DESIGN ANALYSIS AND OPTIMIZATION IN HIGH-RISE BUILDING THROUGH ETABS

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ABSTRACT

Shear walls are often used in seismically active areas, in buildings where they do not have much experience in handling and where long beams are not used and loads increase with too much lowering. Steel options, steel-concrete composites and R.C.C. options are discussed. Analysis was performed using the isostatic method. ETABS software system program for composite materials, steel and RCC design. The model results were also compared. This analysis is a way to determine how the image behaves in different combinations. Style is a system that must be followed with certain rules. Analysis and design of the fraud software package has been completed. Horizontal Force Effect. Using the right method, the quality of the data is overcome by varying the length of the curtain wall in case of failure, thus optimizing the frequency count until the sample is not strong enough to conserve power. Initially, it was assumed that the shear wall scale would remain constant during development when the analysis was stopped. In addition to wind and seismic masses, there are many parameters that affect the performance of the structure, such as floor shear, floor shear and floor displacement, which affect the behavior of the structure. Optimized shear walls also depend on the results of shear, bending moment, storey slip, storey displacement, storey offset, and the amount of concrete and steel load. Homes are also subject to lateral masses due to wind and seismic forces, in addition to those vertical masses.

The distributions of transverse shear stiffness and bending stiffness per storey are used to rule the static and dynamic structural responses of high-rise buildings. Both the lateral load evaluation for shapes with RC shear walls and steel plate shear walls as well as the dynamic linear evaluation using the response spectrum technique are now complete. Results are contrasted for each case's bending second and earthquake forces. Additionally, it has been established that as shear partitions are added to frames with low lateral forces, lateral forces are reducing.

Keywords: Shear wall, ETABS, Earthquake loads, Load combination, Base shear.

1. INTRODUCTION

1.1 FUNCTION OF SHEAR WALL

- Providing Lateral Strength to the building: Shear Wall must provide lateral shear strength to the building to resist the horizontal earthquake forces, wind forces and transfer these forces to the foundation.

- Providing Lateral Stiffness to the building: Shear Walls provide large stiffness to building in the direction of their orientation, which reduces lateral sway of the building and thus reduces damage to the structure.

TYPE OF SHEAR WALL

- Concrete Shear Wall
- Steel Plate Shear Wall
- Plywood Shear Wall

To safely manipulate gravity and outside air, buildings that come to mind often have layout ideas, predictive analysis, initial setup and optimization. The main purpose of all types of models used in the building is the correct transfer of gr avitational massThe maximum not unusual place masses as a consequence of the impact of gravity are useless load, stay load, and snow load over it

- Enough well-distributed reinforcements.
- Shear wall Cost-effectiveness respect of earthquake.
- Minimized damages to structural and Non-structural elements.

1.2 IMPORTANT POINT

- Ratio of breadth/width > 0.4
- Finished corners are possible.
- Clear surface without any offset is possible.

- Normally less consumption of bricks/blocks.
- Shear walls run along the full length of walls.
- The lateral load is resisted by shear deformation.
- The shear wall system is more efficient for high rise structures.
- Shear wall cross-section is like a vertically oriented wide beam.
- More carpet area is available as compared to the column beam system.

2. LITERATURE REVIEW

B. Vamsi Krishna, A.V. Prasanna Kumar, E. Rakesh Reddy

[1] In this study, Building R.C.C. is modeled, investigated, and discussed. Shear wall structure in the context of the situation is an examination of the Vs functionality ratio in conjunction with the characteristics of segment shear walls. This can be advanced through the accurate version created at Etabs, taking into account the earthquake and wind forces. The main goal of this strategy is to investigate various Shear partition designs using ETABS, which is now being used to determine where approximately Shear partitions should be placed within the form.

The constructing is effectively built using ETABS with the have a look at of reaction spectrum turned into applied in the direction of degree constructing's performance. The gadget labored admirably additionally the effects have been mentioned below.

- Storey flow approximately shape be within the boundaryin the vicinity of clause no 7.11.1 of IS-1893 (Part-1):2002.
- Storey Rigidity approximately shape be within the boundary of clause no 4.20 of IS-1893 (Part-1):2002.
- Due to the life of shear partitions on each capacity bend location, the harm that could show up because of wind and earthquake forces may be monitored in this project.

L. Rahul, M.Akbar, M.Sriraman [2] Shear partitions are vertical components of a horizontal pressure-resisting machine. They are designed to function in opposition to the effects of lateral hundreds acting at the shape. Shear partitions are located directly outside of partitions that form a field and provide lateral support for residential building. Wind, earthquakes, the weight of the shape, and occupants all contribute to lateral support. These thousands have the power to destroy a whole structure. When a body is reinforced by attaching a rigid inner wall, the body's shape is maintained and joint rotation is prevented. Especially in houses with significant upward thrust that are vulnerable to lateral wind and seismic forces. Shear wall homes are for residential functions to deal with 100-500 populations consistent withconstruction.

Both the lateral load evaluation for shapes with RC shear walls and steel plate shear walls as well as the dynamic linear evaluation using the response spectrum technique are now complete. Results are contrasted for each case's bending second and earthquake forces. Additionally, it has been established that as shear partitions are added to frames with low lateral forces, lateral forces are reducing. As a result, it may be deduced that Steel plate shear partitions (t=6 mm) are more resistant to lateral hundreds in an irregular shape.

Authors: M. Pavani, G. Nagesh Kumar, Dr. Sandeep Pingale [3] The buildings present on the sloping floor are very exceptional from the ones on the plain ground, in the sloping ground, the buildings are very abnormal and unsymmetrical in horizontal and vertical planes. The buildings in the sloping ground motive extra harm in the course of earthquakes because, in the sloping ground, the shape is built with unique column heights. In this examine the 3-D analytical version of 10 storied buildings, the plan ofevery configuration consists of four bays withinside the Y course and six bays withinside the X course that's saved theidentical for all configurations of the constructing frame, the slope became selected in among zero to 30 degrees. The shape was efficiently constructed through the use of ETABSand the response spectrum evaluation was used to measurethe behavior of the shape. The shape is executed admirablyand the effects are mentioned below.

- The shape now no longer be the identical form all roundhas modified the displacement of the shape in X and Y course.
- Displacement is extra in X course than in Y course.

The tale waft is likewise very excessive whilst in comparison to the Y course

The quality manner to lessen waft and displacement forthe duration of lateral loading is to contain a shear wall in an uneven configuration in each direction.

3. METHODOLOGY

PROJECT DETAILS
GENERAL PARAMETERS

Table 3.1 GENERAL DATA

DESCRIPTION		DATA
Dimension of theplan	:-	25 x 13.5 m
No. of stories	:-	10
Floor to floor height	:-	3.15 m
Type of soil	:-	Medium
Support condition	:-	Fixed

Table 3.2 MATERIAL PROPERTIES

DESCRIPTION		DATA
Grade of Concrete(Beam)	:-	M25
Grade of Concrete(Column)	:-	M25
Grade of Concrete(Slab)	:-	M25
Grade of Steel (Beam& Column)	:-	Fe 500
Grade of Steel (Slab)	:-	Fe 500

Table 3.3 EARTHQUAKE PARAMETERS

DESCRIPTION		DATA
Zone	:-	III
Zone factor	:-	0.16
Importance factor, I	:-	1.5
Response reduction, R	:-	5

Model – 1 (G+10 w/o S. WALL)

Table 3.4 SIZING OF COLUMN & BEAM MEMBERS

DESCRIPTION		DATA
Column	:-	0.45m x 0.75m
Beam	:-	TB: 0.30m x 0.60m MB: 0.45m x 0.55m (terrace)SB: 0.30m x 0.45 m

Model – 2 (G+10 w S. WALL)

Table 3.5 SIZING OF COLUMN & BEAM MEMBERS

DESCRIPTION		DATA
Column	:-	0.45m x 0.75m
Beam	:-	TB: 0.30m x 0.60m MB: 0.45m x 0.55m (terrace)SB: 0.30m x 0.45 m

Model – 2 (G+10 w S. WALL) (D.A.1)

Table 3.6 SIZING OF COLUMN & BEAM MEMBERS

DESCRIPTION		DATA
Column	:-	0.45m x 0.75m
Beam	:-	TB: 0.30m x 0.60m MB: 0.45m x 0.55m (terrace)SB: 0.30m x 0.45 m
Wall	:-	230mm

Model – 2 (G+10 w S. WALL) (D.A.2)

Table 3.7 SIZING OF MEMBERS

DESCRIPTION		DATA
Column	:-	0.45m x 0.75m
Beam	:-	TB: 0.30m x 0.60m MB: 0.45m x 0.55m (terrace)SB: 0.30m x 0.45 m
Wall	:-	230mm

Model – 2 (G+10 w S. WALL) (D.A.3)

Table 3.8 SIZING OF MEMBERS

DESCRIPTION		DATA
Column	:-	0.45m x 0.75m
Beam	:-	TB: 0.30m x 0.60m MB: 0.45m x 0.55m (terrace)SB: 0.30m x 0.45 m
Wall	:-	230 mm

Table 3.9 SIZING OF MEMBERS

DESCRIPTION		DATA
Column	:-	0.45m x 0.75m
Beam	:-	TB: 0.30m x 0.60m MB: 0.45m x 0.55m (terrace)SB: 0.30m x 0.45 m
Wall	:-	230 mm

4. RESULTS

The results of, story displacement & storey drift arecompared.

STORY DISPLACEMENT

STORY DISPLACEMENT												
EQX												
STORY	ERRAC E	9f	8f	7f	6f	5f	4f	3f	2f	1f	linth/g f	Base
X- Dir (mm)	34.747	33.516	31.613	29	25.75	22.04	18	13.75	9.406	5.136	1.35	0
X- Dir (mm) W S.W.	27.226	26.011	24.344	22.19	19.57	16.62	13.45	10.16	6.887	3.763	0.961	0
X- Dir (mm) D.A.1	22.541	21.133	19.446	17.45	15.14	12.6	9.915	7.209	4.622	2.346	0.61	0
X- Dir (mm) D.A.2	22.387	20.879	19.126	17.08	14.77	12.24	9.589	6.936	4.417	2.214	0.558	0
X- Dir (mm) D.A.3	15.733	14.375	12.811	11.12	9.359	7.564	5.785	4.09	2.558	1.278	0.325	0
X- Dir (mm)	33.998	32.777	30.89	28.33	25.16	21.56	17.65	13.54	9.338	5.188	1.368	0

(SPSW)												

Figure 4.1 DATA
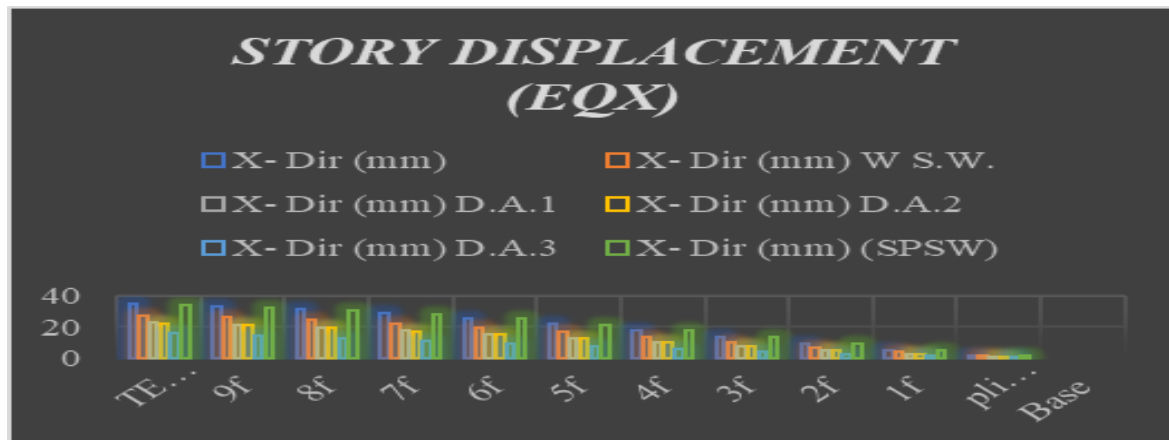
Figure 4.2 DATA
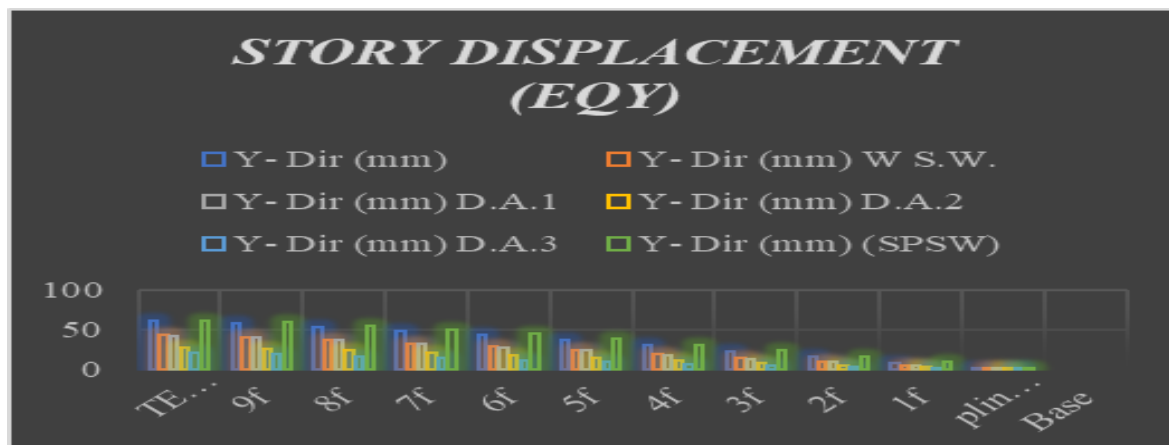
Figure 4.3 STORY STIFFNESS

STORY DRIFT

STORY	TERRACE	9f	8f	7f	6f	5f	4f	3f	2f	1f	plinth/gf	Base
X- Dir (mm)	0.00039	0.0006	0.00083	0.001	0.001	0.001	0.001	0.001	0.001	0.001	6E-04	0
X- Dir (mm) W S.W.	0.0004	0.0005	0.00062	7E-04	8E-04	9E-04	9E-04	9E-04	9E-04	8E-04	3E-04	0
X- Dir (mm) D.A.1	0.00047	0.00057	0.00066	8E-04	8E-04	9E-04	9E-04	9E-04	8E-04	6E-04	3E-04	0
X- Dir (mm) D.A.2	0.00033	0.00041	0.00049	6E-04	7E-04	7E-04	7E-04	7E-04	7E-04	6E-04	3E-04	0
X- Dir (mm) D.A.3	0.00033	0.00041	0.00049	6E-04	7E-04	7E-04	7E-04	7E-04	7E-04	6E-04	3E-04	0
X- Dir (mm) (SPSW)	0.00039	0.0006	0.00081	0.001	0.001	0.001	0.001	0.001	0.001	0.001	6E-04	0

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| STORY	TERRACE	9f	8f	7f	6f	5f	4f	3f	2f	1f	plinth/gf	Base
Y- Dir (mm)	0.00091	0.00123	0.00156	0.002	0.002	0.002	0.002	0.002	0.002	0.002	9E-04	0
Y- Dir (mm) W S.W.	0.00082	0.00095	0.00111	0.001	0.001	0.001	0.001	0.001	0.001	1E-03	5E-04	0
Y- Dir (mm) D.A.1	0.00089	0.00106	0.00125	0.001	0.001	0.002	0.002	0.002	0.001	0.001	5E-04	0
Y- Dir (mm) D.A.2	0.00067	0.00078	0.00089	1E-03	0.001	0.001	0.001	0.001	9E-04	8E-04	4E-04	0
Y- Dir (mm) D.A.3	0.00067	0.00078	0.00089	1E-03	0.001	0.001	0.001	0.001	9E-04	8E-04	4E-04	0
Y- Dir (mm) (SPSW)	0.00086	0.00121	0.00156	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0

Figure 4.5 DATA
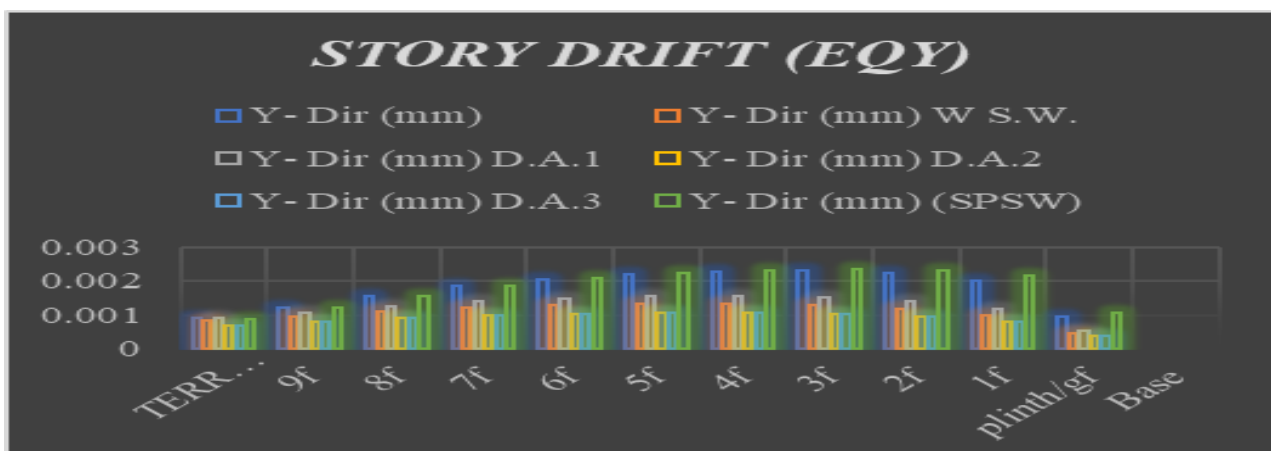
Figure 4.6 DATA

5. CONCLUSIONS

Similarly, another 12 models of G+15 and G+20 have beenanalyzed and from that, it is concluded that

- When in comparison to a building w/o a shear wall,the building with the shear wall is effective.
- When compared to a typical building, the weight of abuilding with a shear wall is relatively more.
- When it comes to story stiffness steel plate shear wall has a little bit less story stiffness compared to a buildingw/o a shear wall.
- When it comes to story displacement building with ashear wall (D.A.3) has the least displacement of the others.
- In short, building with a shear wall is more economical than building w/o a shear wall, and the economyof a shear wall depends on the materials used, arrangementand convenience of construction of a shear wall.

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