Comparison between RC Framed Structure and Flat Slab Structure with Different Geometrics and Different Shear Wall Locations

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Abstract— Conventional R.C frame structure and flat slab 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 flat slab structure and RC frame structure of 20 storey without shear wall and with shear wall some different location. The main objective of the analysis is to study best and Economical structure in Regular and irregular structure in Rc framed structure and flat slab structure with and without shear wall different location. The analysis is carried out using Etab 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: Flat slab, Shear walls, storey displacement, Storey drift, Time period

I. INTRODUCTION

Generally the analysis of flat slab is more complex and also is 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 etc. In this dissertation work, modern R.C.C structure i.e flat slab, shear wall for different heights are modelled and analyzed for the different combinations of static loading with corner shear wall and middle shear wall with varying height of multistoried building .The comparison is made between the conventional R.C.C flat slab structure and RC frame structure of 20storey without shear wall and with shear wall with different shear wall location.. A reinforced concrete flat slab, also called as beamless slab, is a slab supported directly by columns without beams.

II. PROBLEM FORMULATION

Conventional R.C.C flat slab structure without shear wall and flat slab R.C.C 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 flat slab structure and flat slab R.C.C. structure with shear walls situated in seismic zone III Different cases of Regular and Irregular building considered are as given below:

A. Regular building

1) Case-1: 20 storey Design and analysis of RC frame structure without shear wall
2) Case-2: 20 storey Design and analysis of RC frame structure with corner shear wall
3) Case-3: 20 storey Design and analysis RC frame structure middle shear wall
4) Case-4: 20 storey Design and analysis of flat slab without shear wall.
5) Case-5: 20 storey Design and analysis of flat slab with corner shear wall
6) Case-6: 20storey Design and analysis middle shear wall

B. Irregular building:

1) Case-1: 20 storey Design and analysis of RC frame structure without shear wall
2) Case-2: 20 storey Design and analysis of RC frame structure with corner shear wall
3) Case-3: 20storey Design and analysis RC frame structure middle shear wall.
4) Case-4: 20 storey Design and analysis of flat slab without shear wall
5) Case-5: 20 storey Design and analysis of flat slab with corner shear wall
6) Case-6: 20 storey Design and analysis middle shear wall

1) Details of Modeling:

1) Storey height 3500mm
2) Thickness of flat slab-200mm
3) Thickness of shear wall 150mm
4) Size of column 300x900
5) Size of beam 230x600
6) Plan dimension 42x42m for Regular building
7) Plan dimension 42x48m for Irregular building
8) Loading Details: Gravity Loads

– Dead load - 4.6 kN/m2
– Live load – 3.5kN/m2
– Floor finish load – 1.5kN/m2

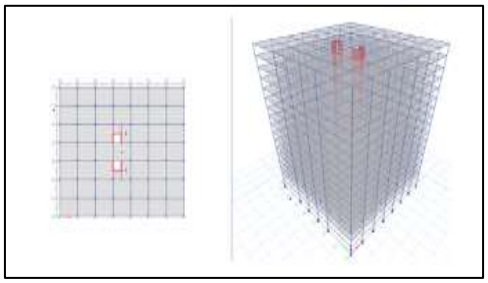
2) Detail of Earthquake loading:

Sr.	Parameters	Code Provision
1)	Type of structure	RCC
2)	Importance factor (I)	1.2
3)	Response reduction factor (R) for Rc frame structure	5
4)	Response reduction factor (R) for Rc frame structure	3
4)	Damping for concrete	5%
5)	Zone factor (Z)	0.16

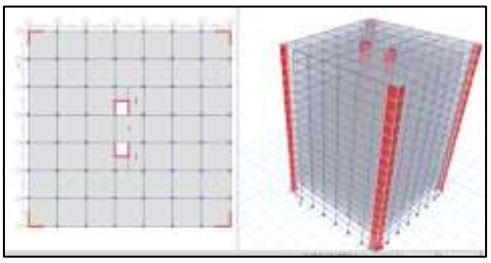
III. MODELLING

A. Regular Building:

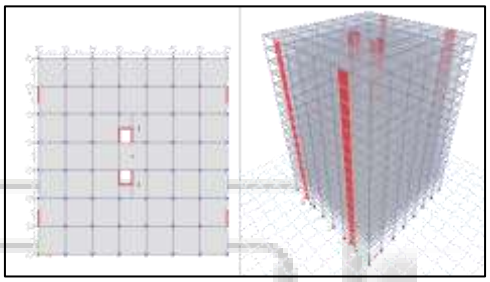
RC frame structure: 20storey



Case 1: RC frame

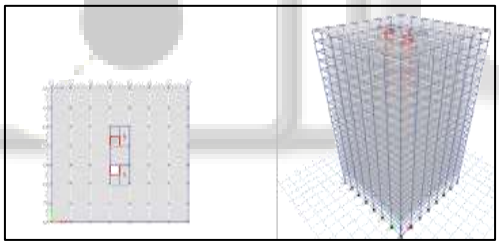


Case 2: RC frame corner shear wall

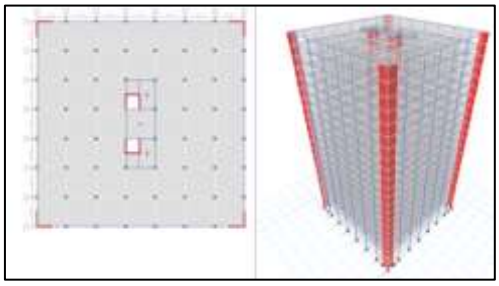


Case 3: RC frame corner shear wall

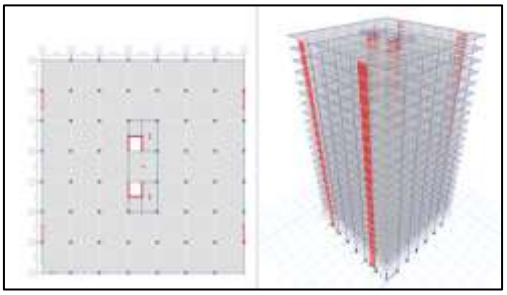
B. Flat Slab Structure:



Case 4: Flat slab structure



Case5: Flat slab corner shear wall



Case 6: Flat slab middle shear wall

IV. RESULT AND DISCUSSION

A. Time period

Cases	Time period(Sec)
Rc frame	3.69
RC frame corner shear wall	3.35
Rc frame middle shear wall	3.68
Flat slab structure	4.63
Flat slab corner shear wall	3.96
Flat slab middle shear wall	4.53

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

B. Story Displacement

Cases	Story displacemet(mm)
Rc frame	115.75
RC frame corner shear wall	98.23
Rc frame middle shear wall	114.27
Flat slab structure	311.25
Flat slab corner shear wall	237.39
Flat slab middle shear wall	296.40

This study we come to know story displacement less in RC frame corner shear wall.

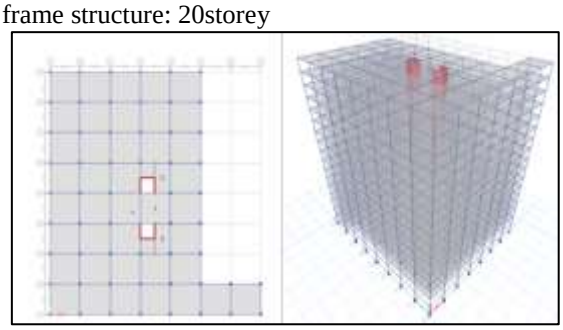
C. Story Drift

Cases	Story Drift
Rc frame	2.21
RC frame corner shear wall	2.13
Rc frame middle shear wall	2.16
Flat slab structure	7.73
Flat slab corner shear wall	7.16
Flat slab middle shear wall	7.51

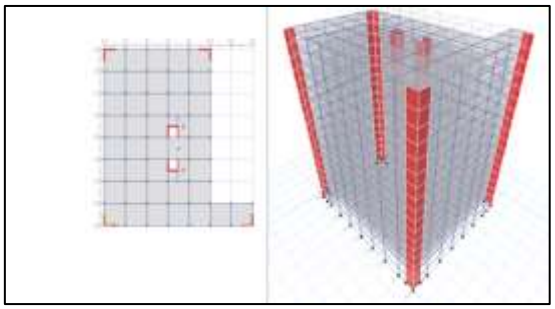
This study we come to know story drift less in RC frame corner shear wall.

D. Irregular Building

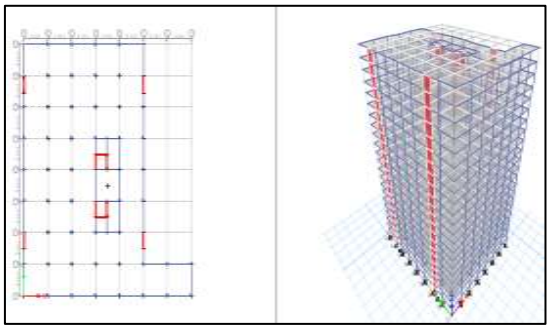
RC frame structure: 20storey



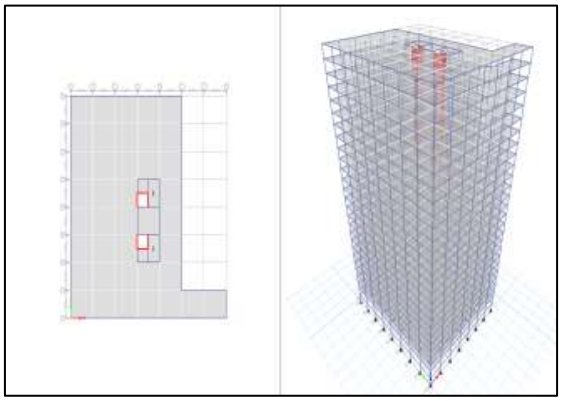
Case1- Rc frame corner shear wall



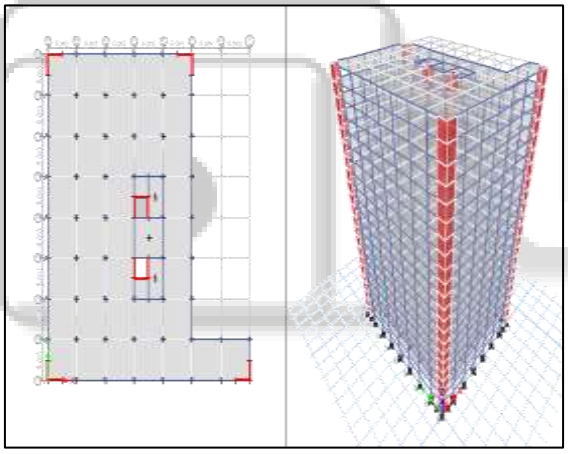
Case 2: Rc frame corner shear wall



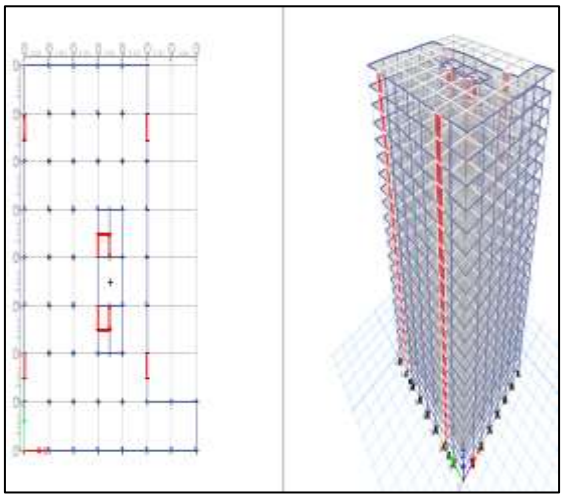
Case 3: Rc Frame middle shear wall



Case 4: Flat slab structure



Case 5: Flat slab corner shear wall



Case 6: Flat slab middle shear wall

V. RESULT AND DISCUSSION

A. Time Period

Cases	Time period(Sec)
Rc frame	3.7
RC frame corner shear wall	3.13
Rc frame middle shear wall	3.16
Flat slab structure	4.52
Flat slab corner shear wall	3.80
Flat slab middle shear wall	4.42

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

B. Story Displacement

Cases	Story Displacement
Rc frame	118.47
RC frame corner shear wall	99.174
Rc frame middle shear wall	110.64
Flat slab structure	310.47
Flat slab corner shear wall	229.46
Flat slab middle shear wall	302.66

This study we come to know story displacement less in RC frame corner shear wall.

C. Story Drift

Cases	Story drift
Rc frame	2.7
RC frame corner shear wall	2.15
Rc frame middle shear wall	2.47
Flat slab structure	7.5
Flat slab corner shear wall	7.2
Flat slab middle shear wall	7.4

This study we come to know story drift less in RC frame corner shear wall.

VI. CONCLUSION

A. Regular building and Irregular building

1) Best and Economic structure is RC Frame with Shear Walls are 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 of view.
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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