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Behavior of RCC Frame Structure with and Without Shear Wall

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ABSTRACT: To study the comparative effect of RC Structure with and without Shear Wall is Modeled and Analyses the seismic forces using STAAD-pro software. Based on Analysis, Observation and Remarks it is seen that Shear Wall is played a Vital Role it can be concluded that the Nodal Displacement decreases with the provision of shear wall and out of RC shear wall Similarly, it can be seen that the displacement value at the intermediate Nodal Location is more. The Drift Value at the Top and Bottom Floor is less whereas greater at second and third floor. In the structure with RC shear wall Drift value is comparatively less.

KEY WORDS: Shear wall, Drift, STAAD pro, Moment

I. INTRODUCTION

Tall buildings have intent mankind from the creation of advancement, their construction initially for the protection and consequently for clerical purpose. In any high-rise structure, shear walls are the structural system to provide the stability to the structure from lateral force like due to its self-loads and other moving or living loads which is designed by earthquake analysis or wind analysis. Since shear wall structure more stable due to their supporting area like total cross-sectional area of the shear wall with the reference to total plans area of the structure is comparatively more unlike the RCC framed structures.

II. LITERATURE SURVEY

H. N. Gadge et al 9 In this, a trial was made to model 10 story building with and without shear walls by static analysis method for earthquake zone III. software is employed for the analysis. the target of this study is to assess the comparative seismic performance of buildings in terms of displacement, story drift, base shear, cost and carpet area. Buildings with shear wall area unit economical as compared to without shear wall. it is found that the deflection at different level in multi storied building with shear wall is comparatively lesser as compared to R.C. building without shear wall. More carpet area will be available in the building as the sizes of columns are reduced when shear wall is provided. Less obstruction will be there because of reduced sizes of column and provision of shear wall **Kiran Tidke et al 10** The scope of present work is to study the effect of seismic loading on placement of shear wall in building at different alternative location. Effectiveness of shear wall has been studied with the help of five different models. Model one is bare frame structural system and other four models have different arrangements of shear wall. Response spectrum and time history method are used for analysis in SAP2000 software and structure was assumed to be situated in zone II. From analysis some parameters are determine like base shear, storey drift and displacement of a structure. It was found that RC frame with shear wall is having higher value of base shear than bare frame. The presence of shear wall can affect the seismic behaviour of frame structure to large extent, and the shear wall increases the strength of stiffness of structure. The max. storey drift of shear wall reduces 0.0074% to 0.0303% as compared to bare frame. **Aazim Nisar et al 11** In this study, we have chosen Seismic analysis (zone v) of RCC building (G+5) with shear walls using STAAD. Pro software the multi-story building (G+5) is the subject of analysis. The STAAD Pro, Designing and Analysis software is used to develop the 3D model of Shear wall and Building. Giving it constraints that are based on the acting seismic force and wind loads on buildings rendered the nodes weak, so we added a shear wall to reinforce that node. Following the inclusion of the building's shear wall and analysis using STAAD. Pro in standard format. After analysing the effect & shear wall's position on the building & comparing results with old building design without shear wall, it was determined that the addition & location of shear walls in multi-story structures strengthens the structure's weak points and enables it to withstand lateral loads, wind loads, and earthquake loads. **Mukesh Sharma et al 12** The present study has been done on G+6 Xin Liu et al. Proposed a spam filtering approach with push technology to share user's individual spam knowledge in social network. Spam filtering approaches like source-based method and content-based method are used. Improve performance and accuracy rate using Bayesian filter. multi-storey building. The modeling has been done using STAAD. Pro software package. The focus of the study is to determine the ideal location of shear walls and seismic performance of multi-storey

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buildings with and without shear walls which is situated in Chandigarh region in seismic zone-IV. The design of structure is according to IS 1893 (PART–I):2002. The static analysis is performed in this study. The method used for analysis is Equivalent static method. This study involves modeling different models of multi-storey building with and without shear walls on STAAD. Pro and then comparing the results obtained for base shear, storey shear, storey drift, nodal displacements etc. result shows that the base shear which is estimation of maximum lateral force at the base of the structure has been observed minimum for model-I i.e. building model without shear walls and it is maximum for shear wall models-III, IV. The provision of shear walls increases base shear but also increases lateral load resisting capability. The storey shear variation graph shows storey shear values at each storey which varies from minimum at the top of the building to the maximum at the bottom. Storey shear values are maximum for model-III and IV and minimum for model-I.

III. METHODOLOGY

3.1 Line plan of models without shear wall (model 01) and with shear wall (model 02)

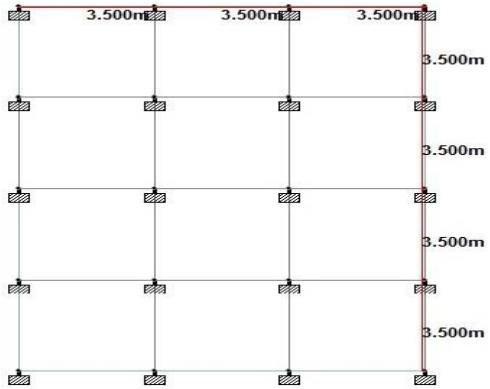

Fig 3.1 Line plan of Model 01

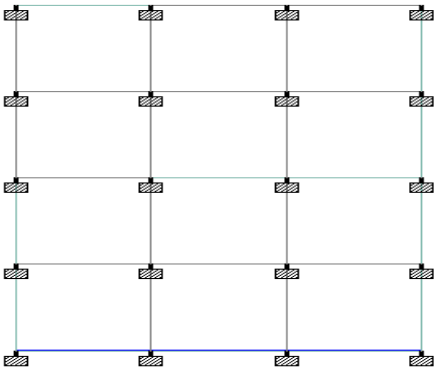

Fig 3.2 Line plan of Model 02

3.2 Structural Parameters

Table 3.1 Structural parameters

Parameter	Value
Live load	3 kN/m2
Density of concrete	25 kN/m3
Thickness of slab	130 mm
Depth of beam	300 mm
Width of beam	230 mm
Dimension of column	300 x 450 mm
Thickness of outside wall	230 mm
Thickness of inner side wall	150 mm
Height of floor	3.05 m
Earthquake zone	II
Damping ratio	5%
Type of soil	II
Type of structure	Special moment resisting frame

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Response reduction factor	5
Importance factor	1

3.3 Material Properties:

Different materials are used in the structural modeling of the building. The grade of concrete and reinforcement used in the study of the models is taken as M 25 and Fe 415. The elastic properties of these materials are taken as per the IS 456:2000. As per clause 6.3.2.1 of the IS 456:2000 the modulus of elasticity of concrete is taken as: $Ec = 5000 (Fck)^{0.50}$ N/mm^2

Where fck is the characteristic compressive strength of the concrete in N/mm2 at 28 days. For present study value of fck is 25. For the reinforcement, the yield stress (*fy*) and modulus of elasticity (*Es*) is taken as per IS 456:2000.

Table 3.2 material properties

Material	Concrete	Steel
Grade	M 25	Fe 415
Mass Density	2549.3	7849
Unit Weight	25	76.97
Modulus of Elasticity	25,000,000	20,000,000
Poisson's Ratio	0.15	0.3

3.4 3D view of RCC model

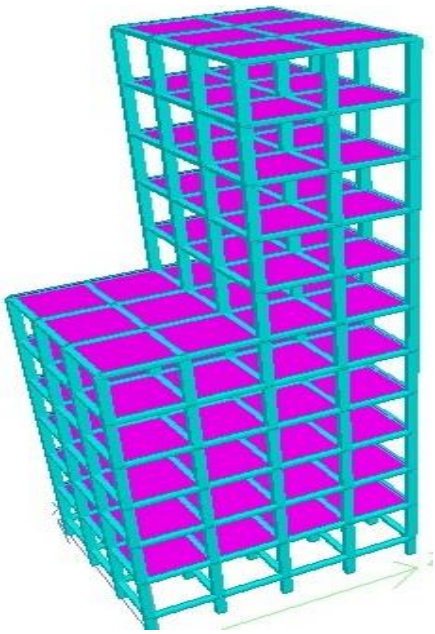

Fig. 3.3 3D VIEW OF G+10 BUILDING WITHOUT SHEART WALL (Model 01)

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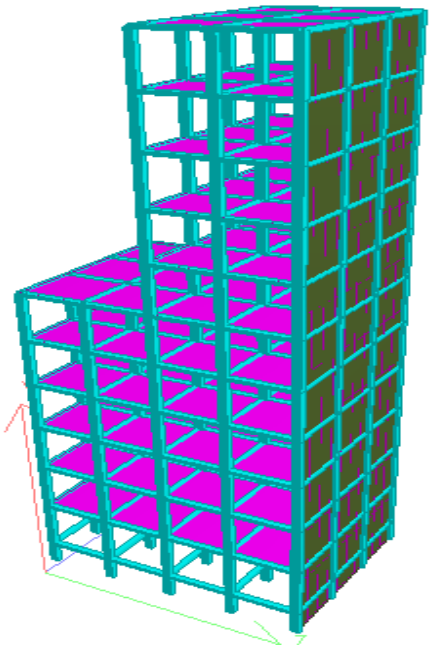

Fig. 3.4 3D VIEW OF G+10 BUILDING WITH SHEAR WALL (Model 02)

IV. EXPERIMENTAL RESULTS

Table 4.1 Node Displacement

Node no	Case	Location	Resultant	Rotation		
				X	Y	Z
240	Model 01	36.48	56.46	0.000	0.002	0.000
	Model 02		13.54	0.000	0.002	0.000
220	Model 01	33.3	54.99	0.000	0.002	0.001
	Model 02		12.99	0.001	0.002	0.001
200	Model 01	30.12	52.42	0.000	0.002	0.001
	Model 02		12.75	0.001	0.002	0.000
180	Model 01	26.94	48.76	0.000	0.002	0.001
	Model 02		12.47	0.001	0.001	0.000
160	Model 01	23.76	44.15	0.000	0.002	0.001
	Model 02		11.92	0.001	0.001	0.000
140	Model 01	20.58	38.4	0.000	0.001	0.001
	Model 02		10.676	0.000	0.001	0.000
120	Model 01	17.4	32.66	0.000	0.001	0.001
	Model 02		9.37	0.000	0.000	0.000
100	Model 01	14.22	26.32	0.000	0.001	0.002
	Model 02		8.13	0.000	0.000	0.000
80	Model 01	11.04	19.65	0.000	0.001	0.002

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	Model 02		6.28	0.000	0.000	0.000
60	Model 01	7.86	12.88	0.000	0.000	0.002
	Model 02		4.21	0.000	0.000	0.000
40	Model 01	4.68	6.34	0.000	0.000	0.001
	Model 02		2.14	0.000	0.000	0.000
20	Model 01	1.5	0.91	0.000	0.000	0.001
	Model 02		0.319	0.000	0.000	0.000
260	Model 01	0	0.000	0.000	0.000	0.000
	Model 02		0.000	0.000	0.000	0.000

Table 4.2 Storey Drift

Node no	Case	Location	Drift
240	Model 01	36.48	00.00
	Model 02		00.00
220	Model 01	33.3	1.47
	Model 02		0.55
200	Model 01	30.12	2.57
	Model 02		0.24
180	Model 01	26.94	3.66
	Model 02		0.28
160	Model 01	23.76	4.61
	Model 02		0.55
140	Model 01	20.58	5.78
	Model 02		1.24
120	Model 01	17.4	5.74
	Model 02		1.31
100	Model 01	14.22	6.34
	Model 02		1.24
80	Model 01	11.04	6.76
	Model 02		1.85
60	Model 01	7.86	6.68
	Model 02		2.07
40	Model 01	4.68	6.54
	Model 02		2.07
20	Model 01	1.5	5.43
	Model 02		1.82
260	Model 01	0	0.91
	Model 02		0.32

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V. CONCLUSION AND FUTURE WORK

To study the comparative effect of RC Structure with and without Shear Wall is Modeled and Analyses the seismic forces using STAAD-pro software. On the basis of Analysis, Observation and Remarks it is seen that Shear Wall is played a Vital Role it can be concluded that the Nodal Displacement decreases with the provision of shear wall and out of RC shear wall Similarly, it can be seen that the displacement value at the intermediate Nodal Location are more. The Drift Value at the Top and Bottom Floor is less whereas greater at second and third floor. In the structure with RC shear wall Drift value is comparatively less.

1. In the present study, building is considered in zone-III. It can extend to other zones.
2. The further work can be done by comparing the static and Dynamic Analysis for RC Structure with and without Shear Wall located in different Zone.
3. Construction of shear walls gives all time protection for the building not only while the times of earthquakes but also against vibrations.
4. Shear walls are quick in construction, as the walls doesn't need any special brick Arrangement or plastering, they are very quick in their construction.
5. It just requires an effective form work and very little skilled labor. It was estimated that a 20 floors building can be built within six months which is most astonishing. Therefore, there is lot of scope for future study in shear walls.

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