

A COMPARATIVE ANALYSIS OF STRUCTURE USING OUTER AND INNER EDGE SHEAR WALL

Sohrab Alam¹, Prof Kapil Soni²

ABSTRACT: *The potential of new technologies has been required to design buildings primarily for checking the adequacy of the structure and the gravity loads for safety due to lateral loads. During earthquake RC (Reinforced Concrete) structures are subjected to lateral displacement. Most of the RC structures are designed to resist gravity loads only neglecting the effect of lateral forces arising due to earthquake.. Deficient parallel protections and poor enumerating of support are the primary explanations behind insufficient seismic execution. Shear divider framework is a standout amongst the most ordinarily utilized sidelong load opposing procedure for development of structures and to dissect its torsional abnormality. A comparative has been done by placing shear wall at different location in the building subjected to seismic load. These locations consist of shear wall being placed at periphery, at intermediate position and in the core. The point of this research is to decide the arrangement whether the structure with or without shear wall is appropriate and area of the shear wall as per the suitability. For this reason three unique models ten storied building each has been considered i.e. one model without shear wall and other with shear wall with various areas (i.e., inward and external part).*

Key Notes:- *Shear wall, lateral loads, Location of Shear wall, Low Rise Building, Torsional Irregularity, Displacement*

I. GENERAL

In many regards concrete is a perfect building material, consolidating economy, flexibility of shape and work, and significant protection from fire and the assaults of time. The crude materials are accessible in for all intents and purpose each nation, and the assembling of cement is moderately simple. It is little wonder that in this century it has turned into a general building material.

Tall structures are the most complex constructed structures since there are many clashing necessities and complex building frameworks to coordinate. Today tall structures are winding up increasingly slim, prompting the possibility of more influence in examination with elevated structures. RC Buildings are sufficient for opposing both the vertical and flat load.

At the point when such building is composed without shear wall, the shaft and section sizes are very heavy, steel amount is additionally required in vast sum in this way there is parcel of congestion at these joint and it is hard to put and vibrate concrete at these joints and removal is very substantial which actuates heavy forces in part. Shear wall may wind up noticeably basic from the perspective of economy and control of parallel diversion. In RC multi-story building R.C.C. shear

wall are normal necessity. center point of mass and solidness of the building must concur. In any case, on many events the plan must be founded on the center position of lift and stair case wall regarding center point of mass which comes about into an over the heavy forces in a large portion of the basic individuals, undesirable deflection and torsion moment.

Strengthened concrete walls, which incorporate shear walls, are the typical requirements of Multi Story Buildings. Configuration by agreeing center of mass and solidness of the building is the perfect for a Structure. Giving of shear wall speaks to a basically proficient answer for solidify a building auxiliary framework on the grounds that the fundamental capacity of a shear wall is to expand the rigid nature for parallel load protection.

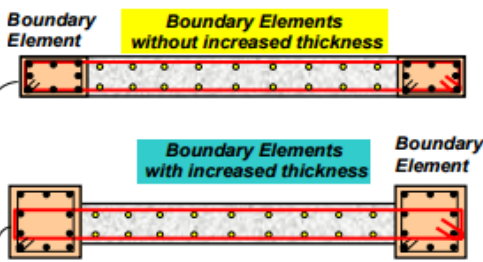
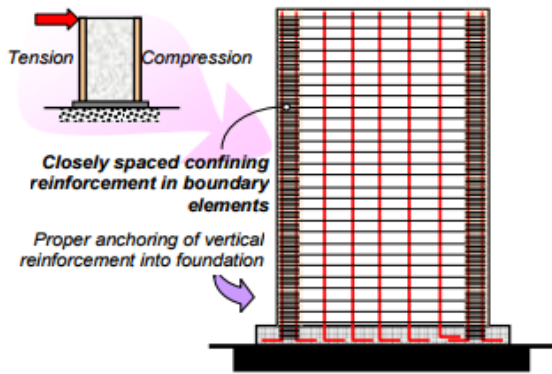
The utilization of shear wall structure has picked up popularity in elevated structure, particularly in the development of apartments or office/business tower.



Reinforcement of Shear wall

II. FUNCTION OF SHEAR WALL

Shear walls must give the vital parallel strength to oppose flat quake forces. At the point when shear walls are sufficiently solid, they will exchange these horizontal forces to the following component in the load path below them. These different parts in the load path might be other shear walls, floors, foundation walls, slabs or footings. Shear walls additionally give horizontal stiffness to keep the floor above from over the top side's direction. At the point when shear walls are sufficiently firm, they will forestall floor and roof confining individuals from getting off their supports. Likewise, structures that are adequately hardened will as a rule endure less non-basic damage.



Layout of main reinforcement in shear walls as per IS: 13920-1993

ADVANTAGES OF SHEAR WALL:

- (1) Sound lessening
- (2) Cost sparing
- (3) Greater control of precision and workmanship
- (4) Superb solid complete, quality change:
- (5) Lesser water leakage issue:
- (6) Fire protection:
- (7) Strong, strong, inflexible, sturdy and low upkeep:

APPLICATION OF SHEAR WALL

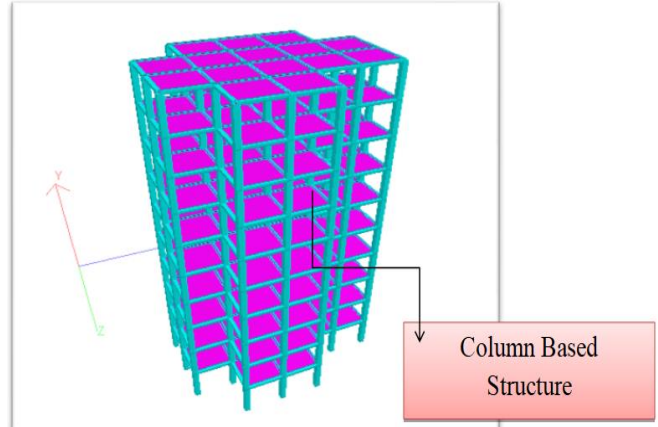
Following are the utilizations of Shear divider:-

- Shear divider is an auxiliary part used to oppose parallel powers i.e. parallel to the plane of the wall. As it were, Shear walls are vertical components of the flat power opposing framework.
- In building development, an inflexible vertical stomach relevant for exchanging sidelong powers from outside walls, floors, and rooftops to the ground establishment toward a path parallel to their planes.
- Shear walls are particularly material in tall structures subject to horizontal breeze and seismic powers. They give sufficient quality and firmness to control parallel relocations.

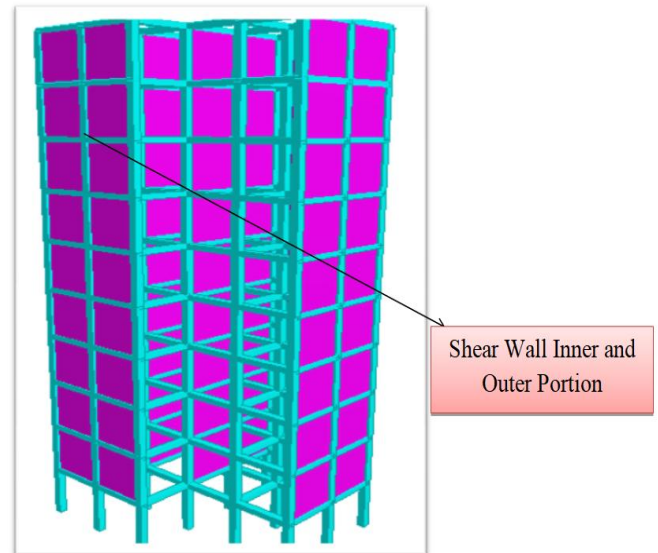
MODELING

For this investigation, G+9 story working with a 4-meters tallness for every story, consistent in design is demonstrated. These structures were planned in consistence to the Indian Code of Practice for Seismic Resistant Design of Buildings. The structures are thought to be settled at the base. The areas of basic components are square and rectangular. Story statures of structures are thought to be consistent including the ground story. The structures are displayed utilizing

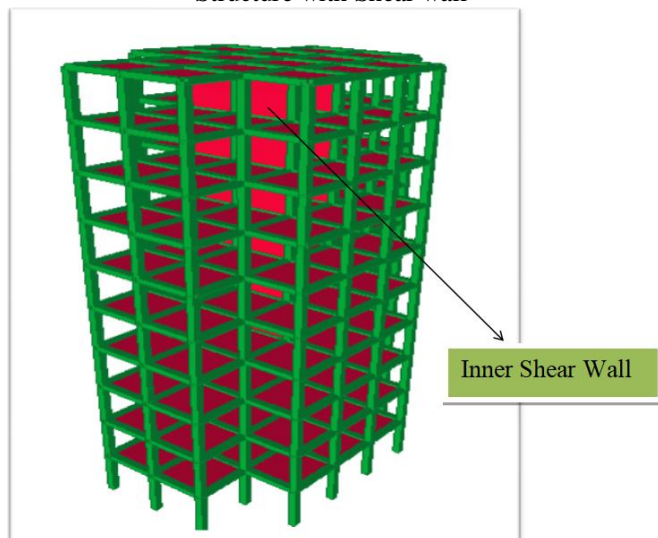
programming STAAD. Four unique models were examined in which Structure with and without Shear divider, structure with various situating of shear divider in building i.e., Inward and Outer Portion of the Structure. Models are examined in zone-3 contrasting sidelong uprooting for all models.



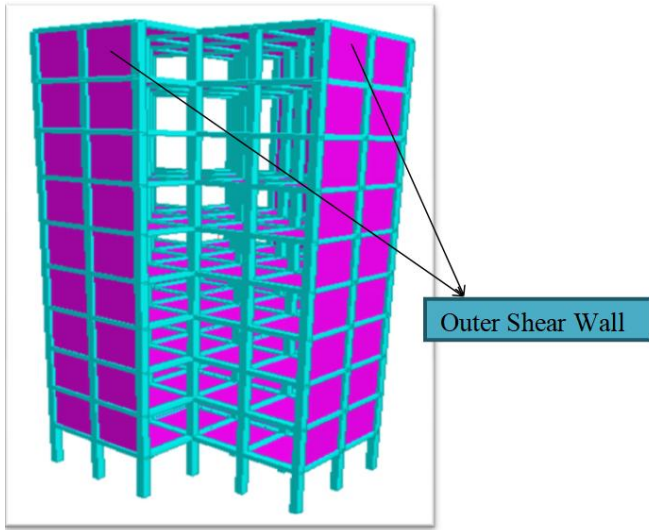
Structure without Shear wall



Structure with Shear wall



Structure with Inner Shear wall



Structure with Outer Shear wall

III. METHOD OF ANALYSIS

(a)The investigation of multistory structures for the gravity loads and horizontal loads should be possible by examination apparatus STAAD pro,

(b) For the static and dynamic investigation of multistory structures have minute opposing edge

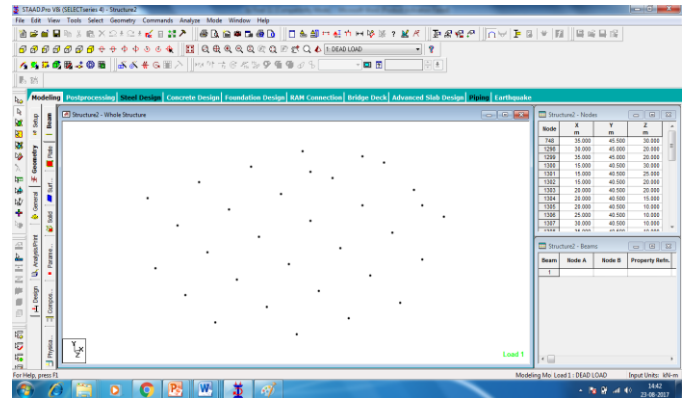
- By STAAD Pro. programming
- Method Equivalent static parallel force strategy – For Static examination as it were. Examined according to IS 1893(part-1):2002 for consistent structures as it were.

Modelling

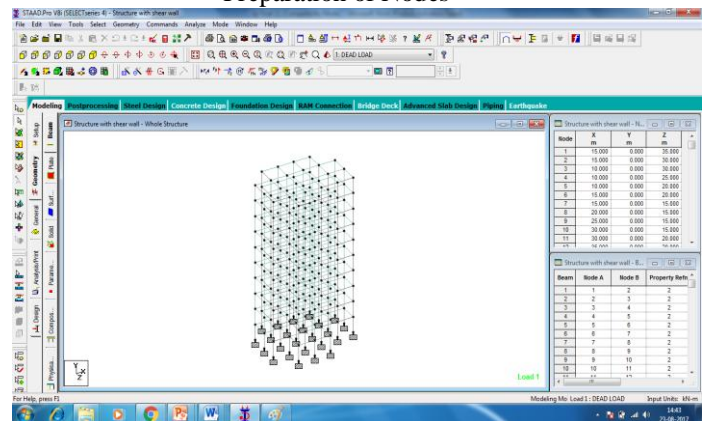
Modelling is one of the important features in finite element method of analysis. A three dimensional structure can be easily analysed by considering it as a two dimensional structure without any variation in results.

Creative thinking in idealizing and meshing of the structure helps not only in considerable reduction of time but also in less memory of the system. The ultimate purpose of a finite element analysis is to recreate the mathematical behaviour of actual engineering system. In other terms the analysis must be a precise mathematical model of physical prototype. In broader sense model comprises all the elements, nodes, real constants, material properties, boundary conditions and other properties that are used to represent the physical system.

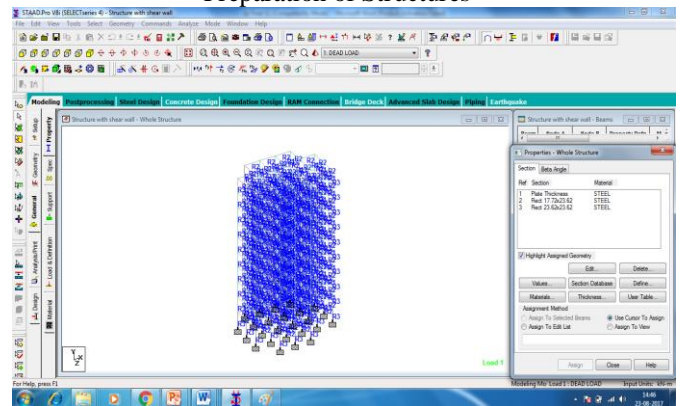
Procedure of preparing structure in STAAD Pro.



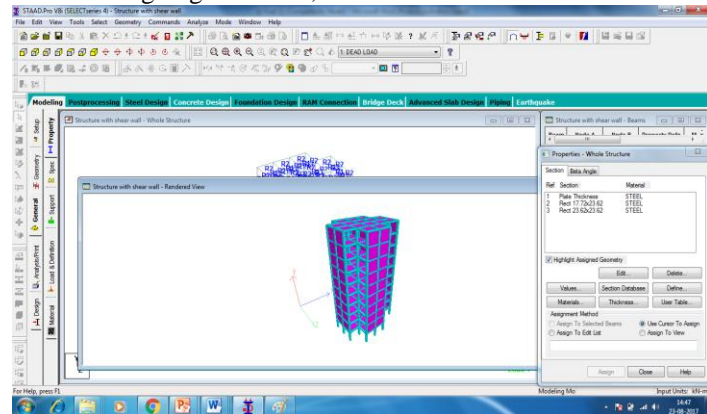
Preparation of Nodes



Preparation of Structures



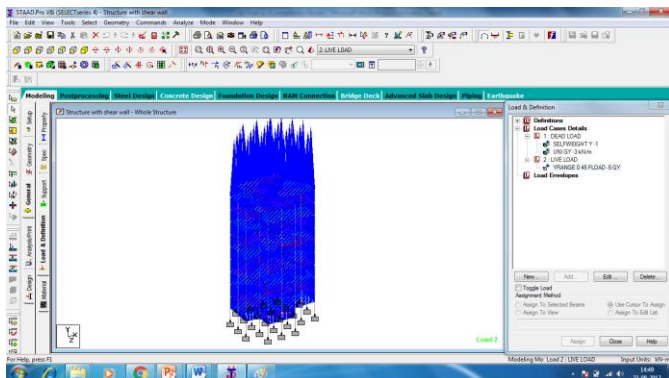
Assigning of Beams, columns and Shear wall



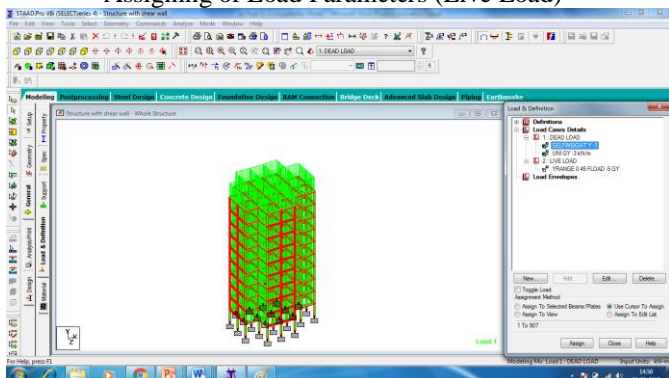
-D Rendered View



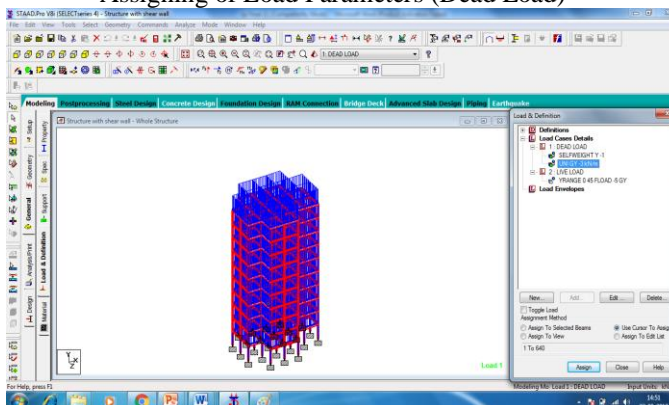
STAAD Pro.



Assigning of Load Parameters (Live Load)



Assigning of Load Parameters (Dead Load)



Assigning of Load Parameters

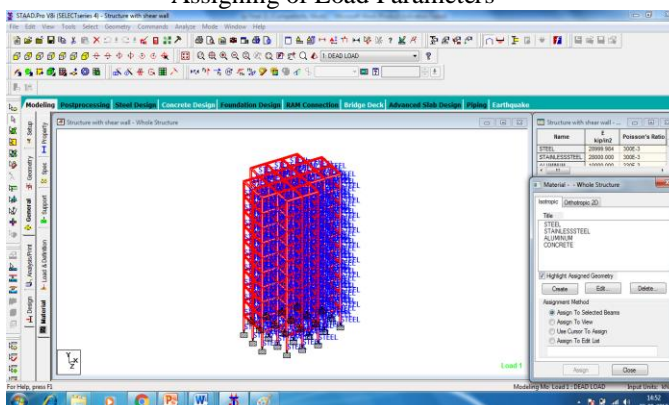
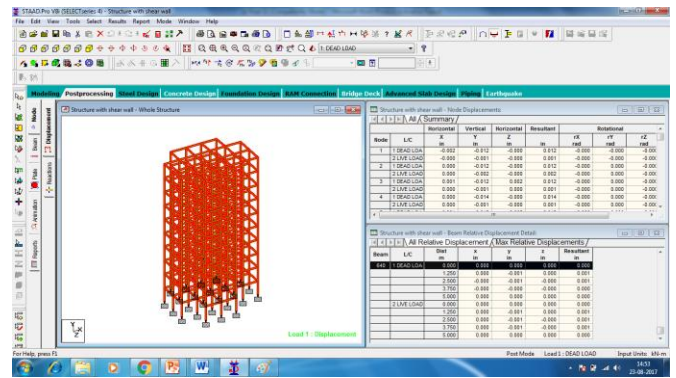
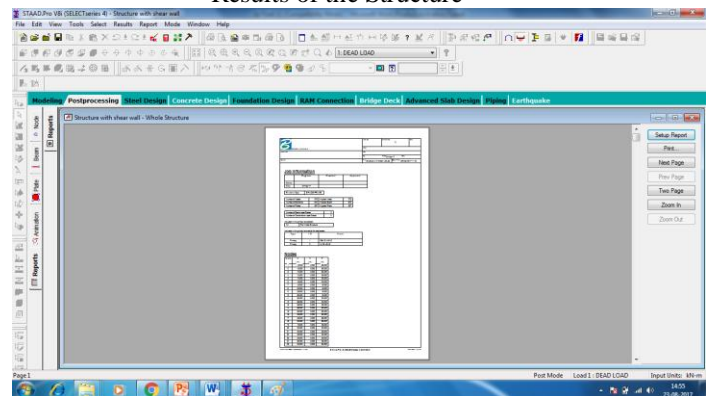


Fig. 4.9 Assigning of Materials



Results of the Structure



Final Reports of the Structure

Result analysis

The following are results from the analysis:-

- Comparison of Inner and Outer Shear wall using STAAD Software
- Over all displacement of the structure with respect to inner and outer shear wall.
- The behavior and resistance of shear wall against different locations and displacement, storey shear and torsional irregularity.
- Torsional Irregularity
- Displacement
- Story Drift
- Cost analysis

Loads were an essential thought in any building outline since they characterize the nature and magnitude of risks is outer forces that a building must oppose to give a performance all through the structure's helpful life. The expected loads are impacted by a building's planned utilize, setup and area. At last, the sort and greatness of configuration loads influence basic choices, for example, material utilization, development points of interest and building arrangement. Residential structures strategies for deciding plan loads are finished yet customized to common private conditions as with any outline work, the designer should at last understand and affirm the loads for a given task and in addition the general outline system, including all its characteristic qualities and weakness.

Therefore Design load considered for the Structure as follows:-

- Dead Load

- Live Load
- Floor Load
- Parapet Load
- Generated Indian Code Combination

IV. CONCLUSION

In this examination an investigation is carried on five types of average structures by considering diverse shear wall positions and story numbers and on the inferred structure groups with differing axis number. Discoveries on lateral load examinations are assessed and the following conclusions were outlined:

- The shear wall make the structure safe by enhancing stiffness, ductility and reducing lateral and vertical drift of the storey at joints, which is due to direct reduction of displacement of member along the propagation of seismic force..
- The lateral displacement in X- direction and Z- direction is restricted more by the intermediately configured shear wall making building structure safe to shear failure.
- Torsional irregularity coefficients achieve most extreme values when the shear walls were set as close as possible to the center of mass without harmonizing them.
- The Proportionate material requirement for the restriction of applied load safely; in the construction of building also shows the Intermediate configuration will be more economical than other with exception of steel in core and concrete in periphery position; but this could not retard structural buckling considerably.
- Since the floor turns might be considered as the genuine representative of the torsional conduct, torsional irregularity coefficients as characterized in the controls to be totally amended.

REFERENCES

- [1] Atc. Seismic Evaluation and Retrofit of Concrete Buildings—Volume 1 (Atc-40).Report No's 96-01. Redwood City (Ca): Applied Technology Council; 1996.
- [2] Fema. Nehrp Guidelines for the Seismic Rehabilitation of Buildings (Fema 273). Washington (Dc): Building Seismic Safety Council; 1997.
- [3] Fema 356 Nehrp Pre Standard and Commentary for the Seismic Rehabilitation of Buildings. (2000).
- [4] K.V.G.D Balaji Pushover Analysis of Unsymmetrical Framed Structures On Sloping Ground.International Journal of Civil, Structural Environmental and Infrastructure Engineering, Research and Development (Ijcsieird), ISSN 2249-6866, Vol. 2 Issue 4 Dec - 2012 45-54.
- [5] Mrugesh D. Shah Nonlinear Static Analysis Of R.C.C. Frames (Software Implementation ETABS 9.7) National Conference On Recent Trends In Engineering & Technology.
- [6] S. V. Venkatesh Effect of Internal & External Shear

wall On Performance of Building Frame subjected To Lateral Load. International Journal of Earth Sciences and Engineering, Issn 0974-5904, Volume 04, No 06 Spl, October 2011.

- [7] Anshuman.S. Solution of Shear Wall Location in Multi-Storey Building.International Journal of Civil and Structural Engineering, ISSN 0976 – 4399, Volume 2, No 2, 2011.
- [8] Mangulkar Madhuri N. Review on Shear Wall for Soft Story High-Rise Buildings.International Journal of Engineering and Advanced Technology (IJEAT), ISSN: 2249 – 8958, Volume-1, Issue-6, August 2012
- [9] Anuj Chandiwala Earthquake Analysis of Building Configuration with Different Position of Shear Wall.International Journal of Emerging Technology and Advanced Engineering, ISSN 2250-2459, Volume 2, Issue 12, December 2012.
- [10] O. Esmaili S Study of Structural RC Shear Wall System in a 56-Story RC Tall Building.The 14th World Conference on Earthquake Engineering, Oct 2008, Beijing, China.