Factor , I the Importance Factor , R the Response Reduction Factor , and Sa/ g the Design Acceleration Spectrum Value given by:

$$\frac{S_a}{g} = \begin{cases} \begin{cases} 2.5 & 0.00 < T < 0.40 \\ \frac{1.00}{T} & 0.40 < T < 4.00 \end{cases} & \text{for Soil Type I : rocky or hard soil sites} \\ \begin{cases} 2.5 & 0.00 < T < 0.55 \\ \frac{1.36}{T} & 0.55 < T < 4.00 \end{cases} & \text{for Soil Type II : medium soil sites} \\ \begin{cases} 2.5 & 0.00 < T < 0.67 \\ \frac{1.67}{T} & 0.67 < T < 4.00 \end{cases} & \text{for Soil Type III : soft soil sites} \end{cases}$$

Figure: Sa/g Values

in which T is the fundamental translational natural period of the building in the considered direction of shaking. Seismic Zone Factor Z as per IS:1893 (Part 1) - 2007 of the site where the building to be designed is located

Seismic Zone	V	IV	III	II
Z	0.36	0.24	0.16	0.10

Note:
The zone in which a building is located can be identified from the Seismic Zone Map of India given in IS:1893-2007, sketched in Figure

Figure 3.3: Seismic Zone Factor

Importance Factor Z of buildings as per IS: 1893 (Part 1) – 2007

Building	Importance Factor I
Normal Buildings	1.0
Important Buildings (e.g., Critical buildings required to be functional after an earthquake, Lifeline buildings associated with utilities, like water, power & transportation)	1.5

Figure: Importance Factor of buildings

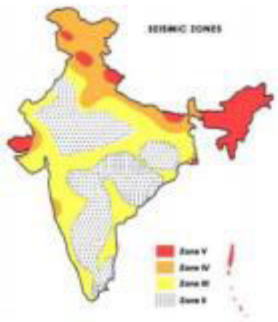


Figure: Sketch of Seismic Zone Map of India: sketch based on the seismic zone of India map given in IS:1893 (Part 1) – 2007

Response Reduction Factor R of buildings as per IS:1893 (Part 1) – 2007

Lateral Load Resisting System	R
Building Frame Systems	
Ordinary RC moment resisting frame (OMRF)	3.0
Special RC moment-resisting frame (SMRF)	5.0
Steel frame with	
(a) Concentric braces	4.0
(b) Eccentric braces	5.0
Steel moment resisting frame designed as per SP 6 (6)	5.0
Buildings with Shear Walls	
Ordinary reinforced concrete shear walls	3.0
Ductile shear walls	4.0
Buildings with Dual Systems	
Ordinary shear wall with OMRF	3.0
Ordinary shear wall with SMRF	4.0
Ductile shear wall with OMRF	4.5
Ductile shear wall with SMRF	5.0

Figure 3.6: Response reduction Factor

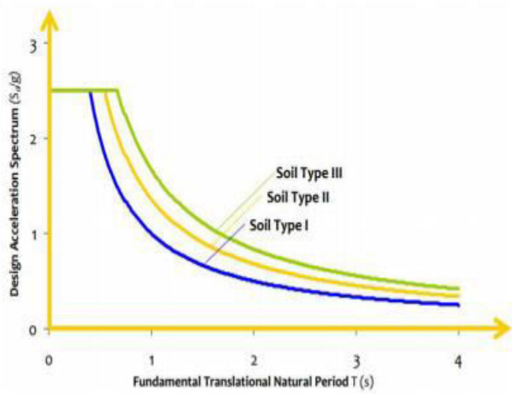


Figure: Design Acceleration Spectrum

This is based on fundamental translational natural period T of the building; this is defined in the following In the above equation, W is the seismic weight of the building. For the purpose of estimating the seismic weight of the building, full dead load and part live load are to be included. The proportion of live load to be considered is given by IS:1893 (Part 1)

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

as per Table 2.4; live load need not be considered on the roofs of buildings in the calculation of design earthquake force. While there is lesser control on design acceleration spectrum value Ah, designers can consciously reduce seismic weight W though the mass of the building. Choosing light materials and efficiently using the materials together help reducing the source of design earthquake force on the building. Also, the distribution of this mass in plan and elevation of the building renders earthquake-induced inertia forces to be uniformly distributed throughout the building, instead of being localized at a few parts of the building. Proportion of Live Load to be considered in the estimate of Seismic Weight of buildings as per IS:1893-2004

Imposed Uniformity Distributed Floor Loads (kN/m²)	Percentage of Imposed Load
Up to and including 3.0	25
Above 3.0	50

Figure 3.8: Live Loads

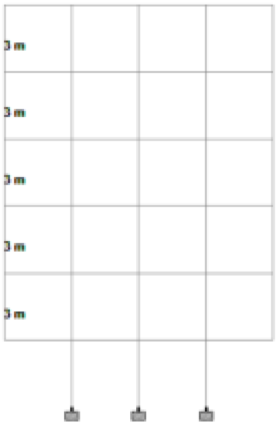
3. MODELLING OF G+5 and G+10 STRUCTURES In this study, analysis is made for multi-storeyed G+5 and G+ 10 structures with floating column. These are analyzed for gravity loads and seismic loads in the software as per IS 1893(Part-1):2002 condition of analysis. OVERVIEW OF SOFTWAREs List of software's used 1. Staad pro(v8i) STAAD PRO (V8i) Staad is powerful design software licensed by Bentley .STAAD stands for Structural Analysis And Design Any object which is stable under a given loading can be considered as structure. So first find the outline of the structure, where as analysis is the estimation of what are the type of loads that acts on the beam and calculation of shear force and bending moment comes under analysis stage. Design phase is designing the type of materials and its dimensions to resist the load. This we do after the analysis. To calculate shear force diagram and bending moment diagram of a complex loading beam it takes about an hour. So when it comes into the building with several members it will take a week. Staad pro is a very powerful tool which does this job in just an hour. Staad is a best alternative for high rise buildings. Now a days most of the high rise buildings are designed by staad which makes a compulsion for a civil engineer to know about this software. This software can be used to design Reinforced Concrete Structure, steel Structure or bridge, truss etc. according to various country codes. STAAD EDITOR: Staad has very great advantage when compared to other software's i.e., staad editor. Staad editor contains programming. This program can be used to analyse other structures also by just making some modifications, but this requires some skills. So load cases created for a structure can be used for another structure using staad editor. Limitations of Staad pro: 1. Huge output data 2. Even analysis of a small beam creates large output. DESIGN CONSIDERATIONS He G+5 and G+ 10 structures with floating column is considered for the present study. Plan and Elevation view of the frame model considered for the study are shown below. The present study deals with 2-different kinds of Building models 1. G+5 model with floating column 2. G+10 model with floating column

Plan

Plan of G+5 & G+10Structure

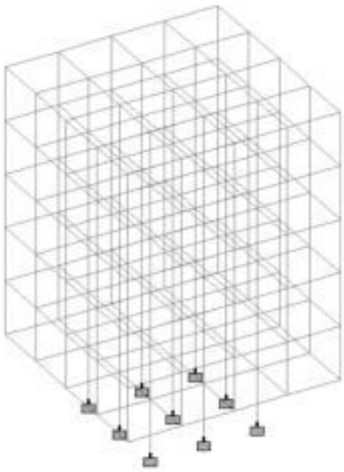
International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

Elevation



Elevation of G+5 Floating column

Elevation of G+10 Floating column



3D Model

Member and Material Properties

Dimensions of the beams and columns are determined on the basis of trial and error process in analysis of Staadpro by considering nominal sizes for beams and columns and safe sizes are as show in the table below.

	Beam (m)	Column (m)
G+10	0.23x0.40	0.40x0.40
G+5	0.23x0.35	0.35x0.35

Material properties of the building are like M20 grade of concrete, FE415 steel and 13800 N/mm2 of modulus of elasticity of brick masonry in the buildings.

Dead Load:

Floor finish : 1.5kN/m2

Internal wall load : 2.7x0.15x20 = 8.1KN/m

External wall load : 2.7x0.23x20 =12.42KN/m

Parapet Wall : 1x0.15x20= 3KN/m

Live load:

For typical floors : 3kN/m2

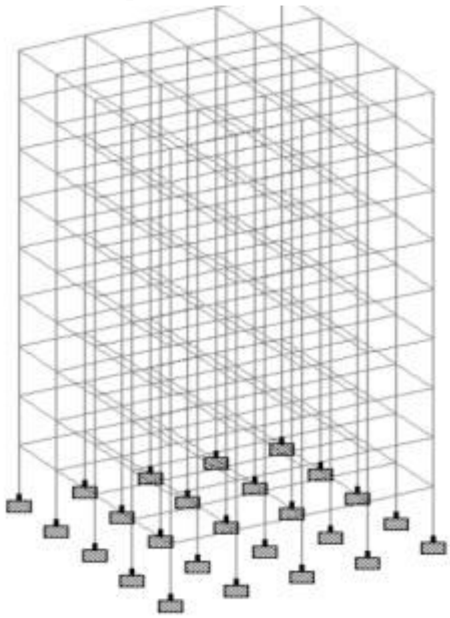
For top floor : 1.5kN/m2

Load Combination:

In this Project 13 Load Combinations are considered.

i) MODELLING OF STRUCTURE IN STAADPRO

Create a 3-d frame in structure wizard as shown in the plan

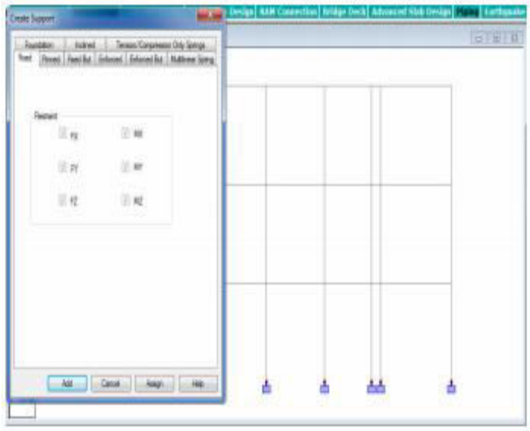


3-d structure

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

ii) Supports

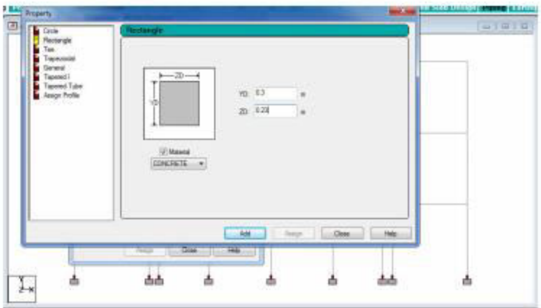
The base supports of the structure were assigned as fixed.

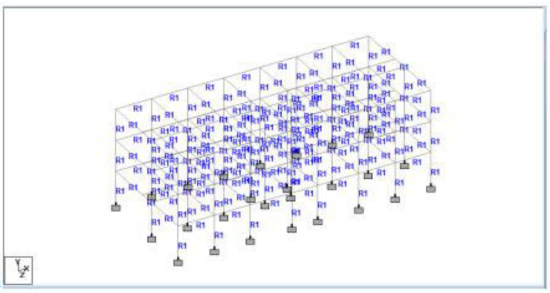


Defining Supports

iii) Member Property

Generation of member property can be done in STAAD.Pro by using the window as shown below. Define property (Beam and column cross section) For example: 300x230mm



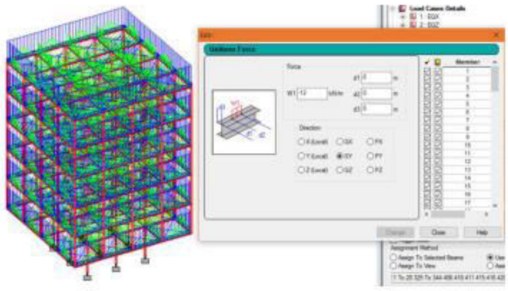


Property definition Assigning cross-section

iv) Loading

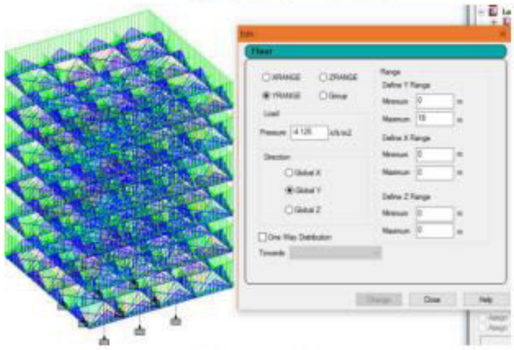
The loadings were calculated manually and rest was generated by stadd.pro. The loading caseswere categorized as:

- Seismic Load Definitions
- EQx and EQy
- Dead Load: Self weight, Member load, Floor Load, Floor Finishes.
- Live Load: Floor load

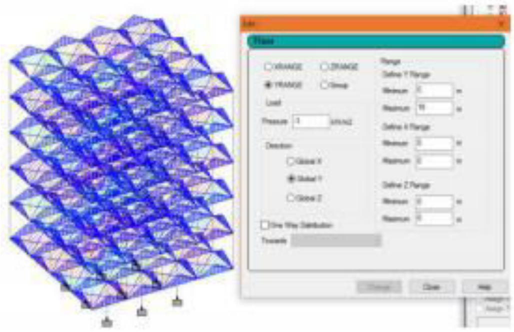


Assigning wall load

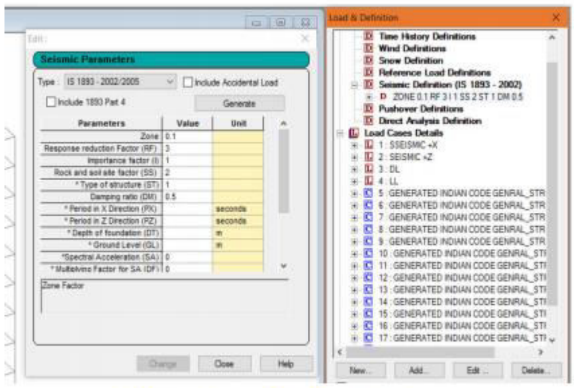
Assigning wall load



Assigning Slab Load



Assigning Live Load



Defining Seismic load definitions

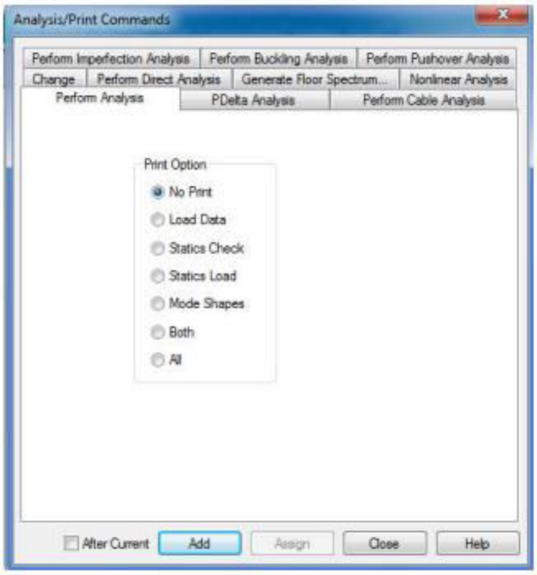
Self weight:

The self weight of the structure can be generated by STAAD.Pro itself with the self weight command in the load case column.

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

Load combination

The structure has been analyzed for load combinations considering dead load and live load Define design parameters then analyze/print analysis and run analysis.



Print analysis command

V) ANALYSIS

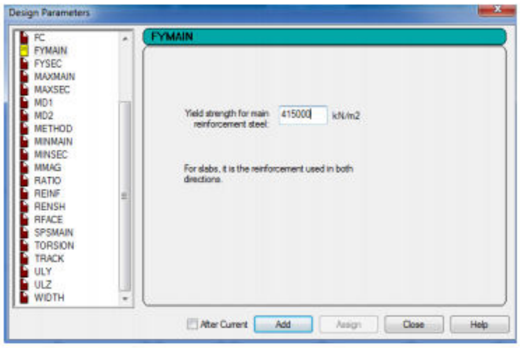
In analysis part we have to find out the behaviour of the structure as well as element in terms of deflection diagrams and stress contours (axial stress, shear stress, bending stress) due to various external loadings.

So after performing analysis output file will generate. Therefore we can check all the applied loads, node displacement values, structure deformations, support reactions, bending moments and shear force for beams& columns.

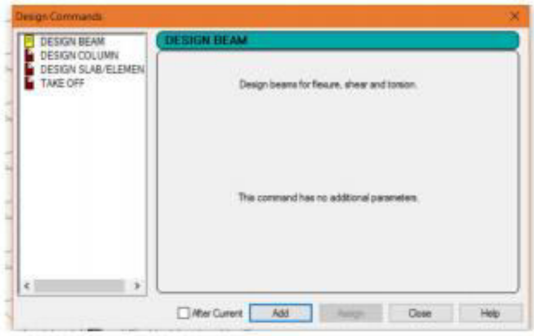
DESIGN

In this by means of analysis find out the respective members sizes and reinforcement details by means of various design parameters.

The structure was designed for concrete in accordance with IS code. The parameters such as clear cover,Fy, Fc, etc were specified. The window shown below is the input window for the design purpose.



Input window for design purpose



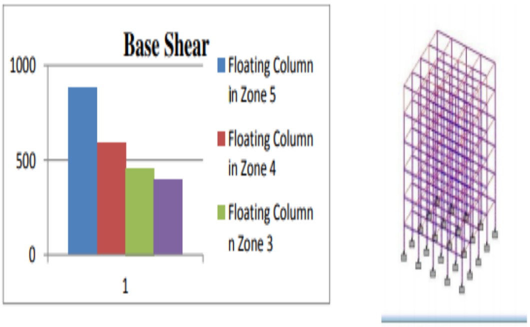
Design Command

4. RESULTS AND DISCUSSIONS COMPARISION OF BASE SHEAR Base shear is the horizontal reaction at the base against horizontal earthquake load. This base shear is acting at the base or supports of the structure or wherever structure is fixed. The variation in base shear dueto floating column and non-floating column are tabulated in below tables also variation in base shear is shown through graphs.

Table 5.1 Comparison of base shear of G+5 for different Zones

	Structure without Floating column Base shear (kN)	Structure with Floating column Base shear (kN)		
		Zone 5	Zone 4	Zone 3
Static analysis	397	881.7	587	391

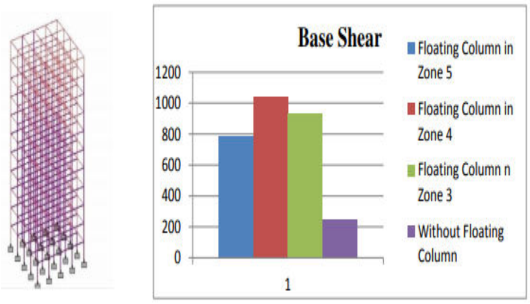
International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org



Comparison of Base Shear (G+5)

Table 5.2Comparision of base shear of G+10 for different Zones

	Structure without Floating column Base shear (kN)	Structure with Floating column Base shear (kN)		
		Zone 5	Zone 4	Zone 3
Static analysis	249	784	1043	931



Comparison of Base Shear (G+10)

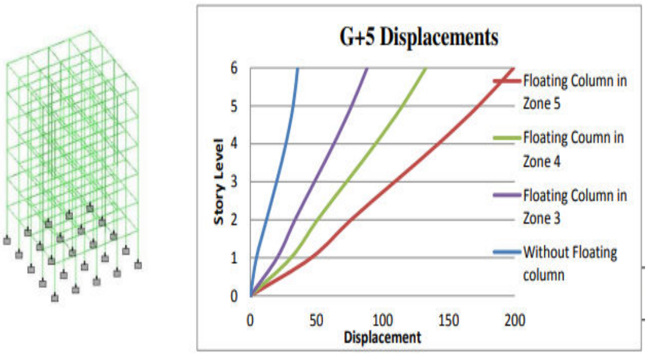
From the above results it was observed that base shear increases for the floating column buildings as compared to without floating column building.Also the base shear found to be higher in G+10 building than G+5 building. From which wecan conclude that as height increases base shear increases.

COMPARISION OF DISPLACEMENTS

Storey displacement is the lateral movement of the structure caused by lateral force. The deflectedshape of a structure is most important and most clearly visible point of comparison forany structure. No other parameter of comparison can give a better idea of behaviour of the structure than comparison of storey displacement.By the application of lateral loads in X and Z directions the structure can be analysed for variousload combinations given by clause 6.3.1.2 of IS 1893:2002. For the given load combinationsmaximum displacement at each floor is noted in and are shown below in the form oftables and graphs

Table 5.3Comparision of displacements of G+5 for different Zones

Storey Level	Structure without Floating column Displacements (mm)	Structure with Floating column Displacements (mm)		
		Zone 5	Zone 4	Zone 3
Ground Floor	4.64	46.16	30.8	20.3
First Floor	12.24	76.218	50.8	33.8
Second Floor	19.9	109.2	72.8	48.5
Third Floor	26.9	142.17	94.7	63.19
Fourth Floor	32.4	172.5	115.039	76.6
Fifth Floor	35.8	199.2	132.8	88.4

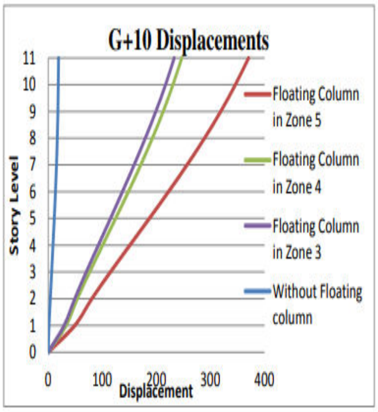


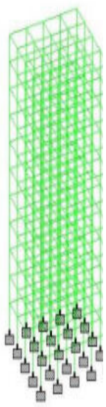
Comparison of Displacements

Table 5.4Comparision of displacements of G+10 for different Zones

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

Storey Level	Structure without Floating column Displacements (mm)	Structure with Floating column Displacements (mm)	
		Zone 5	Zone 4	Zone 3
Ground Floor	1.5	49.2	33.063	29.4
First Floor	3.9	80.73	53.8	49.12
Second Floor	6.4	115.152	76.7	70.4
Third Floor	8.8	151	100.6	92.7
Fourth Floor	11.25	187.01	124.6	115.14
Fifth Floor	13.4	222.4333	148.28	137.2
Sixth Floor	15.31	256.62	171.08	158.8
Seventh Floor	16.8	288.9	192.6	179.5
Eighth Floor	17.9	318.94	212.6	199
Ninth Floor	18.6	346.05	230.6	217
Tenth Floor	19.14	370.54	247.1	233





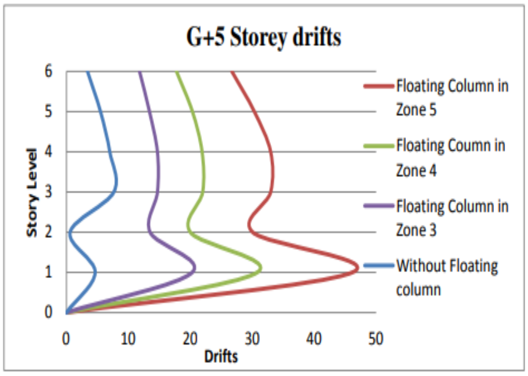
Comparison of Displacements

From the observation of the results it was observed that displacement of the building increases from lower zones to higher zones because the magnitude of intensity will be morefor higher zones.

COMPARISION OF STOREY DRIFTS

Storey drift is the relative displacement of the floor. The results variation of storey drift due to floating column in different zones are tabulated in below tables, also variation of storeydrifts are shown through graph.Comparision of storey drifts of G+5 for different Zones

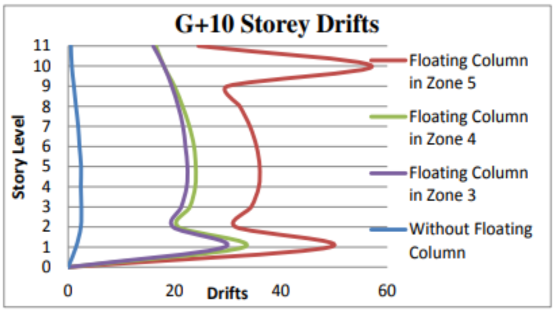
Storey Level	Structure without Floating column Drifts (mm)	Structure with Floating column Drifts (mm)		
		Zone 5	Zone 4	Zone 3
Ground Floor	4.64	46.16	30.8	20.3
First Floor	.6	30.056	20	13.5
Second Floor	7.66	32.98	22	14.7
Third Floor	7	32.97	21.9	14.69
Fourth Floor	5.5	30.33	20.339	13.41
Fifth Floor	3.4	26.7	17.761	11.8



Comparison of Storeydrifts (G+5)

Comparision of storey drifts of G+10 for different Zones

Storey Level	Structure without Floating column Drifts (mm)	Structure with Floating column Drifts (mm)		
		Zone 5	Zone 4	Zone 3
Ground Floor	1.5	49.2	33.063	29.4
First Floor	2.4	3153	20.737	19.72
Second Floor	2.5	34.422	22.9	21.28
Third Floor	2.4	35.85	23.9	22.3
Fourth Floor	2.45	36.01	24	22.44
Fifth Floor	2.15	35.42	23.68	22.06
Sixth Floor	1.91	34.19	22.8	21.6
Seventh Floor	1.49	32.28	21.52	20.7
Eighth Floor	1.1	30	20	19.5
Ninth Floor	0.7	57.06	18	18
Tenth	0.54	24.496	16.5	16



Comparison of Storey drifts (G+10)

COMPARISION OF STOREY SHEAR

Comparision of storey Shear of G+5 and G+10 for different Zones

Storey Level	Structure without Floating column Storey Shear (kN)	Structure with Floating column Storey Shear (kN)		
		Zone 5	Zone 4	Zone 3
Ground Floor	4.4	9.5	6.3	4.23
First Floor	17.9	39.8	26.5	17.6
Second Floor	40.3	89.6	59.7	39.82
Third Floor	71.7	159.2	106.19	70.7
Fourth Floor	112.15	248.8	165.9	110.62
Fifth Floor	150.7	334.5	223.05	148.7

Storey Level	Structure without Floating column Storey Shear (kN)	Structure with Floating column Storey Shear (kN)		
		Zone 5	Zone 4	Zone 3
Ground Floor	0.8	3.599	2.3	3
First Floor	3.336	15.175	10.117	11
Second Floor	7.507	34.145	22.76	22
Third Floor	13.345	60.702	40.46	36
Fourth Floor	20.852	94.847	63.23	54
Fifth Floor	30.027	136.57	91.05	76
Sixth Floor	40.870	185.9	123.93	101
Seventh Floor	53.382	242.8	161.87	129
Eighth Floor	34.353	307.304	204.86	162
Ninth Floor	22.6	379.387	252.92	197
Tenth	21.688	104.74	69.8	155

From the above results it states that the building with floating columns experienced more storey shear than that of the normal building. This is due to the use of more quantity of materials than a normal building. So the floating column building is uneconomical to that of a normal building 5.

CONCLUSIONS

The analytic study is carried out in order to compare the response of G+5 and G+10 RCC building with floating columns in different zones. The structures are designed using IS:456:2000 and IS 1893:2002 codes. From the study the following conclusions are obtained.

1.It was observed that in building with floating column has less base shear as compared• to building without floating column.

2.By the application of lateral loads in X and Y direction at each floor, the lateral displacements• of floating column building are more compared to that of a normal building and also displacement of the building increases from lower zones to higher zones because the magnitude of intensity will be more for higher zones. So the floating column building is unsafe for construction when compared to a normal building.

3.By the calculation of storey drift at each floor for the buildings it is observed that• floating column building in zone 5 will suffer extreme storey drift than normal building. The storey Drift is maximum at 1st and 2nd storey levels. Second Floor 7.507 34.145 22.76 22 Third

4.The building with floating columns experienced more storey shear than that of the• normal building. This is due to the use of more quantity of materials than a normal building. So the floating column building is uneconomical to that of a normal building

ACKNOWLEDGEMENT

I am grateful to my guide Mr. D.S.V.S.R SAGAR, Assistant Professor, for having given me the opportunity to carry out this project work. I take this opportunity to express my profound and whole heartfelt thanks to my guide, who with her patience, support and sincere guidance helped me in successful completion of the project. I would like to thank Dr.D. VENKATESWARLU, Professor and Head of the Department of CIVIL ENGINEERING, for valuable suggestions throughout my project which have helped in giving definite shape to this work. I would like to express my deep sense of gratitude to Dr.D.V. RAMA MURTHY Principal, for providing me a chance to undergo the course in the prestigious institute. I am very much obliged to Dr.L.S. GUPTA, Director and Dr.M.VARA PRASADARAO, Dean of Godavari Institute of Engineering and Technology for giving opportunity to undergo this project. Finally I would like to thank all the faculty members and non teaching staff from Department of Civil Engineering, GIET for their direct and indirect help during the project work. I owe my special thanks to the MANAGEMENT of our college for providing necessary arrangements to carry out this project. The euphoria and satisfaction of completing this project will not be completed until I thank all the people who have helped me in the successful completion of this enthusiastic task. Lastly I thank my parents for their ever-kind blessings. DECLARATION I, Gudipati Achyuth, hereby declare that the project entitled “Seismic Response of G+5 and G+10 RCC Building with Floating column in Different Zones” under the guidance of Mr. D.S.V.S.R SAGAR, submitted in partial fulfilment of the requirements for the award of the degree of Master of Technology in Structural Engineering is a record of bonafide work carried out by me and the results embodied in the project have not been reproduced. The results embodied in this project have not been submitted to any other university or institution for the award of any degree.

6. REFERENCES

1. PrernaNautiyal, Saleem Akhtar and GeetaBatham 2014, " Seismic Response Evaluation of RC frame building with Floating Column considering different Soil Conditions", Bhopal. 2. SukumarBehra and A V Asha & K C Biswal 2012," Seismic analysis of multistorey building with floating column", Rourkela 3. Shrikanth .M.K (2014) –Seismic response of complex building with floating column and without floating column, International journal of Engineering Research-Online. A Peer Reviewed International Journal .Vol. 2., Issue.4, 2014 .ISSN: 2321-7758 4. T.Raja. Sekhar (2014) – Study of behavior of seismic analysis of multistory building with and without floating column. T. Raja Sekhar et al, Carib .j. SciTech, 2014, Vol2, 697-710. 5. A. P. Mundada (2014) – Comparative seismic analysis of multi storey building with and without floating column ,International Journal of Current Engineering and Technology, Vol.4, No.5 (Oct 2014) 6. SreekanthGandlaNanabala(2014)- Seismic analysis of a normal building and floating column building , International Journal of Engineering Research &technology. 7. HardikBhensdadia(2015)- Pushover analysis of Rc structure with floating column and soft storey in different earthquake zones , frame International Journal of Research in Engineering and Technology . Volume: 04 Issue: 04 | Apr-2015 8. ArlekarJaswant N, Jain Sudhir K. and Murty C.V.R, (1997), “Seismic Response of RC Frame Buildings with Soft First Storeys” Proceedings of the CBRI Golden Jubilee Conference on Natural Hazards in Urban Habitat, 1997, New Delhi. 9. Awkar J. C. and Lui E.M, “Seismic analysis and response of multistorysemirigid frames”, Journal of Engineering Structures, Volume 21, Issue 5, Page no:425- 442,1997. 10. Design And Practical Limitations In Earthquake Resistant Structures And Feedback .International Journal Of Civil Engineering And Civil Engineering (IJCIET), Volume 5, Issue 6, June (2014), pp. 89-93 11. Pankaj Agarwal, Manish Shrikhande, Earthquake Resistant Design of Structures 12. IS 456: 2000, Plain And Reinforced Concrete Code of Practice, Indian Standard Institution, New Delhi.