Analysis of Different Geometrics and Different Shear Wall Locations In High Rise Building Using Floating Column

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Abstract- *Conventional R.C frame structure and floating column structure, shear wall are modelled and analyzed for the different combinations of static loading with multistoried building. The comparison is made between the regular and irregular conventional floating column structure and RC frame structure of 15 storey without shear wall and with shear wall at different locations. The main objective of the analysis is to study best and economical structure in regular and irregular structure in RC framed structure and floating column structure with and without shear wall at different location. The analysis is carried out using ETABs 2017 software Present work also provides a good source of information on various parameters like storey displacement, storey drift, time period. This study will help to find torsion free and economical high rise Building structures.*

Keywords: Floating Column, Shear walls, storey displacement, Storey drift, Time period.

I. INTRODUCTION

Generally the analysis of floating column structure is not complex but it is also important to study the behaviour against different forces acting on the components of a multistoried building. The analysis may be carried out using software like Etabs 2017. In this dissertation work, modern R.C.C structure i.e floating column, shear wall for different locations are modelled and analyzed for the different combinations of static loading with corner shear wall and middle shear wall with varying geometrics of multistoried building .The comparison is made between the conventional R.C.C floating column structure and RC frame structure of 15 storey without shear wall and with shear wall at different shear wall locations.

II. PROBLEM FORMULATION

Conventional R.C.C Floating column structure without shear wall and R.C.C Floating column structures with shear wall at particular locations are modeled and analyzed for the different combinations of static loading. Comparison is made between the conventional R.C.C Floating column structure and R.C.C. Floating column structure with shear walls situated in seismic zone III. Different cases of regular and irregular building considered are as given below;

A) Regular Building

Case-1: 15 storey Design and analysis of RC frame structure without shear wall.
Case-2: 15 storey Design and analysis of RC frame structure with middle shear wall.
Case-3: 15 storey Design and analysis of RC frame structure corner shear wall.
Case-4: 15 storey Design and analysis of floating column structure without shearwall.
Case-5: 15 storey Design and analysis of floating column structure with middle shear wall.
Case-6: 15 storey Design and analysis of floating column structure with corner shear wall.

B) Irregular Building

Case-1: 15 storey Design and analysis of RC frame structure without shear wall.
Case-2: 15 storey Design and analysis of RC frame structure with middle shear wall.
Case-3: 15 storey Design and analysis of RC frame structure with corner shear wall.
Case-4: 15 storey Design and analysis of floating column structure without shear wall.
Case-5: 15 storey Design and analysis of floating column structure with middle shear wall.
Case-6:15 storey Design and analysis of floating column structure with corner shear wall.

a. Details of Modeling:

1) Storey height 3500mm
2) Thickness of shear wall 150mm
3) Size of column 500x500
4) Size of beam 230x600
5) Plan dimension 40x40m for Regular building
6) Plan dimension 40x45m for Irregular building
7) Loading Details: Gravity Loads
   - Load on exterior frame– 12KN/m

- Load on interior frame– 7.68KN/m
- Live load – 3.5KN/m^2
- Floor finish load – 1.5KN/m^2

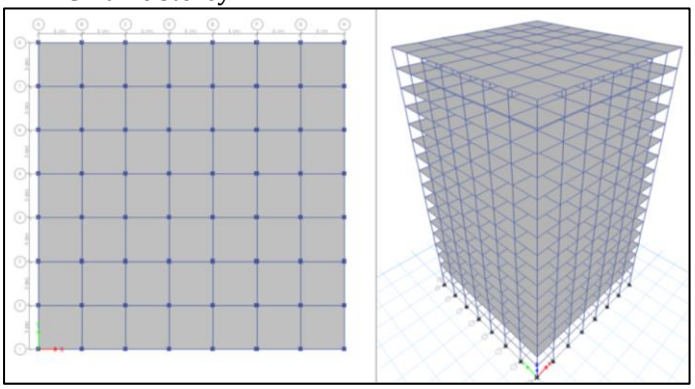
b. Detail of Earthquake loading:

Sr. No.	Parameters	Code Provision
1	Type of structure	RCC
2	Importance factor (I)	1.2
3	Response reduction factor (R) RC frame structure	5
4	Response reduction factor (R) Floating column structure	5
5	Damping for concrete	5%
6	Zone factor (Z)	0.16

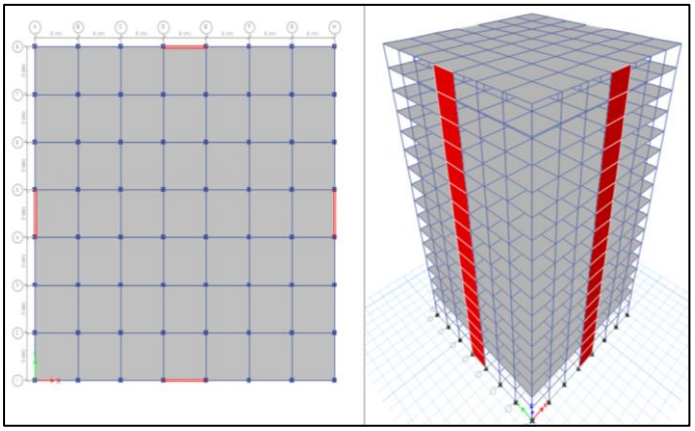
III. MODELLING

A. Regular structure: 15 Building

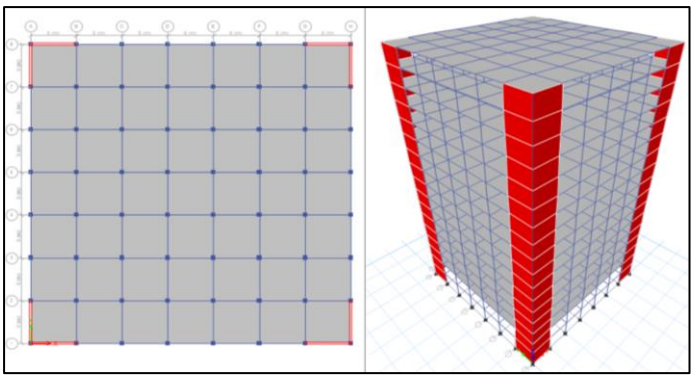
1. RC frame storey



Case 1: RC frame Structure

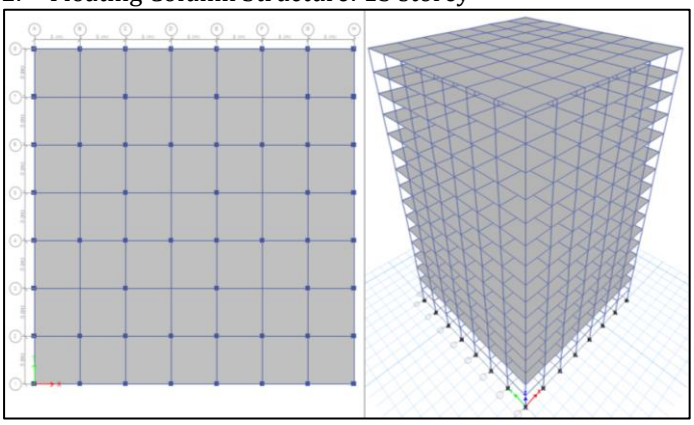


Case 2: RC frame middle shear wall Structure

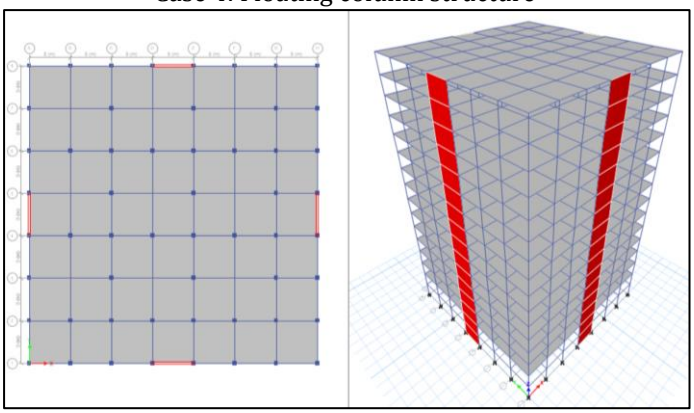


Case 3: RC frame corner shear wall Structure

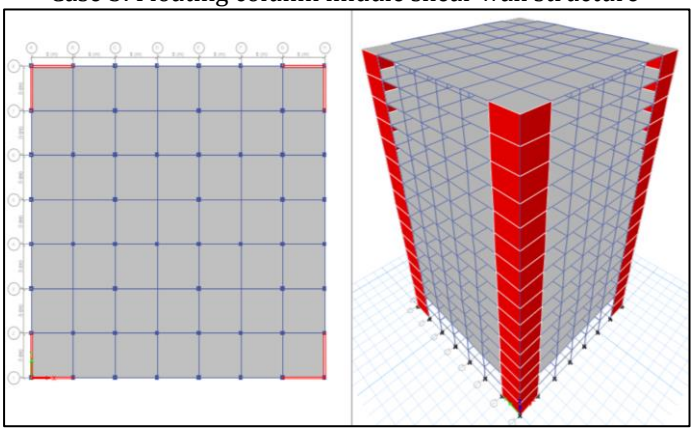
2. Floating Column Structure: 15 storey



Case 4: Floating column structure



Case 5: Floating column middle shear wall structure

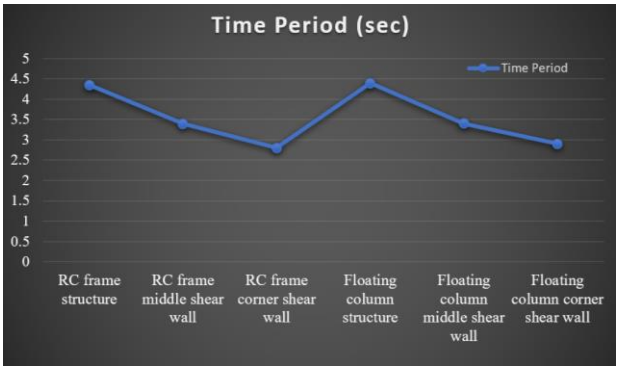


Case 6: Floating column corner shear wall structure

IV. RESULT AND DISCUSSION

1) Time period

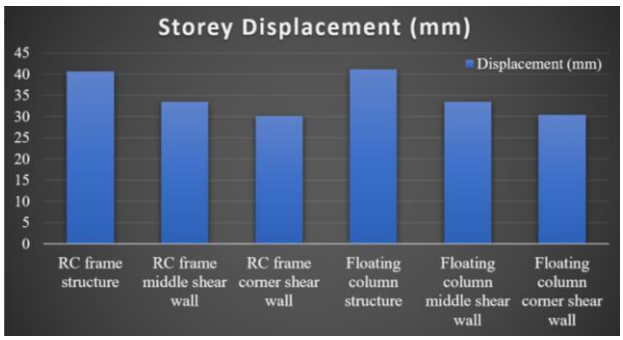
Cases	Time Period (sec)
RC frame structure	4.35
RC frame middle shear wall	3.39
RC frame corner shear wall	2.80
Floating column structure	4.39
Floating column middle shear wall	3.40
Floating column corner shear wall	2.90



This study we come to know Time Period less in RC frame corner shear wall.

2) Storey Displacement

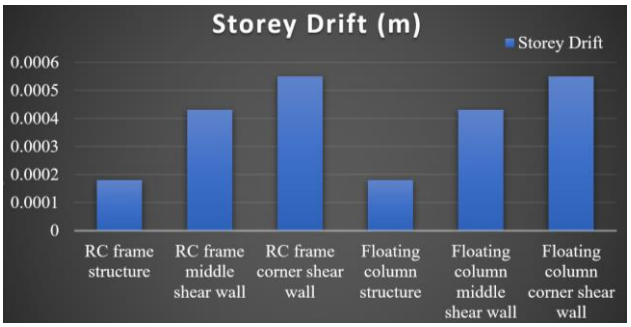
Cases	Displacement (mm)
RC frame structure	40.65
RC frame middle shear wall	33.51
RC frame corner shear wall	30.13
Floating column structure	41.11
Floating column middle shear wall	33.53
Floating column corner shear wall	30.45



This study we come to know Storey Displacement less in RC frame corner shear wall.

3) Storey Drift

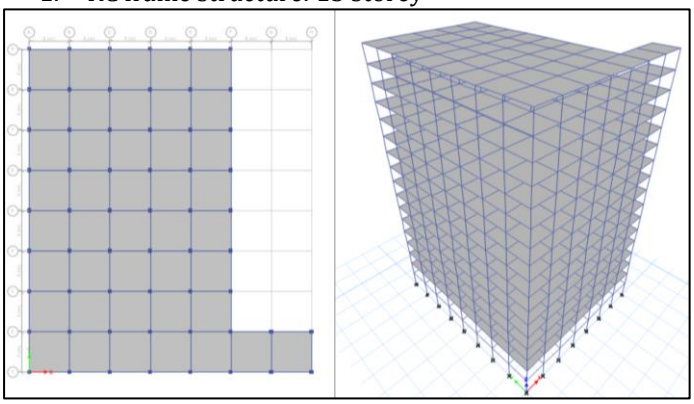
Cases	Storey Drift
RC frame structure	0.00018
RC frame middle shear wall	0.00043
RC frame corner shear wall	0.00055
Floating column structure	0.00018
Floating column middle shear wall	0.00043
Floating column corner shear wall	0.00055



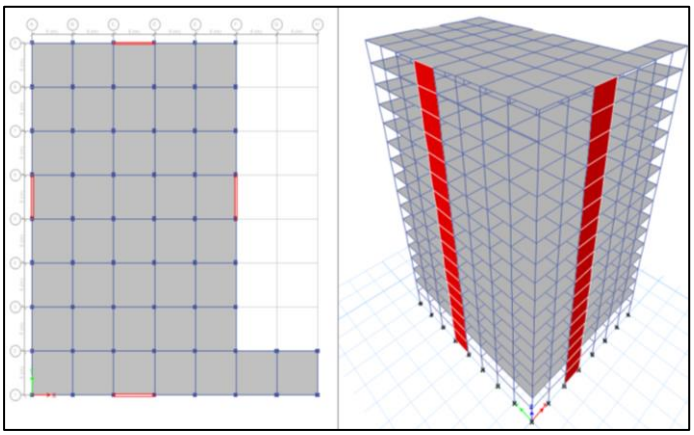
This study we come to know Storey Drift less in RC frame structure without shear wall and Floating column structure without shear wall.

B. Irregular Building

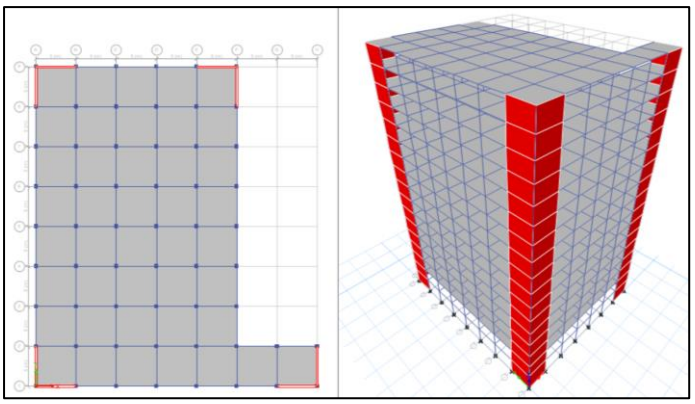
1. RC frame structure: 15 storey



Case 1: RC frame Structure

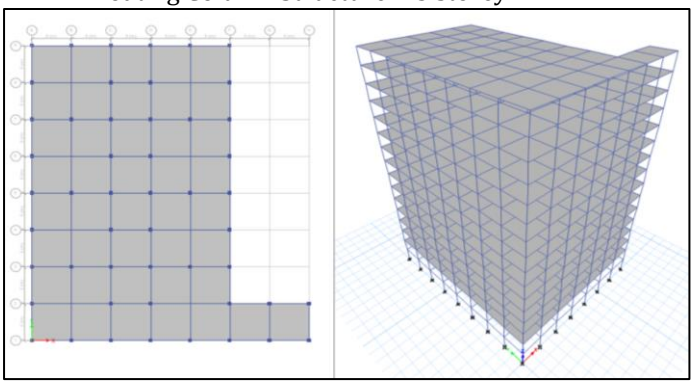


Case 2: RC frame middle shear wall Structure

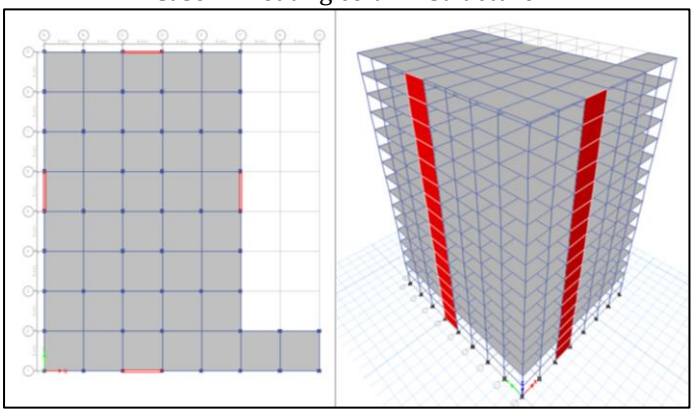


Case 3: RC frame corner shear wall Structure

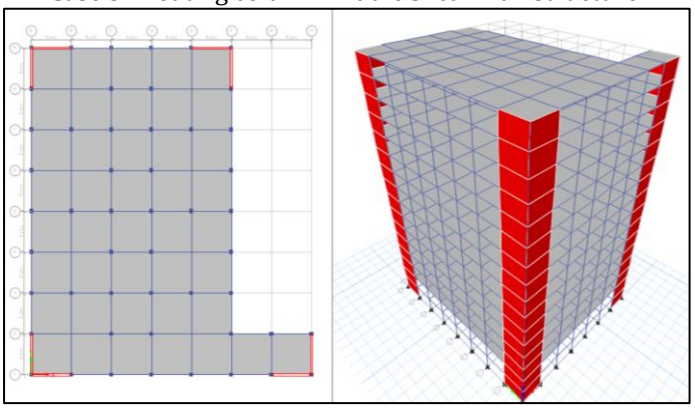
2. Floating Column Structure: 15 storey



Case 4: Floating column structure



Case 5: Floating column middle shear wall structure

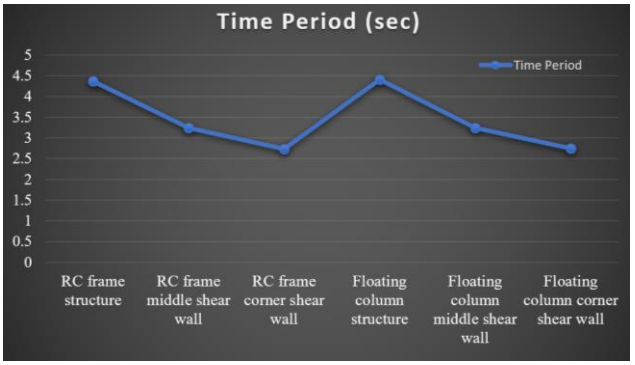


Case 6: Floating column corner shear wall structure

V. RESULT AND DISCUSSION

1) Time period

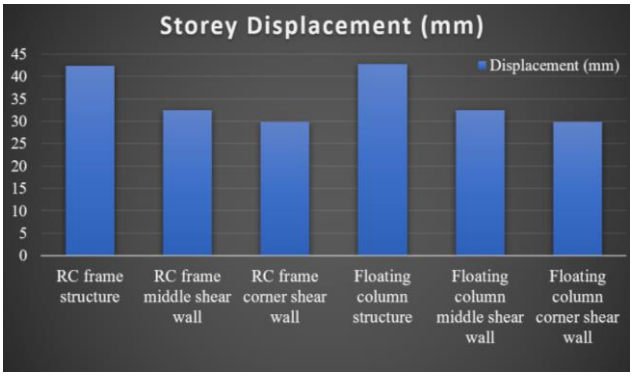
Cases	Time Period (sec)
RC frame structure	4.37
RC frame middle shear wall	3.24
RC frame corner shear wall	2.74
Floating column structure	4.41
Floating column middle shear wall	3.25
Floating column corner shear wall	2.75



This study we come to know Time Period less in RC frame corner shear wall.

2) Storey Displacement

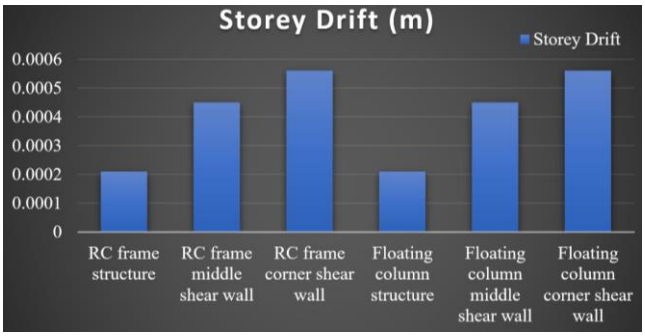
Cases	Displacement (mm)
RC frame structure	42.33
RC frame middle shear wall	32.47
RC frame corner shear wall	29.86
Floating column structure	42.78
Floating column middle shear wall	32.50
Floating column corner shear wall	29.88



This study we come to know Storey Displacement less in RC frame corner shear wall.

3) Storey Drift

Cases	Storey Drift
RC frame structure	0.00021
RC frame middle shear wall	0.00045
RC frame corner shear wall	0.00056
Floating column structure	0.00021
Floating column middle shear wall	0.00045
Floating column corner shear wall	0.00056



This study we come to know Storey Drift less in RC frame structure without shear wall and Floating column structure without shear wall.

VI. CONCLUSIONS

1) Best and Economic structure is RC Frame with Shear Walls at corner of the building.
2) RC frame with Shear Walls at corner attract less torsion in the building. So it is good structural system from earthquake point of view.
3) Time period is less in RC frame with Shear Walls at corner, it gives more stiffness. Hence building will be more stable from strength and serviceability point ofview.
4) Compared to other system RC frames with shear walls at corner gives less storey displacement.
5) Compared to other system RC frames with shear walls at corner gives less storey drift values.

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