Study on Effective Region of Shear Wall In RC Building By Using Etabs

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Abstract- *In this study, the effective location or optimum positioning of shear wall in multistory buildings is studied. For this purpose multistory buildings with and without shear walls have been analysed. It is very important to know the positioning of shear walls it resist the seismic loads, wind loads, lateral loads. if not know the actual or best position of shear wall it is negative effect instead The overall performance of the constructing is evaluated the use of parameters such as time period, lateral displacement, and base shear and storey drift. The seismic performance of the frame also depends upon (optimum positioning) location of shear walls and its symmetry. Hence addition of shear walls in existing is being structures is an effective tool forseismic strengthening like the other methods of retrofitting. different cases of shear wall position Shear walls should be provided along preferably both length and width.*

Keywords- Shear Wall, Seismic Forces, and Optimization Concrete Buildings

I. INTRODUCTION

In multi-story structures, shear walls are critical, because in addition to precluding the failure of surface walls, they also support the multiple bottoms of the structure, icing that they don't collapse as a result of side movement in an earthquake. When a building has a story without shear walls, or with poorly placed shear walls, it is known as a soft story building, referencing the idea that the story besides reinforcement will be gentle and susceptible in a disaster. Because shear partitions are structural in nature, they can't be moved or reduce open. This is an important issue to consider when building a structure from the ground up; it's a good idea to think about how uses of the space might change, to ensure that a shear wall does not be come a nuisance later**.** Concrete walls, which have high plane stiffness, placed at convenient locations are economically used to provide necessary resistance to horizontal forces. The walls may be placed in the form of assemblies surrounding the lift shafts or stair wells. The walls are not only designed to resist gravity / vertical loads (due to its self-weight and other living / moving loads), but they are also designed for lateral loads of earthquakes / cyclones.

The partitions are structurally built-in with roofs / flooring and different lateral walls, thereby giving the three dimensional steadiness for the constructing structures. Shear wall structural machine of 3-dimensions can efficaciously stand up to the earthquake forces. A railway compartment or a bus coach, which will be subjected to lot of vibrations and base excitations are constructed of stiffened plate machine - a easy metal plate stiffened (strengthened / reinforced) through a grid of metal structural angles or channels.

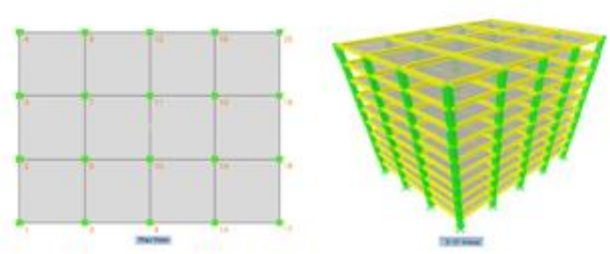
Objective of the Study

The most important objectives of present study include:

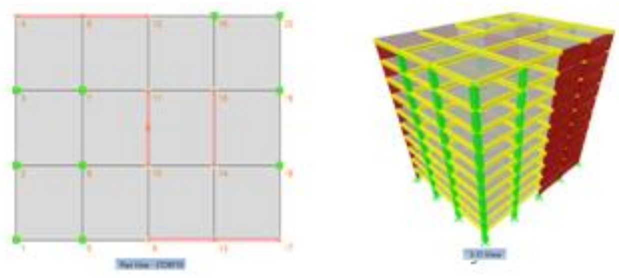
- To analyze the multi-storey RC building with shear wall using Equivalent static method.
- Make the objective function to minimize the lateral displacement of the multi-storey RC building during earthquake.
- Effective location effects of shear wall in multi-storey building which are subjected to lateral loads.

II. THE DIFFERENT TYPES OF MODELS STUDIED ARE

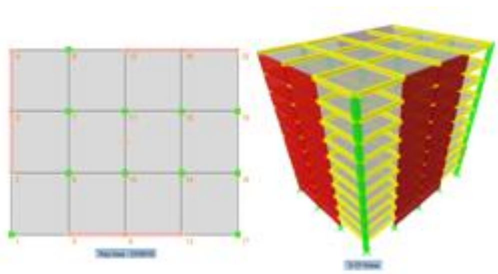
1) Model without Shear Wall



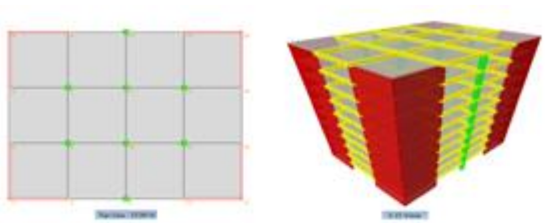
2) Model with Asymmetric Shear Wall



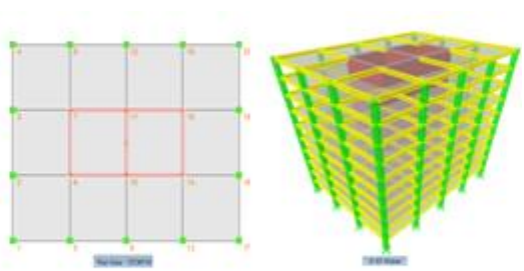
3) Model with Symmetric Shear Wall



4) Model with Shear Walls on Periphery at Corners



5) Model with Shear Walls on Periphery at Centers



III. ANALYSIS

PROBLEM STATEMENT

The structure analyzed is a ten-storied reinforced concrete residential building. Pushover method of analysis is used to the behavior of structure. Various parameters such as Time Period, Lateral Displacement, Story Drift, and Base Shear are contrast and conclusions are formulated for the same. The software used for the modeling and analysis is ETABS.

The details of the model considered for the study are given as:
Number of Stories = 10 Storey
Height = 3.5 meters
Number of Bays along X-direction = 4
Number of bays along Y-direction = 3
Bay Width along X-direction = 7.5 meters
Bay Width along Y-direction = 7.5 meters
Size of Column – 700 mm X 700 mm
Size of Beam – 450 mm X 650 mm
Depth of Slab – 250 mm
Thickness of Shear Wall – 230 mm

TYPE OF STRUCTURE

Frame Type – Ordinary Moment Resisting Frame
Seismic Zone (Z) – V
Type of Soil – Medium Soil (Type-II) Response Reduction Factor (R) – 3 Importance Factor (I) – 1
Response Spectrum – As per IS 1893 (Part- I) 2002 Wind Speed (Vb) – 50 m/s
Terrain Category – 4Class of model – B

LOADING

Live Load – 2 KN/m2
Floor Finish Load – 1 KN/m2
Waterproofing Load – 2 KN/m2 (only on Terrace Floor) Service Load – 0.5 KN/m2
Wall Load – 14 KN/m

MATERIAL PROPERTIE

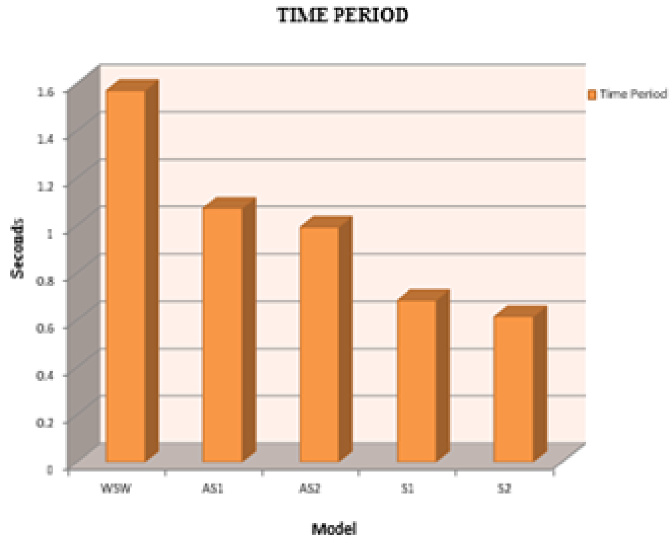
Grade of Concrete – M50 Grade of Steel – Fe500
Modulus of Elasticity of concrete – 35355339 KN/m2 Poisson's Ratio – 0.2

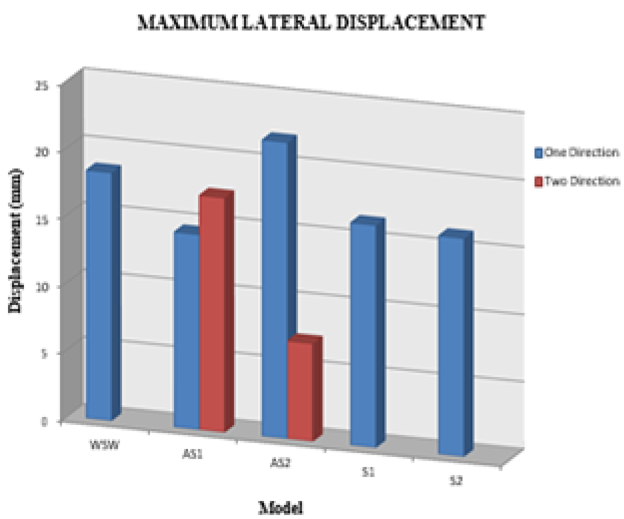
The behavior of all the framing systems is taken as a basic study on the modeled structure. Deflection ratio is check in IS-1893:2002 i.e. under transient seismic loads. The following parameters were considered to present a comparison between the different frames:

1. Storey Drift
2. Storey Displacement
3. Base Shears
4. Storey Overturning Moment

has been modeled the usage of ETABS software program

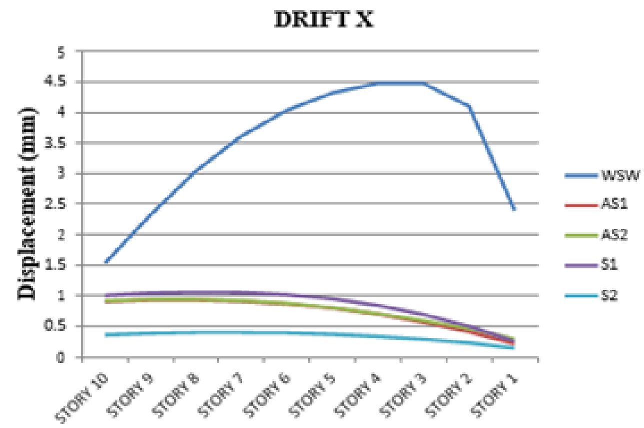
COMPARATIVE ANALYSIS AND RESULTS





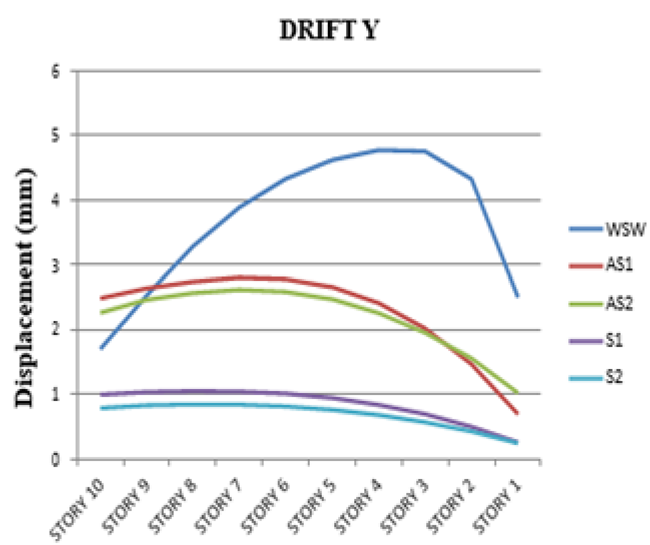
STORY DRIFT IN X-DIRECTION

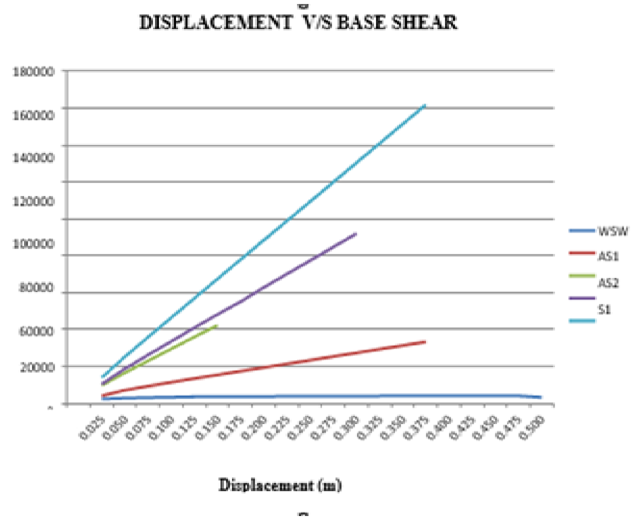
Story	WSM	AS1	AS2	S1	S2
Ten	1.699	2.485	2.260	0.996	0.787
Nine	2.52	2.638	2.461	1.033	0.827
Eight	3.280	2.742	2.564	1.049	0.842
Seven	3.881	2.800	2.612	1.044	0.839
Six	4.322	2.779	2.585	1.010	0.811
Five	4.618	2.656	2.469	0.942	0.758
Four	4.774	2.411	2.255	0.837	0.677
Third	4.753	2.021	1.951	0.692	0.566
Second	4.324	1.467	1.557	0.499	0.426
First	2.39	0.218	0.294	0.258	0.241



STORY DRIFT IN Y-DIRECTION

Story	WSM	AS1	AS2	S1	S2
Ten	1.54	0.0909	0.919	1.010	0.363
Nine	2.33	0.930	0.941	1.046	0.388
Eight	3.046	0.932	0.942	1.061	0.401
Seven	3.618	0.913	0.922	1.055	0.403
Six	4.037	0.870	0.878	1.019	0.394
Five	4.323	0.801	0.807	0.950	0.372
Four	4.482	0.702	0.708	0.843	0.338
Third	4.477	0.573	0.599	0.696	0.290
Second	4.100	0.415	0.466	0.502	0.231
First	2.39	0.218	0.294	0.258	0.151





IV. OBSERVATIONS

1. it can be seen that, the Time Period of model without shear wall is more as compared to other models having shear wall. This time period goes on decreasing from models with highest from WSW (1.5698 sec.) to AS1 (1.0715 sec.), AS2 (0.9916 sec.), S1 (0.6824 sec.) and lowest being S2 (0.6139 sec.)
2. it can be seen that, the Maximum Lateral Displacement of model with symmetric shear wall is less (16.22 mm) as compared to the other models with highest being for WSW (18.44 mm). Also the model with Asymmetric shear wall is subjected to torsion with large displacements.
3. it can be seen that, the story drift of model with shear wall is much lower as compared to model without shear wall. Also the story drift of symmetric shear wall is lower as compared to that of asymmetric shear wall. Central box type location of shear wall has less story drift than that of L shaped shear wall at corners.
4. it can be seen that, at 0.15 m displacement the base shear of model WSW is 3853.27 KN, AS1 is 15617.96 KN, AS2 is 42476.12 KN, S1 is 48420.64 KN and of S2 is 67591.63 KN. The Base Shear of model with Symmetric Shear wall is highest as compared to that of asymmetric shear wall and without shear wall. There is a tremendous difference between base shear of model with shear wall and without shear wall.

V. SUMMARY & CONCLUSIONS

It is clear to all that the seismic hazard has to be cautiously evaluated earlier than the development of essential and high-rise buildings. Based on the above analytical study carried out on 4 models, it is evident that buildings with shear walls behave more effectively than conventional frames when subjected to seismic loads. The following deductions are made from the obtained results:

1) The Fundamental Natural Time Period decreases due to Shear wall.
2) When shear wall is provided, displacement and storey drift reduces and base shear increases.
3) When shear wall is placed symmetrically the displacement is reduced. Central location of shear wall is best for reducing the lateral displacements.
4) As thickness and width of shear wall increases, displacement and storey drift reduces and base shear increases.
5) When shear wall is provided at corner, torsion is considerably reduced. And asymmetrical placement of shear wall induces torsion effect.
6) When two shear walls are inter locked the performance of the shear wall is considerably increased, which increases the stiffness of building.
7) If the dimensions of shear wall are large and along the direction of lateral forces then major amount of lateral forces are taken by shear wall.

VI. FUTURESCOPE

1. Time History analysis of the structure can be carried out and corresponding results can be found.
2. The effect of use of Bracing can be studied and comparison between results of Shear Wall and Bracing can be carried out.
3. In this study the effect of reinforced concrete Shear wall is studied, one can also study the effect of Steel plated shear wall and comparison between stiffened and un-stiffened steel plate shear wall can be made.

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