STUDY BEHAVIOUR OF MULTISTOREY BUILDING WITH & WITHOUT FLOATING COLUMN AND SHEAR WALL UNDER SEISMIC ZONE 2 & ZONE 5

Md Muneeruddin[1], Md Faisaluddin[2], Shaik Abdulla[3], Nadeem Pasha[4]

[1,]M.Tech.(Structural Engineering) ,Khaja Bandanawaz College Of Engineering Gulbarga, Karnataka, India,

[2,3,4]Professors of M.Tech (Structural Engineering), Khaja Bandanawaz College Of Engineering Gulbarga, Karnataka, India

ABSTRACT- In present scenario, Buildings with and without floating columns are of typical aspect in the modern high rise structure practices in urban India. Such types of Buildings are highly objectionable which built in areas seismically prone. In this study analysis of a G+15 storey normal building & a G+15 storey were having floating column in addition with and without shear wall building for external forces. The analyze is done by the use of ETABS16.2.0 by comparing the displacement, drift, base shear of two different zones i.e., zone 2 & zone 5. This investigation is to discover whether the structure is protected or risky with floating columns when worked in seismically dynamic territories and likewise to discover coasting segment building is economical or uneconomical.

Keywords: *Floating column, shear wall, Displacement, Drift, Equivalent static method (EQ), Response spectrum method (RS).*

1. INTRODUCTION

1.1 GENERAL

Numerous urban multi storey structures in India now mostly have open first story here & their initial two storeys as an unavoidable element. This is same being received to oblige stopping or gathering anterooms in the primary storey. While the aggregate seismic base shear as experienced by a working amid a quake is subject to its common period, the seismic force distribution is reliant on the circulation of solidness & mass along the tallness. The direct of a working in the center of tremor depends on a very basic level on its general shape, measure and geometry, despite how the shake powers are passed on the ground. The shudder powers made at different floor levels in a building ought to be passed on down along the stature to the ground by the most restricted way. Structures with vertical disasters (like the hotel structures with two or three stories more broad than the rest) cause a sudden incline in seismic tremor powers at the level of brokenness Such structures are required to be examined by the dynamic examination & composed purposely. Fortified cement outline structures done by brick work infill walls been generally developed for business, mechanical & multi-family private uses in seismic-inclined areas around the world. Brick work infill regularly comprises of block, mud tile or solid square walls, built amongst segments & light emissions RC outline.

Structures which have less sections or walls in a specific storey or bizarrely tall storey tend to harm which is started on that storey. Structures which have less segments or walls in a particular storey or with exceptionally tall storey tend to fall which is begun in those storey .Many structures with an open ground storey or some time open first storey planned for stopping crumbled or was extremely harmed in Gujarat amid the 2001 Bhuj seismic tremor. Structures with segments that float on pillars at a middle story & don't go the distance to the establishment having more discontinuities in the load exchange way.

FLOATING COLUMN:

The floating column is a vertical section which at its lower level rests on a beam which is a horizontal member. Structures with sections that float on beam at a middle of the storey and don't go the distance to foundation, have more discontinuities in load exchange way. The beam thus exchanges the heap to different sections beneath it. Such columns where the load was considered as a point load.

There are numerous tasks in which floating segments are received, particularly over the ground floor, where exchange supports are utilized, so more open space is accessible in the ground floor. These open spaces might be required for gathering corridor or parking reason. The exchange supports must be outlined & nitty gritty appropriately, particularly in earth seismic zones.

SOME OF THE PICTURES SHOWING BUILDINGS HAVING FLOATING COLUMNS:

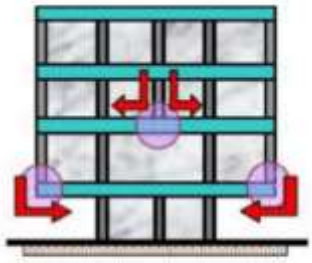


Fig. Floating Column

2.

OBJECTIVES:

The fundamental target of this investigation is to analyze the G+15 Storey working on floating column and shear wall at various areas and likewise to check the storey displacement, drift, base shear for drifting sections at different areas by looking at two changed seismic zone i.e., zone 2 and zone 5.

- To outline the essential idea and conduct of the Buildings with floating columns.
- To study the impact of shifting the area of floating segments in the floor of multi storied RC expanding on different response quantities amounts of the building utilizing response spectrum analysis
- To study the displacement, base shear, drift for floating columns which consider in different configuration.

3. METHODOLOGY & STRUCTURAL PLANNING

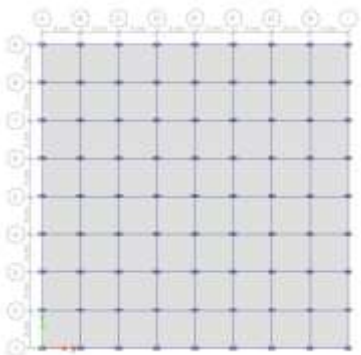
This project analysis is completed using ETABS 16.2.0It is a completely coordinated program that enables the user to make demonstrate, do adjustment, execution of investigation, improvement, and results survey from inside a solitary interface. ETABS 16.2.0 is an independent limited component based response program for the investigation and outline of common structures. It offers a delicate, yet capable UI with numerous instruments to help in brisk and exact development of the high rises inside a brief timeframe, alongside refined method expected to accomplish more unpredictable undertakings.

Case 1: R.C high rise without Floating column & shear wall in zone 2 & zone 5 i.e., Normal (G+15) storey building
Case 2: R.C high rise without floating column but shear wall placed in zone 2 & zone 5
Case 3: R.C high rise with floating column but no shear wall, i.e, Columns removed in exterior frame in zone 2 & zone5
Case 4: R.C high rise with floating column & also shear wall in zone 2 &zone 5(EXT columns removed)
Case 5: R.C high rise with floating columns but no shear wall i.e., columns removed in interior frame in zone 2 & zone 5
Case 6: R.C high rise with floating columns & also shear wall in zone 2 &zone 5(middle columns removed)

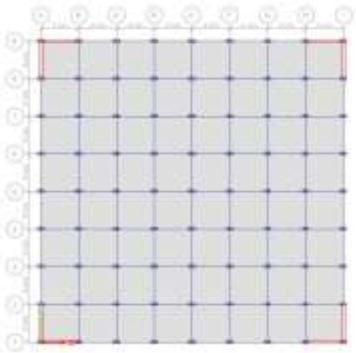
The building considered is regular G+15 normal R.C structure of plan area with 24mX24m, the building are considered to be located in Zone 2& Zone 5 as in Indian code IS 1893-2002.The below table contains structural data of the building.

Geometrical Properties Of Structure

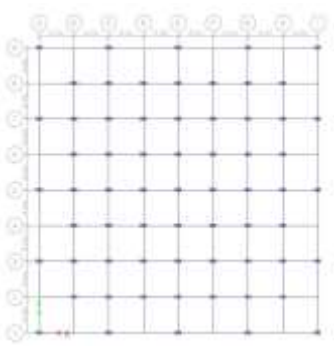
I)Material Data	
1 Grade of concrete	M30
2 Grade of Steel	Fe500
3 Unit weight of RCC	25kN/m2
II) Structural Data	
1 Type of structure	SMRF
2 Type of soil	Medium soil
3 Size of beam	300mm X600mm
4 Size of column	300mmX600mm
5 Depth of slab	150mm
6 Thickness of exterior wall	230mm
7 Thickness of interior wall	230mm
III) Architectural Data	
1 Number of stories	G+15
2 Floor height	3.2m
3 Dimension of plan	24mX24m
IV)Seismic Data	
1 Seismic Zone	2 & 5
2 Response reduction factor	5
3 Importance factor	1
4 Damping ratio	5%
V) Loads	
1 Live load	3kN/m2
2 Floor finish	1.5kN/m2
3 Wall load on exterior frame	4kN/m
4 Wall load on interior frame	4kN/m



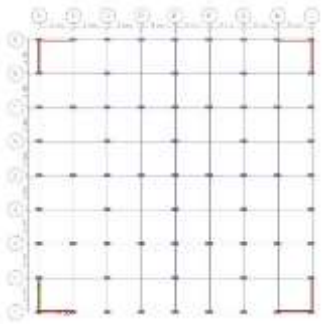
Model of case 1



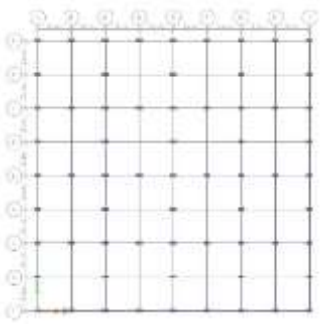
Model of case 2



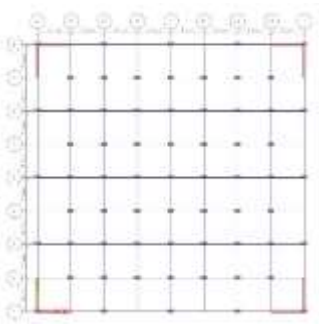
Model of case 3



Model of case 4



Model of case 5



Model of case 6

4. ANALYSIS OF THE BUILDING

The current Indian standard code IS: 1893 – 2002, requires that practically all tall buildings be analyzed as 3D systems. The above code is used to calculate the quake design forces .This force depends on the mass & seismic coefficient of the building & the next it depends on structure lays in which seismic zone, importance of the structure the soil strata, its stiffness & its ductility.

1) Equivalent static method
2) Response spectrum method

5. RESULTS & DISCUSSIONS

The results of, displacements, storey drifts & base shear for the building models for each of above analyses are presented & compared. An exertion has been done to concentrate the influence of floating column & shear wall positioned at X & Y Direction Multistory Building.

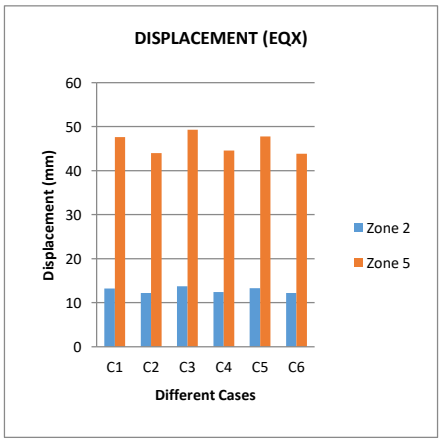
- **Storey displacement:**

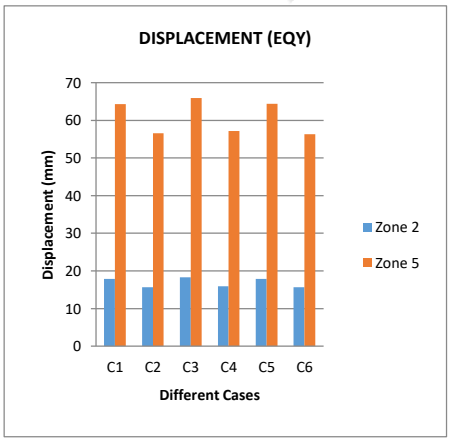
The Lateral displacement of a building which is caused by the lateral forces is known as storey displacement. In different zone the displacement shows different values. In seismic zone 2 displacements is less compare to displacements in seismic zone 5.With introduction of floating column it is even more in both.

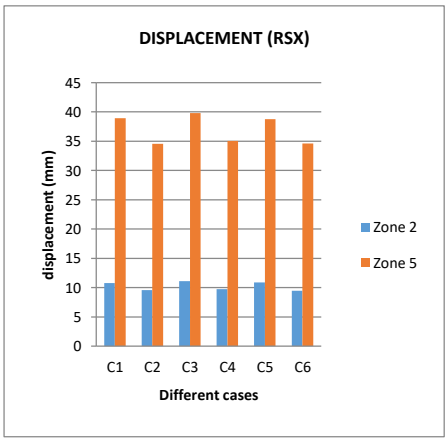
Displacement(EQX)		
Case no	Zone 2	Zone 5
C1	13.228	47.621
C2	12.213	43.966
C3	13.692	49.290
C4	12.389	44.600
C5	13.271	47.775
C6	12.174	43.826

Displacement(EQY)		
Case no	Zone 2	Zone 5
C1	17.865	64.315
C2	15.711	56.559
C3	18.319	65.947
C4	15.886	57.19
C5	17869	64.424
C6	15.634	56.282

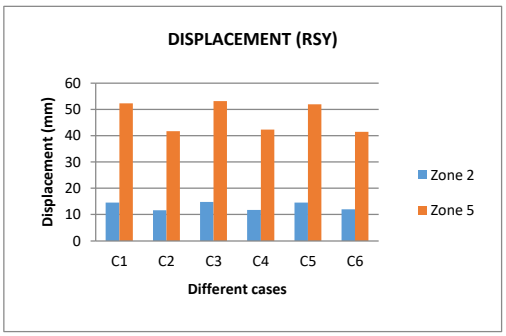
Displacement(RSX)		
Case no	Zone 2	Zone 5
C1	10.808	38.908
C2	9.607	34.585
C3	11.139	39.781
C4	9.734	35.044
C5	10.869	38.753
C6	9.493	34.62







Displacement(RSY)		
Case no	**Zone 2**	**Zone 5**
C1	14.531	52.311
C2	11.583	41.699
C3	14.788	53.095
C4	11.748	42.291
C5	14.588	51.959
C6	11.953	41.472



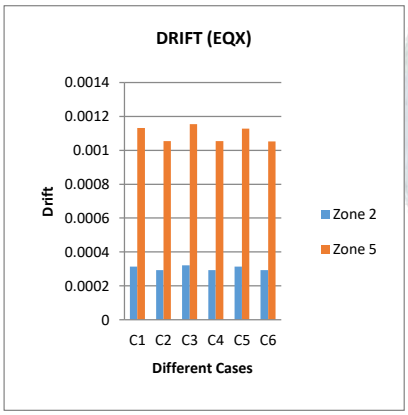
➢ **Storey Drift:**

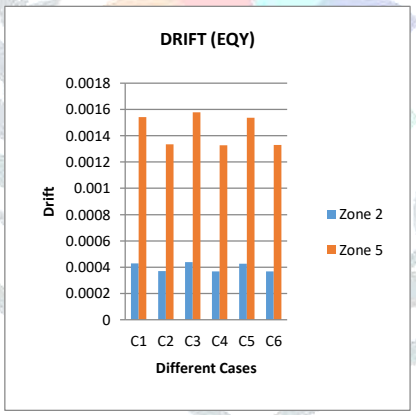
It is defined as the difference between the relative storey displacements. As we introduce floating column in a building, storey drift increases as storey displacement increases. Storey drift goes on decreasing as we move towards top stories & it goes on increasing from bottom storey.

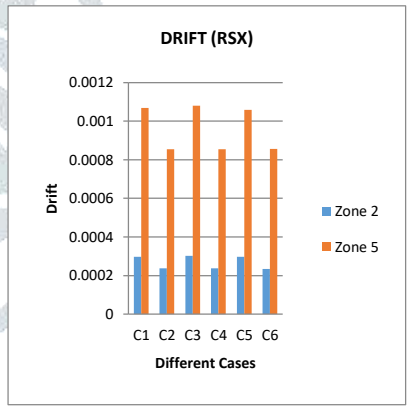
Drift (EQX)		
Case no	**Zone 2**	**Zone 5**
C1	0.000314	0.001131
C2	0.000293	0.001055
C3	0.000321	0.001155
C4	0.000293	0.001054
C5	0.000313	0.001128
C6	0.000292	0.001052

Drift (EQY)		
Case no	**Zone 2**	**Zone 5**
C1	0.000428	0.001542
C2	0.000371	0.001335
C3	0.000438	0.001578
C4	0.000369	0.001328
C5	0.000427	0.001536
C6	0.000369	0.001329

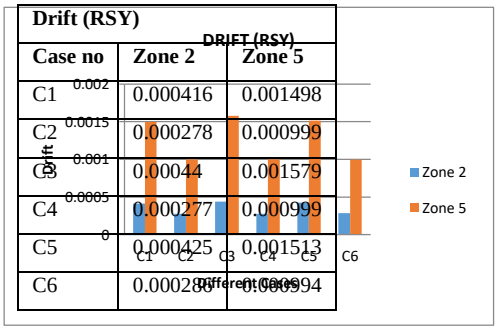
Drift (RSX)		
Case no	**Zone 2**	**Zone 5**
C1	0.000297	0.001069
C2	0.000237	0.000855
C3	0.000302	0.001079
C4	0.000237	0.000855
C5	0.000297	0.001059
C6	0.000235	0.000856





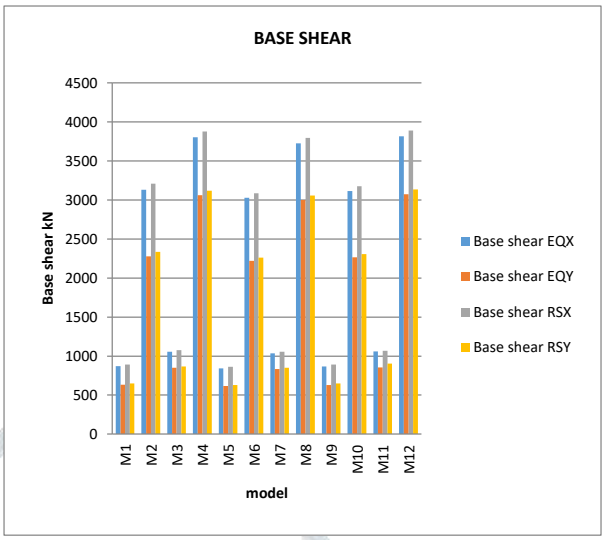


Drift (RSY)		
Case no	**Zone 2**	**Zone 5**
C1	0.000416	0.001498
C2	0.000278	0.000999
C3	0.00044	0.001579
C4	0.000277	0.000999
C5	0.000425	0.001513
C6	0.000286	0.000994



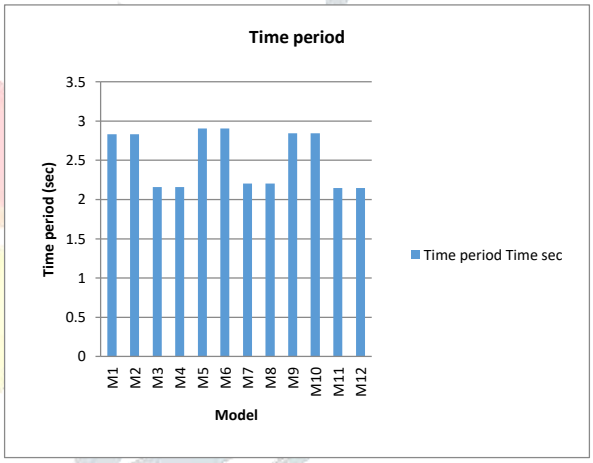
➢ **Base shear:**

Base shear(kN)				
Model no	**EQX**	**EQY**	**RSX**	**RSY**
1(case1)	869.3028	632.2364	891.7361	648.6942
2(case1)	3129.49	2276.051	3210.25	2335.299
3(case2)	1056.5963	850.0127	1076.57	866.2961
4(case2)	3803.7467	3060.046	3875.65	3118.666
5(case3)	841.3355	616.531	864.0686	630.2587
6(case3)	3028.808	2219.512	3085.981	2262.865
7(case4)	1034.44	833.478	1054.345	849.4308
8(case4)	3723.9819	3000.521	3795.64	3057.951
9(case5)	865.493	629.58	891.0826	647.9864
10(case5)	3115.78	2266.49	3177.16	2308.022
11(case6)	1059.69	853.821	1065.963	903.2372
12(case6)	3814.866	3073.756	3887.608	3133.882

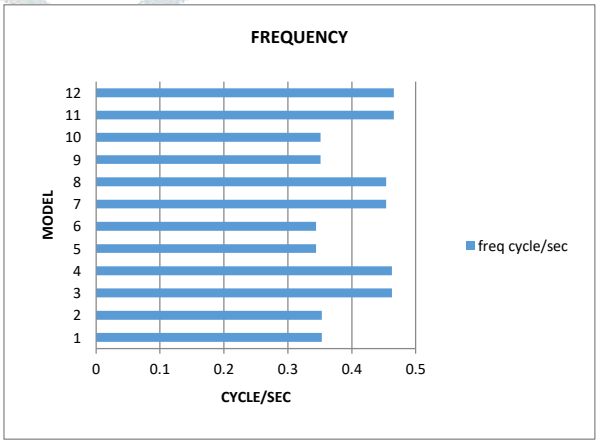


➢ **Time period:**

Time period	
model	**Time sec**
1(case1)	2.834
2(case1)	2834
3(case2)	2.158
4(case2)	2.158
5(case3)	2.906
6(case3)	2.906
7(case4)	2.203
8(case4)	2.203
9(case5)	2.846
10(case5)	2.846
11(case6)	2.148
12(case6)	2.148



Frequency	
model no	freq cycle/sec
1(case1)	0.353
2(case1)	0.353
3(case2)	0.463
4(case2)	0.463
5(case3)	0.344
6(case3)	0.344
7(case4)	0.454
8(case4)	0.454
9(case5)	0.351
10(case5)	0.351
11(case6)	0.466
12(case6)	0.466



6. CONCLUSIONS

The study of various cases shows different results for storey displacement, story drift & base shear.

- Generally, displacement is vigorously increases in zone 5 compare to zone 2.
- Storey drift & displacement is more when the floating column was introduced & it is even more in zone 5.
- The diagonal corners are covered with shear walls in some cases, which show best effective method to minimize the displacement and drift.
- The base shear decreases with use of floating column.
- It is also seen that base shear value increases with introduction of shear wall with floating column.
- There is also huge variation in base shear value compare to zone 2 and zone 5.
- The time period decreases with introduction of shear wall.
- There is less stability is seen when floating column is introduced in exterior compare to middle configuration.
- And also the displacement is more for exterior floating column compare to middle floating column.

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