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Design and Analysis of Shear Wall for Fifteen Story Building with Two Different Shapes

Vidhi Patel[1], Kavita Golghate[2]
[1]P.G. Student, Civil Engineering, Shushila Devi Bansal college of Engineering, Indore, India
[2]Asst. Professor, Civil Engineering, Shushila Devi Bansal college of Engineering, Indore, India

Abstract: Shear walls are structural components that give buildings stability against lateral stresses like wind and seismic loads. Shear walls have extremely high stiffness and strength, which provide the building stability. These structural systems consist of connected shear walls, shear wall frames, shear panels, and staggered walls. These structural systems are made of reinforced concrete and reinforced masonry. The goal of the current paper work is to examine several research projects concerned with improving shear walls and their response to lateral stresses. A shear wall in structural engineering is a vertical component of a system created to withstand in-plane lateral forces, which are commonly caused by wind and seismic loads. For soft story high rise structures, which are similar in type to those built in India, shear walls resist the majority of lateral loads in the lower sections of the buildings while the frame sustains the lateral loads in the upper portions of the building. Civil engineering is involved with building different kinds of structures while assuring its functionality, toughness, and safety. The phenomena known as a "earthquake" now has an impact on the structural stability and safety. The type of building, the type of soil, the earthquake resistance technology utilized, and ultimately the location of the building with shear wall all affect how much damage an earthquake will do to buildings. Because an earthquake alters ground motion and causes foundation failure, the impacts of an earthquake strongly rely on the type of soil in which a building's foundation was constructed. Therefore, it is crucial to look at how different soils behave while building structures with shear walls. A diaphragm typically transfers the applied load to the wall. Here in this paper; we will study the structural aspects of one of the tallest RCC building, located in the high seismic zone, with 15 stories.
Keywords: Regular Building, Seismic Analysis, Earthquake, Tall Building, Reinforced Concrete, Shear wall system, Behaviors, ETABS.

I. INTRODUCTION

The effects of lateral loads, such as those caused by earthquake, wind, and blast forces, are currently of the highest concern. One of the biggest issues any designer has is providing enough strength and stability to withstand lateral stresses. Therefore, in order to protect the structure from lateral loads, structural engineers must have a proper grasp of the seismic performance of various types of shear walls. The current study compares the seismic performance of tall structures and discusses how to maximize the thickness of RCC, Steel Plate, and Composite Shear Walls for (G+15) stories. Utilizing the programme ETABS, the design and analysis of the building with RCC shear walls is completed.

A shear wall is a structural component that resists lateral forces, such as wind forces, in a reinforced concrete framed construction. High-rise structures susceptible to lateral wind and seismic stresses frequently use shear walls. The impacts of wind forces become more important as a structure's height grows in reinforced concrete framed constructions. Codes of conduct place restrictions on sway or horizontal movement.

The most typical shear wall material used in high-rise structures situated in seismic zones is reinforced concrete cement. The material's great strength, stiffness, and ductility are to blame for this. For shear walls to withstand the lateral stresses of wind or seismic occurrences, optimal stiffness is crucial. It is consistently noticed that installing sheer walls in multi-story buildings is useful in enhancing the building's overall seismic response and characteristics.

A R.C.C. shear wall should have a minimum thickness of 150mm. The shear wall has an enormous load-bearing capacity, but if it is not placed correctly, it may lose some of that capacity if the building experiences any movement caused by wind or seismic forces. A shear wall is a type of structural panel that resists forces acting laterally. Buildings, especially high-rise, multi-story structures and those situated in areas with strong winds, require a shear wall framework. If there are no perpendicular shear walls to protect them, forces parallel to the building's plane, such as wind or seismic loads, can push over the parallel structural panels.

The parallel structural panels may move in various directions when the shear wall structure breaks, potentially causing calamities. Any structure's shear walls are typically constructed using concrete. When installing the shear walls, a specific structure must be followed.

They are also known as perimeter walls, because they stand at the boundaries of a building. The lift is often positioned in the middle of a building because there is where shear cores are most likely to form. In order to protect structures from seismic and wind-related shear stresses, people can employ steel-braced framed shear walls, plywood shear walls, reinforced concrete shear walls, and mid-ply shear walls.

The price depends on the components used to construct the shear walls. In this blog, we'll concentrate on reinforced concrete shear walls.

II. LITERATURE REVIEW

1) *Patel and Maulin (2022)* - This study is investigated the load-bearing walls of precast reinforced concrete in the G+11- story residential building. This study examined a load-bearing wall and a one-way slab for gravity and lateral load using ETABS software. Different wall forces, displacements, and moments calculated for different load combinations were analysed. A G+11 storey shear wall building was considered for a one-acre plot with 350 apartments.
2) *Rachakonda Divya, K. Murali (2022)* - Discuss on this study of structures with horizontal irregularity, vertical irregularity, stiffness irregularity, and mass irregularity with and without shear wall, and compares the responses of the buildings. The ETABS software is used to model these four types of models with and without shear walls for G + 15 storey. The study's goal is to compare model results such as stiffness, displacement, shear, and drift values to determine which model performs better. Vertical geometrical irregular building with shear wall performed significantly better than other irregular buildings.
3) *Vinay Kumar Sahu (2022)* - This study is investigated the load bearing wall structure models. This Masonry load bearing wall may collapse due to instability if subjected to vertical concentric and eccentric loading. The failure pattern of masonry load bearing walls of various sizes was investigated in this paper using shaking table tests and compressive strength. The results show that the bearing wall cannot withstand heavy loads, but increasing thickness increases the possibility of structural damage.
4) *Kashyap Shukla (2022)* - Discuss on this study is seismic and wind loads considered for various high-rise rectangular building models with and without shear walls using finite element based ETABS software. Seismic loads were calculated using the equivalent static method specified in IS Code 1893 (Part-1): 2016, and imposed loads were calculated using IS Code 875 (Part-3): 2015. The results of storey displacements and drifts were extracted using four load combinations from the Indian Standard Code. It has been discovered that shear walls located in the centre, in the form of a core, perform well against lateral loads.
5) *Tagore Srilekha (2022)* - Discuss on this study find a solution for shear wall placement in multistorey buildings. A G+ 10 storied reinforced concrete (RC) building with varying ground slopes of 0, 5, 10, 15, and 20 degrees without shear walls and incorporating shear walls symmetrically in plan and at peripheral corners was considered for analysis in this study. Buildings are designed in accordance with IS 456:2000 and then subjected to earthquake loads. Linear Static, Linear Dynamic analysis (Response Spectrum, and Linear Time History analysis) was used to model and analyse the building using the structure analysis tool SAP 2000.

A. Objective of Study

The objective of the structure is to propose simplified and practical design approach which allows designers to consider effects developed due to RCC shear wall structure during seismic analysis of high-rise irregular building to assure the design safety and reliability.

1) Selection of shape of RCC shear wall.
2) Two shapes (G+15) are selected: - SWASTIK and SQUARE.
3) The two different shapes compared with the different shear wall.
4) After then load has been assigned for analysis via ETABS. The types of loads assigned are dead and live loads.

III. METHODOLOGY AND MODELLING APPROCH

Two different building layout is investigated in this study, first is swastik shape building and second is square shape building. Both the buildings are constructed ground floor up to fifteenth floor.

Table 1
Model description

No. of elevation	15
Height	48 m
Total area	12192 sq.mt
Foundation	Rock, Hard soil
Zone	IV
Grade of concrete	M30 and M25
Grade of steel	HYSD 415 and 550
Dead load	As per IS-875 Part 1
Live load	As per IS-875 Part 2
Shear wall thickness	150mm and 200mm
Seismic loading	IS 1893:2016
Openings	No

A) Finite Element Method Used

The Finite Element Method (FEM) is a method for solving numerically the equations governing the issues encountered in nature. Usually, linear or integral form equations are utilised to describe how nature reacts. Because of this, the FEM is regarded in the field of mathematics as a numerical method for resolving partial differential or integral equations. In general, the FEM enables users to acquire the evolution of one or more variables that describe the behaviour of a physical system in space and/or time. The FEM is a potent approach for calculating the displacements, stresses, and strains in a structure under a set of loads when it comes to structural analysis.

B) Swastik shape Modelling with the help of Software Used

Auto-cad is a computer-aided design (CAD) software programme. Auto-cad, created and sold by auto-desk, was originally made available as a desktop application for microcomputers with built-in graphics controllers in December 1982.
AutoCAD used for a create (G+15) Two-dimensional drawing. For the swastik shape ground up to fifteenth floor.

C) Square Shape Modelling with the help of Software Used

Auto-cad is a computer-aided design (CAD) software programme. Auto-cad, created and sold by auto-desk, was originally made available as a desktop application for microcomputers with built-in graphics controllers in December 1982.
AutoCAD used for a create (G+15) Two-dimensional drawing. For the square shape ground up to fifteenth floor.

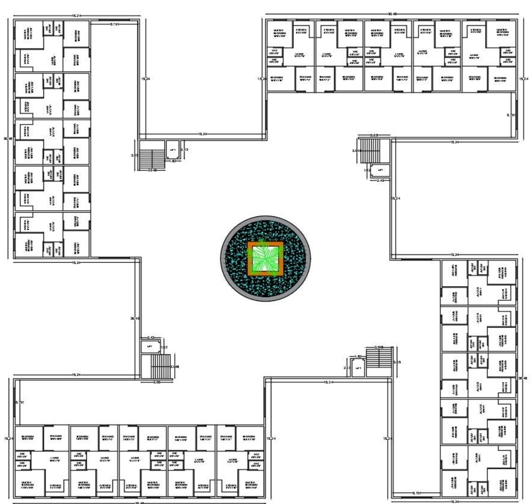


Fig: 1 swastik shape (G+15)

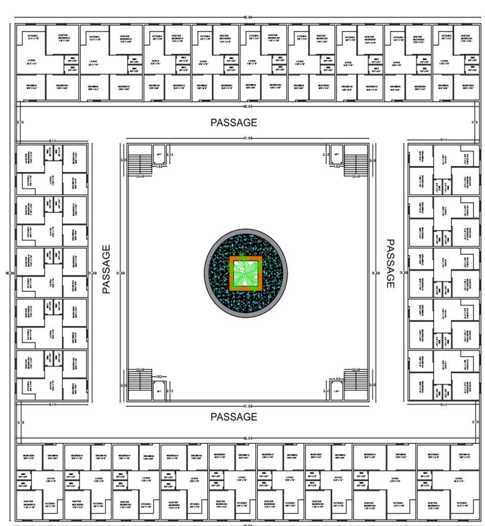


Fig: 2 square shape (G+15)

IV. RESULT AND DISCUSSION

Once all of the modelling procedures have been completed both shapes (swastik and square). We have carried out the analysis and checked for errors. Applying the check model is the first step after selecting the analysis menu. The active degree of freedom, set load case run, automatic mesh setup for the floor and wall, and finally running analysis come next. These analysis procedures have been completed, and the final analysis has been read.

A. Analysis Result of Swastik Shape

1) Structure Results

Table 2

Base Reactions (Part 1 of 2)

Output Case	Case Type	Step Type	FX KN	FY KN	FZ KN	MX KN-m
DEAD	Lin Static	Max	3.182E-05	0.0001	710966.8238	-10465387
LIVE	Lin Static	Max	2.171E-06	3.108E-05	107870.8523	-1769816
EQX	Lin Static	Max	-17039.1873	9.67E-06	-1.872E-05	-0.0006
EQY	Lin Static	Max	8.621E-06	-10172.4089	0	399095.9743
EQZ	Lin Static	Max	-39337.2664	2.311E-05	-4.474E-05	-0.0014
SPECX	Lin Static	Max	32452.7754	4240.2481	21.8533	157537.1902
SPECY	Lin Static	Max	2042.6263	10787.8566	26.7782	402453.0128
SPECZ	Lin Static	Max	28.4723	68.7737	16.2436	2575.498
WLX	Lin Static	Max	-24	-5	0	52
WLY	Lin Static	Max	-5	-63	0	659.55
TEMPERATURE	Lin Static	Max	0	0	0	0
DL+LL	Combination	Max	3.3E-05	0.0001	718837.6761	-11135203
1.2(DL+LL+WLX)	Combination	Max	-28.8	-5.9999	862605.2113	-13362181
1.2(DL+LL-WLX)	Combination	Max	28.8	6.0001	862605.2113	-13362306
1.2(DL+LL+WLY)	Combination	Max	-6	-75.5999	862605.2113	-13361452
1.2(DL+LL-WLY)	Combination	Max	6	75.6001	862605.2113	-13363035
1.5(DL+WLX)	Combination	Max	-36	-7.4999	916450.2356	-14198002
1.5(DL-WLX)	Combination	Max	36	7.5001	916450.2356	-14198158
1.5(DL+WLY)	Combination	Max	-7.5	-94.4999	916450.2356	-14197091
1.5(DL-WLY)	Combination	Max	7.5	94.5001	916450.2356	-14199070
0.9DL+1.5WLX	Combination	Max	-36	-7.4999	549870.1414	-8518770
0.9DL-1.5WLX	Combination	Max	36	7.5001	549870.1414	-8518926
0.9DL+1.5WLY	Combination	Max	-7.5	-94.4999	549870.1414	-8517859
0.9DL-1.5WLY	Combination	Max	7.5	94.5001	549870.1414	-8519837
1.2(DL+LL+EQX+0.3SPECZ)	Combination	Max	-19236.7747	24.7587	862611.059	-13361317
0.9DL-1.5EQX+0.45SPECZ	Combination	Min	24045.9684	-30.9481	549862.8318	-8520007
0.9DL+1.5EQY+0.45SPECZ	Combination	Max	12.8126	-15227.6651	549877.451	-7919045
0.9DL+1.5EQY+0.45SPECZ	Combination	Min	-12.8125	-15289.5614	549862.8318	-7921363
0.9DL-1.5EQY+0.45SPECZ	Combination	Max	12.8126	15289.5615	549877.451	-9116333
0.9DL-1.5EQY+0.45SPECZ	Combination	Min	-12.8125	15227.6653	549862.8318	-9118651
1.2(DL+LL+SPECX+0.3SPECZ)	Combination	Max	26953.5805	5113.0564	862637.2829	-13172272
1.2(DL+LL+SPECX+0.3SPECZ)	Combination	Min	-26953.5804	-5113.0561	862573.1397	-13552216
1.2(DL+LL+SPECY+0.3SPECZ)	Combination	Max	2461.4016	12970.1866	862643.1929	-12878373
1.2(DL+LL+SPECY+0.3SPECZ)	Combination	Min	-2461.4015	-12970.1863	862567.2298	-13846115
1.5(DL+SPECX+0.3SPECZ)	Combination	Max	33691.9756	6391.3204	916490.3251	-13960615
1.5(DL+SPECX+0.3SPECZ)	Combination	Min	-33691.9756	-6391.3201	916410.1461	-14435545
1.5(DL+SPECY+0.3SPECZ)	Combination	Max	3076.752	16212.7332	916497.7126	-13593242
1.5(DL+SPECY+0.3SPECZ)	Combination	Min	-3076.7519	-16212.7329	916402.7587	-14802919
0.9DL+1.5SPECX+0.45SPECZ	Combination	Max	33691.9756	6391.3204	549910.2309	-8281383
0.9DL+1.5SPECX+0.45SPECZ	Combination	Min	-33691.9756	-6391.3202	549830.0519	-8756313
0.9DL+1.5SPECY+0.45SPECZ	Combination	Max	3076.752	16212.7331	549917.6183	-7914010
0.9DL+1.5SPECY+0.45SPECZ	Combination	Min	-3076.7519	-16212.733	549822.6645	-9123687
1.5(DL+LL)	Combination	Min	3.449E-05	0.0002	1078256.5142	-16702805
DL+0.7LL	Combination	Min	2.264E-05	0.0001	686476.4204	-10634258
DL+EQX	Combination	Min	-16039.1872	0.0001	610966.8237	-9465387
DL-EQX	Combination	Min	16039.1873	0.0001	610966.8238	-9465387
DL+EQY	Combination	Min	2.944E-05	-10172.4088	610966.8238	-9066291
DL-EQY	Combination	Min	1.42E-05	10172.409	610966.8238	-9864483
DL+SPECX	Combination	Max	22452.7754	4240.2482	610988.677	-9307850
DL+SPECX	Combination	Min	-22452.7753	-4240.248	610944.9705	-9622924
DL-SPECX	Combination	Max	22452.7754	4240.2482	610988.677	-9307850
DL-SPECX	Combination	Min	-22452.7753	-4240.248	610944.9705	-9622924
DL+SPECY	Combination	Max	2042.6263	10787.8567	610993.602	-9062934
DL+SPECY	Combination	Min	-2042.6262	-10787.8565	610940.0455	-9867840
DL-SPECY	Combination	Max	2042.6263	10787.8567	610993.602	-9062934

2) Story Results

Table 3
Story results

Story	Output Case	Case Type	Step Type	Direction	Maximum mm	Average mm	Ratio
1FR	DEAD	Lin Static	Max	X	0.309	0.292	1.057
1FR	DEAD	Lin Static	Max	Y	0.398	0.347	1.147
BFR	DEAD	Lin Static	Max	X	0.052	0.035	1.494
BFR	DEAD	Lin Static	Max	Y	0.105	0.058	1.8
1FR	LIVE	Lin Static	Max	X	0.02	0.017	1.205
1FR	LIVE	Lin Static	Max	Y	0.077	0.066	1.157
BFR	LIVE	Lin Static	Max	Y	0.019	0.011	1.737
1FR	EQX	Lin Static	Max	X	6.402	6.341	1.01
BFR	EQX	Lin Static	Max	X	1.394	1.339	1.041
1FR	EQY	Lin Static	Max	Y	2.233	2.103	1.062
BFR	EQY	Lin Static	Max	Y	0.501	0.387	1.294
1FR	EQZ	Lin Static	Max	X	15.303	15.156	1.01
BFR	EQZ	Lin Static	Max	X	3.332	3.202	1.041
1FR	SPECX	Lin Static	Max	X	10.177	10.084	1.009
1FR	SPECX	Lin Static	Max	Y	2.328	2.053	1.134
BFR	SPECX	Lin Static	Max	X	2.303	2.183	1.055
BFR	SPECX	Lin Static	Max	Y	0.913	0.621	1.47
1FR	SPECY	Lin Static	Max	X	3.196	3.059	1.045
1FR	SPECY	Lin Static	Max	Y	3.102	2.753	1.127
BFR	SPECY	Lin Static	Max	X	0.578	0.53	1.09

3) Story Drifts

Table 4
Story Drifts

Story	Output Case	Case Type	Step Type	Direction	Drift	Label	X m	Y m	Z m
15FR	1.5(DL+SPECX+0.3SPECZ)	Combination	Min	Y	0.002953	2687	7.3839	-51.1768	51.5
15FR	1.5(DL+SPECY+0.3SPECZ)	Combination	Max	X	0.001042	1758	-30.8563	19.3854	51.5
15FR	1.5(DL+SPECY+0.3SPECZ)	Combination	Max	Y	0.002038	1	9.6161	20.1768	51.5
15FR	1.5(DL+SPECY+0.3SPECZ)	Combination	Min	X	0.001812	372	24.1961	1.9668	51.5
15FR	1.5(DL+SPECY+0.3SPECZ)	Combination	Min	Y	0.001368	144	9.6161	17.2318	51.5
15FR	0.9DL+1.5SPECX+0.45SPECZ	Combination	Max	X	0.002463	2891	-34.9561	-52.3618	51.5
15FR	0.9DL+1.5SPECX+0.45SPECZ	Combination	Max	Y	0.002498	2891	-34.9561	-52.3618	51.5
15FR	0.9DL+1.5SPECX+0.45SPECZ	Combination	Min	X	0.002413	2891	-34.9561	-52.3618	51.5
15FR	0.9DL+1.5SPECX+0.45SPECZ	Combination	Min	Y	0.002834	2687	7.3839	-51.1768	51.5
15FR	0.9DL+1.5SPECY+0.45SPECZ	Combination	Max	X	0.001132	1758	-30.8563	19.3854	51.5
15FR	0.9DL+1.5SPECY+0.45SPECZ	Combination	Max	Y	0.001903	1	9.6161	20.1768	51.5
15FR	0.9DL+1.5SPECY+0.45SPECZ	Combination	Min	X	0.00141	1875	-34.9863	19.3854	51.5
15FR	0.9DL+1.5SPECY+0.45SPECZ	Combination	Min	Y	0.0015	144	9.6161	17.2318	51.5
15FR	1.5(DL+LL)	Combination	Min	X	0.001154	372	24.1961	1.9668	51.5
15FR	DL+0.7LL	Combination	Min	X	0.000768	372	24.1961	1.9668	51.5
15FR	DL+EQX	Combination	Min	X	0.001425	2707	-7.1961	-32.9668	51.5
15FR	DL-EQX	Combination	Min	X	0.001541	372	24.1961	1.9668	51.5
15FR	DL-EQX	Combination	Min	Y	0.000426	2687	7.3839	-51.1768	51.5
15FR	DL+EQY	Combination	Min	X	0.000723	372	24.1961	1.9668	51.5
15FR	DL+EQY	Combination	Min	Y	0.000675	82	51.9561	21.3618	51.5
15FR	DL-EQY	Combination	Min	X	0.000808	372	24.1961	1.9668	51.5
15FR	DL-EQY	Combination	Min	Y	0.000661	2709	-18.2661	-32.9668	51.5
15FR	DL+SPECX	Combination	Max	X	0.001793	2707	-7.1961	-32.9668	51.5
15FR	DL+SPECX	Combination	Max	Y	0.001607	2668	-34.9561	-48.2318	51.5
15FR	DL+SPECX	Combination	Min	X	0.001811	372	24.1961	1.9668	51.5
15FR	DL+SPECX	Combination	Min	Y	0.001963	2687	7.3839	-51.1768	51.5
15FR	DL-SPECX	Combination	Max	X	0.001793	2707	-7.1961	-32.9668	51.5

4) Modal Periods and Frequencies

Table 5
Modal periods

Case	Mode	Period sec	Frequency Cyc/sec	Circle Freq rad/sec	Eigenvalue rad2/sec2
Modal	1	1.945	0.514	3.2312	10.4405
Modal	2	1.923	0.52	3.2676	10.6772
Modal	3	1.92	0.521	3.2726	10.7097
Modal	4	1.772	0.564	3.5457	12.5723
Modal	5	1.587	0.63	3.9599	15.6806
Modal	6	1.544	0.647	4.0683	16.5512
Modal	7	1.528	0.654	4.1118	16.9069
Modal	8	1.449	0.69	4.3366	18.8062
Modal	9	1.359	0.736	4.623	21.3721
Modal	10	1.348	0.742	4.6596	21.7116
Modal	11	1.34	0.746	4.6886	21.9831
Modal	12	1.199	0.834	5.2423	27.4815

B. Analysis Result of Square Shape

1) Structure Results

Table 6
Structure results

Output Case	Case Type	Step Type	FX KN	FY KN	FZ KN	MX KN-m
DEAD	Lin Static	Max	3.182E-05	1.0001	810966.8238	-12465387
LIVE	Lin Static	Max	2.171E-06	4.108E-05	137870.8523	-1969816
EQX	Lin Static	Max	-17039.1873	10.67E-06	-1.872E-05	-0.0008
EQY	Lin Static	Max	8.621E-06	-10172.4089	0	429095.9743
EQZ	Lin Static	Max	-39337.2664	3.311E-05	-4.474E-05	-0.0017
SPECX	Lin Static	Max	32452.7754	4740.2481	21.8533	197537.1902
SPECY	Lin Static	Max	2042.6263	10787.8566	26.7782	502453.0128
SPECZ	Lin Static	Max	28.4723	68.7737	16.2436	3075.498
WLX	Lin Static	Max	-24	-5	0	62
WLY	Lin Static	Max	-5	-63	0	759.55
TEMPERATURE	Lin Static	Max	0	0	0	0
DL+LL	Combination	Max	3.3E-05	0.0001	718837.6761	-12235203
1.2(DL+LL+WLX)	Combination	Max	-28.8	-5.9999	862605.2113	-14362181
1.2(DL+LL-WLX)	Combination	Max	28.8	6.0001	862605.2113	-16362306
1.2(DL+LL+WLY)	Combination	Max	-6	-75.5999	862605.2113	-15361452
1.2(DL+LL-WLY)	Combination	Max	6	75.6001	862605.2113	-14363035
1.5(DL+WLX)	Combination	Max	-36	-7.4999	916450.2356	-15198002
1.5(DL-WLX)	Combination	Max	36	7.5001	916450.2356	-15198153
1.5(DL+WLY)	Combination	Max	-7.5	-94.4999	916450.2356	-14197091

2) Story Results

Table 7
Story results

Story	Output Case	Case Type	Step Type	Direction	Maximum mm	Average mm	Ratio
1FR	DEAD	Lin Static	Max	X	0.401	0.298	1.057
1FR	DEAD	Lin Static	Max	Y	0.399	0.357	1.147
BFR	DEAD	Lin Static	Max	X	0.054	0.045	1.494
BFR	DEAD	Lin Static	Max	Y	0.105	0.058	1.8
1FR	LIVE	Lin Static	Max	X	0.02	0.017	1.205
1FR	LIVE	Lin Static	Max	Y	0.077	0.066	1.157
BFR	LIVE	Lin Static	Max	Y	0.019	0.011	1.737
1FR	EQX	Lin Static	Max	X	6.402	6.341	1.01
BFR	EQX	Lin Static	Max	X	1.394	1.339	1.041
1FR	EQY	Lin Static	Max	Y	2.233	2.103	1.062
BFR	EQY	Lin Static	Max	Y	0.501	0.387	1.294
1FR	EQZ	Lin Static	Max	X	15.303	15.156	1.01
BFR	EQZ	Lin Static	Max	X	3.332	3.202	1.041
1FR	SPECX	Lin Static	Max	X	10.177	10.084	1.009
1FR	SPECX	Lin Static	Max	Y	2.328	2.053	1.134
BFR	SPECX	Lin Static	Max	X	2.303	2.183	1.055

3) Story Drifts

Table 8
Story Drifts

Story	Output Case	Case Type	Step Type	Direction	Drift	Label	X m	Y m	Z m
15FR	DEAD	Lin Static	Max	X	0.000766	372	26.1961	2.8668	51.5
15FR	LIVE	Lin Static	Max	X	4E-05	1772	-30.5013	-15.044	51.5
15FR	LIVE	Lin Static	Max	Y	4.2E-05	2682	-5.5261	-58.876	51.5
15FR	EQX	Lin Static	Max	X	0.000921	2891	-48.9561	-58.361	51.5
15FR	EQY	Lin Static	Max	Y	0.000597	82	59.9561	23.3618	51.5
15FR	EQZ	Lin Static	Max	X	0.002202	2891	-40.9561	-57.368	51.5
15FR	SPECX	Lin Static	Max	X	0.001625	2891	-44.9561	-55.368	51.5
15FR	SPECX	Lin Static	Max	Y	0.001764	2687	9.3839	-57.178	51.5
15FR	SPECY	Lin Static	Max	X	0.000843	1875	-37.9863	21.3854	51.5
15FR	SPECY	Lin Static	Max	Y	0.001126	1	10.6161	28.1768	51.5
15FR	SPECZ	Lin Static	Max	X	8.7E-05	372	27.1961	2.9668	51.5
15FR	SPECZ	Lin Static	Max	Y	2.8E-05	1	10.6161	25.1768	51.5
15FR	WLX	Lin Static	Max	X	2.52E-07	1799	-20.5913	2.6954	51.5
15FR	WLX	Lin Static	Max	Y	1.571E-07	1	11.6161	20.1768	51.5
15FR	WLY	Lin Static	Max	Y	1E-06	1	13.6161	20.1768	51.5
15FR	DL+LL	Combination	Max	X	0.00077	372	27.1961	1.9668	51.5
15FR	1.2(DL+LL+WLX)	Combination	Max	X	0.000923	372	29.1961	1.9668	51.5
15FR	1.2(DL+LL-WLX)	Combination	Max	X	0.000924	372	28.1961	1.9668	51.5
15FR	1.2(DL+LL+WLY)	Combination	Max	X	0.000924	372	26.1961	1.9668	51.5
15FR	1.2(DL+LL-WLY)	Combination	Max	X	0.000923	372	29.1961	1.9668	51.5
15FR	1.5(DL+WLX)	Combination	Max	X	0.001149	372	24.1961	1.9668	51.5
15FR	1.5(DL+WLX)	Combination	Max	Y	0.000363	369	24.1961	4.1468	51.5
15FR	1.5(DL-WLX)	Combination	Max	X	0.001149	372	24.1961	1.9668	51.5
15FR	1.5(DL+WLY)	Combination	Max	X	0.001149	372	24.1961	1.9668	51.5
15FR	1.5(DL+WLY)	Combination	Max	Y	0.000363	369	24.1961	4.1468	51.5

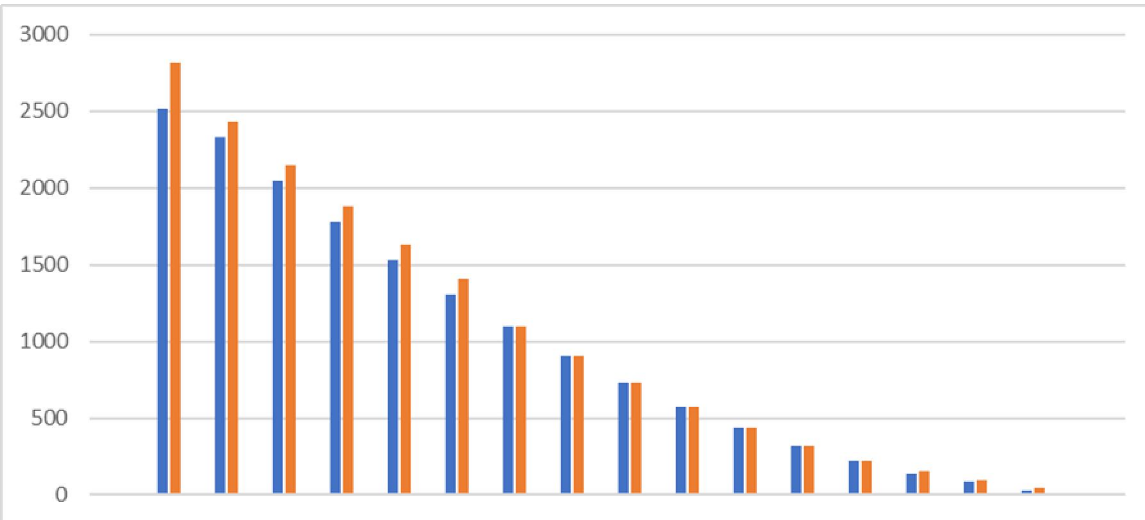
4) Modal Periods and Frequencies

Table 9
Model Periods

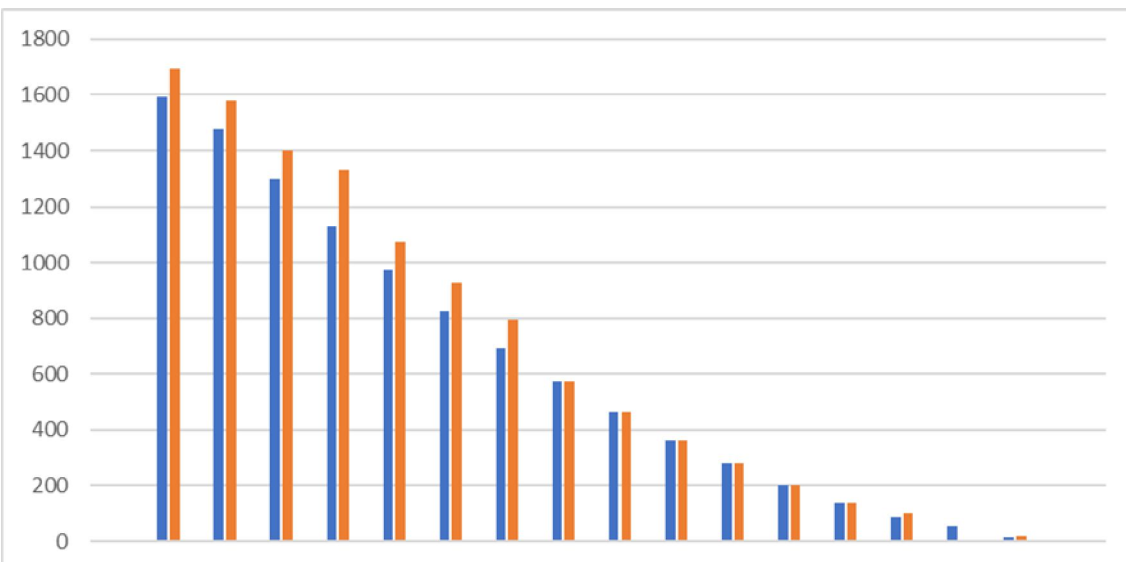
Case	Mode	Period sec	Frequency Cyc/sec	Circle Freq rad/sec	Eigenvalue rad2/sec2
Modal	1	2.945	0.514	4.2312	12.4405
Modal	2	2.923	0.52	4.2676	12.6772
Modal	3	2.92	0.521	4.2726	12.7097
Modal	4	2.772	0.564	4.5457	12.5723
Modal	5	2.587	0.63	4.9599	15.6806
Modal	6	2.544	0.647	4.0683	16.5512
Modal	7	2.528	0.654	4.1118	17.9069
Modal	8	2.449	0.69	4.3366	18.8062
Modal	9	2.359	0.736	4.623	21.3721
Modal	10	2.348	0.742	4.6596	21.7116
Modal	11	2.34	0.746	4.6886	21.9831
Modal	12	2.199	0.834	5.2423	27.4815

C. Discussion

Comparison between both the shapes lateral forces for x direction in blue series is swastik shape and orange series is square shape.

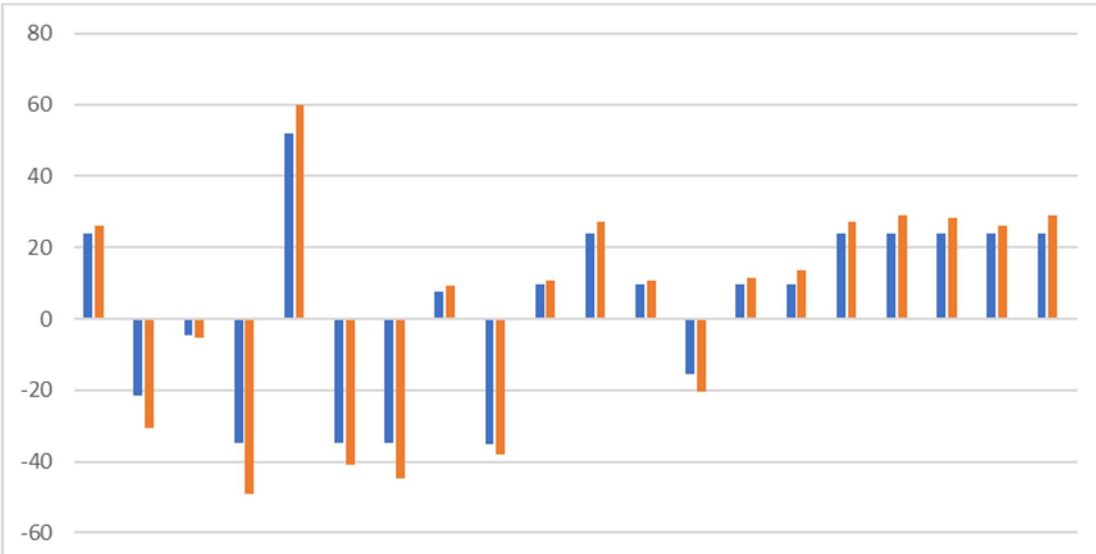


Comparison lateral forces for x direction in both shapes

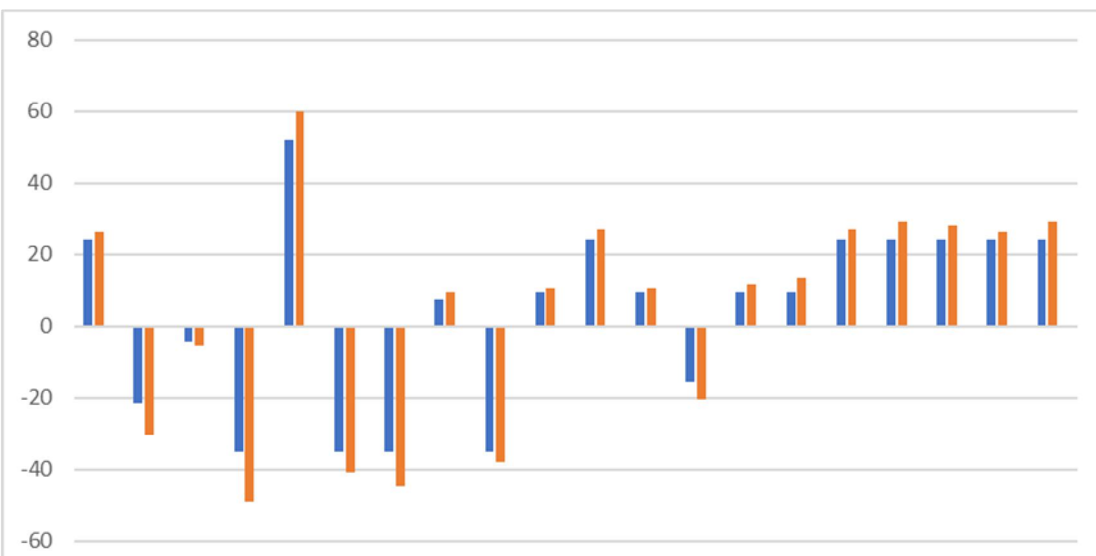


Comparison lateral forces for y direction in both shapes

Comparison between both the shapes story drift for x direction in blue series is swastik shape and orange series is square shape.

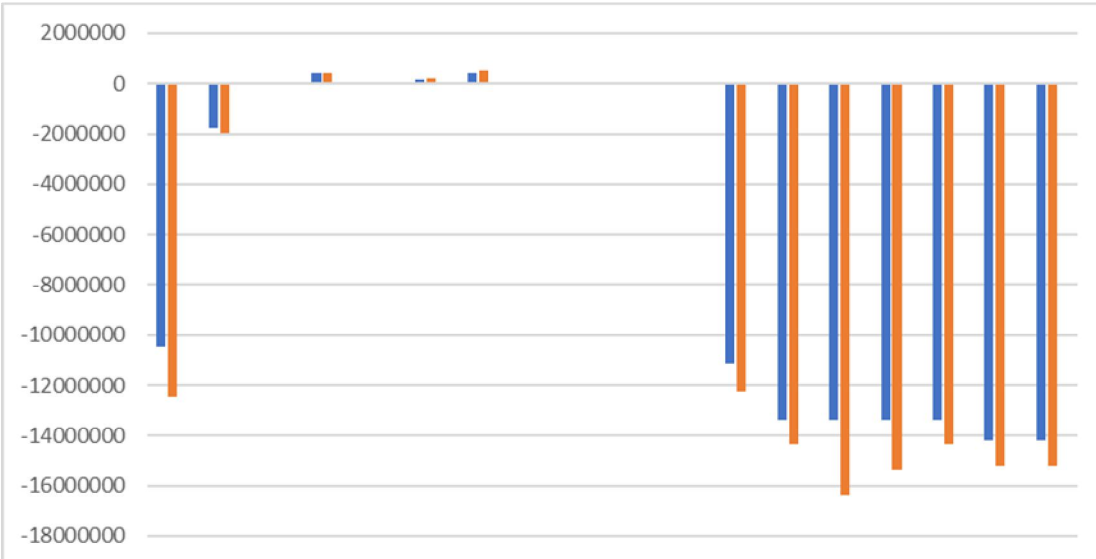


Comparison story drift for x direction in both shapes

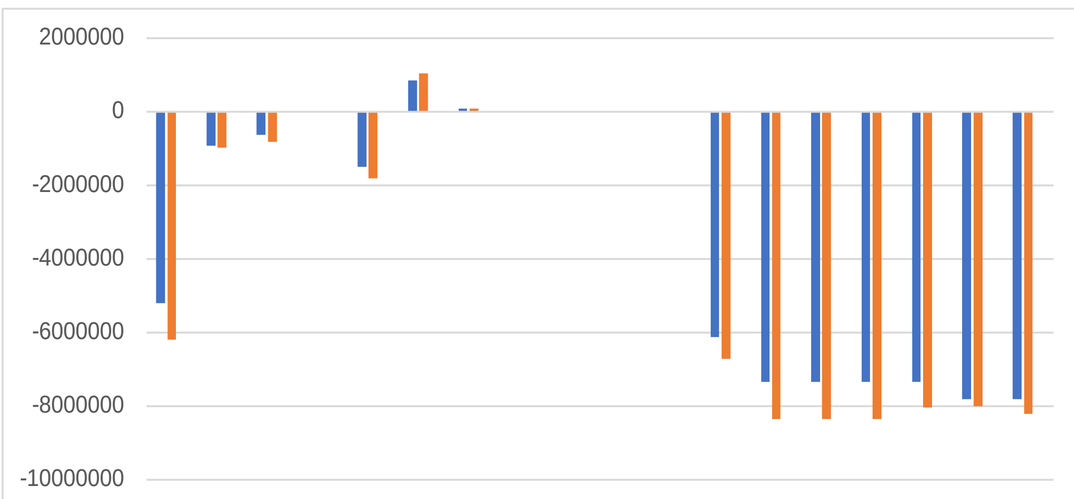


Comparison story drift for y direction in both shapes

Comparison between both the shape base reaction part 1 of 1 or part 1 of 2 in blue series is swastik shape and orange series is square shape.



Comparison Base reaction part 1 of 1 in both shapes



Comparison Base reaction part 1 of 2 in both shapes

V. CONCLUSION

1) In this study created the model on ETABS and analyzed the structure and created the two different shapes on shear wall.
2) The viewed deformed both the shapes under various loading combinations and different load combinations. From those result is found that swastik shape is more stable as compared to the square shape.
3) The structure created detailing of shear wall and beams whose data is mentioned above. There were no signs of failure in beams and shear wall.
4) The design calculated the bill of quantities and rebar quantities of beams and shear wall. According to our comparison the swastik shape bill lesser than the square shape.
5) The work is very innovational a complete shear wall in our structures not a use of columns, even in the parking we cannot use of columns.

6) In this structure created diaphragm of structural elements under various load cases and load combinations.
7) Lastly, I would like to say that structures with shear walls experience far less displacement and deflection than buildings without shear walls. In order to improve structural stability, a shear wall at the center of the building would be appropria

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