A COMPARATIVE STUDY OF A BUILDINGWITH SHEAR WALL AND WITHOUT SHEAR WALL BY USING STAAD PRO

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***Abstract*- Shear wall is a firm and stiff member, is a structural component used generally aroundthe lift areas. Shear wall has constructed from foundation base to the top of the structure.Shear wall are one of the most commonly usedlateral load resisting in high rise building Theyresist in plane loads that are applied along its height. Shear walls are a form of structural system that provide a building or structure lateral resistance. They can with stand in-planeloads that are applied along the height of the structure. A diaphragm, collector, or drag member is used to transfer the applied load to the wall. This study focuses on the comparativestudy of a building model with shear wall and without shear wall at the center with the software approach. The study includes understanding the main consideration factorthat leads the structure to perform poorly during resisting the lateral forces and till someextent the horizontal forces with and without**
It also includes the effects of lateral forces on the building model.

***Keywords*-lateral forces, shear wall, software approach, lateral resistance**

INTRODUCTION

More and more people are shifting to bigger cities for better lifestyle and easy livelihood. This causes concentration of population in cities. Constant effort is being made to find habitable land. As habitable land is constant and not increasing to meet the ever growing demands of increasing population in cities. Horizontal growth is not possible. This leaves us with only option, rise vertically. This gives rise to tall high-rise structures. High rise building structures are both a necessity and a matter of sophistication and pride for structuralengineers. Buildings crossing 25 to 30 storeys are a common phenomenon these days. But what happens to a structure as it crosses these height limits? Forces of the nature in the form of earthquakes and cyclones starts playing brutal games with the structures. Shear Wall are one of the vital structural elements of a multi-storey building with majorfunction to introduce lateral stiffness in thebuilding. The increase in lateral stiffness results in high resistance towards lateral forces.Apart from that shear wall also accompanieswith the structural elements carrying gravityloads in order to transfer it to the ground. Thiscauses reduction in reinforcement in those elements. Shear walls can be of various shapeand sizes and also can be placed at various position of building. The position of shear wallplays an important role in determining the behavior against lateral forces.
In the design of high-rise building, the lateral system that resists wind and earthquake load often dominates. Reinforced concrete shear wall Shear cores are a typical sort of lateral system that is often organized around elevatorsand other vertically continuous building features. because of their high bearing capacity, high ductility and rigidity etc. The shear wall's shape and position have a considerable impact on the structural integrity behavior under lateral load.

LITERATURE REVIEW: -

1. M. S. Aainawala and Dr. P. S. Pajgade (2014) says that shear walls have a high in-plane stiffness and strength, allowing them to resist significant horizontal loadswhile still supporting gravity loads, making them useful in a variety of structural engineering applications. Fordifferent scenarios of shear wall position,an earthquake load is given to a building for G+12, G+25, and G+38 located inzones II, III, IV, and V. In all circumstances, lateral placement and taledrift are calculated. It was discovered thatmultistory R.C.C. buildings with shearwalls. [9]

2. Ashok Thakur and Arvinder Singh ,(2014) “Comparative Analysis of a Multistoried Residential Building with and Without Shear Wall using STADD Pro”. The study in this paper is carried outwith the help of the STADD-pro softwarepackage. The buildings are modelled witha floor space of 216 sqm (18m x12m) with6 bays every 3 m along the 18 m span and4 bays every 3 m along the 12 m span. STAAD.PRO software is used to create the design. As a result, the primary goal ofthis study is to compare the structuralsystem and orientation of structures with and without shear walls. There is a wealthof information accessible on the design and analysis of shear walls. However, there is little discussion in the literature onwhere the shear wall should be placed in a multi-story building.[1]

3. SajalSarkar&AxayThapa (2017)“Comparative Study of Multi- Storied RCC Building with And Without Shear Wall”. In this paper, three models withvaried heights and with and without shear walls are created. With altering structural member dimensions according to height, G+5, G+10, and G+15 R-C frame models with and without shear walls are constructed. In STAAD.

Pro V8i, the models are examined using the Static Method and Response Spectrum Method in seismic zone V. The three approaches are used tocompute lateral displacement, story drift, base shear, and mode shapes for all models (with and without shear walls), and the efficiency ofshear walls is enumerated. In addition,comparisons are made based on earlier studies conducted by the other authors. [13].

4. P. P. Chandurkar and Dr. P. S. Pajgade (2013)

"Seismic Analysis of RCCBuilding with and Without Shear Wall". The major goal of this work is to find a solution for shear wall placement in multi-story buildings. Four separate models were used to investigate the effectivenessof shear walls. The first model is a bare- frame structural system, whereas the otherthree are dual- Page 5 type structural systems. A ten-story building in zone II, zone III, zone IV, or zone V is subjected to an earthquake load. In both situations replacing column with shear wall,parameters such as lateral displacement, story drift, andtotal cost required for the ground level are determined.[12].

5. Himalee Rahangdale and S.R. Satone (2013) "Analysis and Design of Multistory Building with Effect of Shear Wall" Here in this paper the Study of G+5 Story building in Zone IV is presented with some preliminary investigation which is analyzedby changing various position of shear wall with different shapes for determine parameter likeaxial load and moments. The axial load on the column is affected by the placement of the shear wall. In the absence of a shear wall, the axial stress and moments on the column are at their highest. [5]

RESULT

RESULT OF BUILDING WITH SHEARWALL

FLOORS	BEAM	DEFLECTION IN MM			HEIGHT (M)
		END	MIDDLE	END	
G.F.	7	0.266	1.22	0.287	1.5
	4	0.375	0.436	0.226	1.5
	15	0.411	0.667	0.395	1.5
1ST FLOOR	111	0.726	1.879	0.787	3
	108	0.993	-	0.436	3
	119	1.041	1.582	1.077	3
2ND FLOOR	266	1.053	2.238	2.005	6
	272	1.529	1.672	1.672	6
	263	1.417	-	0.565	6
3RD FLOOR	426	1..242	2.015	1.35	9
	432	1.746	2.425	1.746	9
	423	1.653	-	0.642	9
4TH SLAB	573	1.296	1.827	1.407	12
	579	1.826	2.329	1.828	12
	570	1.705	-	0.662	12

FLOORS	BEAM	SHEAR FORCE			
		END	MAX BM	END	
G.F.	7	11.086	16.464	12.026	
	4	15.818	0.545	18.516	
	15	15.793	2.533	15.767	
1ST FLOOI	111	30.685	4.541	28.611	
	108	10.76	2.46	1.575	
	119	35.583	1.858	26.198	
2ND FLOO	266	33.833	16.284	7.089	
	272	9.217	3.396	7.463	
	263	0.175	4.372	12.357	
3RD FLOO	426	31.469	5.235	28.965	
	432	37.562	2.505	37.501	
	423	8.217	2.396	5.463	
4TH SLAE	573	12.439	4.17	12.065	
	579	24.028	2.231	24.515	
	570	0.226	4.453	12.438	

FLOORS	BEAM	BENDING MOMENT			
		END	MAX BM	END	
G.F.	7	11.086	16.464	12.026	
	4	4.86	4.845	7.829	
	15	7.741	6.461	7.702	
1ST FLOOR	111	24.425	15.363	20.96	
	108	2.719	7.867	2.719	
	119	16.973	11.148	14.559	
2ND FLOOR	266	27.565	13.468	12	
	272	6.08	4.537	3.363	
	263	10.189	2.436	4.412	
3RD FLOOR	426	25.273	16.161	20.015	
	432	17.887	13.164	17.928	
	423	12.145	2.478	6.452	
4TH SLAB	573	9.291	12.266	8.508	
	579	10.559	9.792	11.449	
	570	9.463	3.255	5.325	

RESULT OF BUILDING WITHOUT SHEAR WALL

FLOORS	BEAM	DEFLECTION IN MM			HEIGHT (M
		END	MIDDLE	END	
G.F.	7	1.266	1.5	1.287	1.5
	4	1.375	1.436	1.226	1.5
	15	1.411	1.667	1.395	1.5
1ST FLOOR	111	1.726	1.879	1.787	3
	108	1.993	0.556	1.436	3
	119	1.556	1.582	1.077	3
2ND FLOOF	266	1.882	2.238	2.005	6
	272	1.826	1.672	1.752	6
	263	1.417	-	0.565	6
3RD FLOOF	426	1.526	2.015	1.536	9
	432	1.923	2.425	1.856	9
	423	1.653	0.963	0.642	9
4TH SLAB	573	1.536	1.827	1.687	12
	579	1.964	2.329	1.528	12
	570	1.925	0.654	1.662	12

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CONCLUSION

In results we have found that the building without shear wall has higher values of deflection, bending moment and shear wall.

1. The displacements are reduced in building with shear wall compared to building without shear wall.
2. The building with shear wall has more earthquake resistance compared to building without shear wall.
3. There is no variation on wind effect for with and without shear wall

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