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COMPARATIVE STUDY ON THE EFFECT OF COMPOSITE SHEAR WALL ON THE PERFOMANCE OF RC BUILDINGS

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Abstract - *Shear wall systems are one of the most commonly used lateral load resisting system in high rise buildings, to resist lateral forces incorporation of Shear walls has become inevitable. To find seismic performance of building here Comparative study of composite shear wall against conventional RC shear wall is taken with non-parallel force system in building. analysis of G+20 story steel building with SPSW and CSW is carry out using ETABS for different Zone. After that check for different parameter like base shear, story drift, story displacement. After check different parameter, compare that parameter for composite shear wall against conventional RC shear wall. Composite shear walls are modeled as equivalent frame element and analysed using a modelling software.*

Key Words: **Steel Plate Shear Wall, Composite Shear Wall, Story Displacement, Story Stiffness, Story Drift.**

1. INTRODUCTION

Steel-concrete composite beams and columns have been widely used in many structures as their construction is economical and faster. Shear walls are also an integral part of modern high-rise buildings to resist lateral loads. A shear wall is a structural panel. It resist lateral forces which can acting on it. Lateral forces are those that are parallel to the plane of the wall, and are typically wind and seismic loads. In simple terms, lateral forces could push over parallel structural panels of a building were it not for perpendicular shear walls keeping them upright.

When a structural member experiences failure by shear, two parts of it are pushed in different directions, for example, when a piece of paper is cut by scissors. Shear walls are particularly important in large, or high-rise building, or buildings in areas of high wind and seismic activity. Shear walls are typically constructed from materials such as concrete or masonry. Shear forces can also be resisted by steel braced frame which can be very effective at resolving lateral forces but may be more expensive

Conventional walls are used in buildings to resist the lateral load induced during earthquakes. Conventional Shear walls generally have rectangular cross section with the high concentration of vertical reinforcement at the boundary elements. The use of conventional shear wall in multistoried Structures is sometimes Restricted because of the more number of reinforcement bar provided at the boundary region. Later, Steel-Plate type shear walls Suggested as a Conventional shear walls. Thin plate walls contribute to Reduction of the Structure weight with Good stiffness, higher ductility and easy rapid construction.

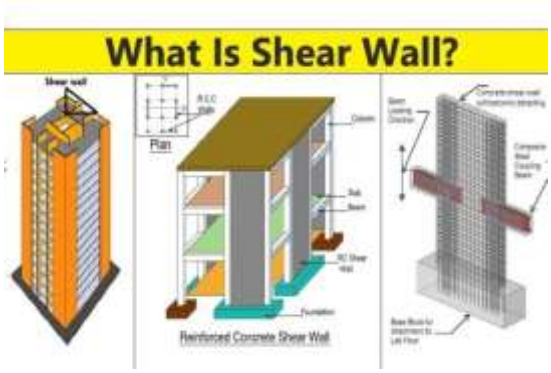

Fig -1: Location of shear wall in building

1.1 Composite Shear Wall

Composite steel concrete elements made by steel and concrete are used in worldwide almost as soon as the two materials became available for structural engineers, taking into account the two main advantages of these materials, good compression strength of concrete and higher tension strength of steel. A composite element which can be used together with perimeter frames in obtaining dual systems is the composite wall obtained from encasing steel shapes in the reinforced concrete wall. Composite walls are reinforced concrete walls with additional steel shapes or plates, being subjected to combined vertical and horizontal loads. Walls with additional shapes referred as composite steel- concrete shear walls, contain one or more encased steel shapes, usually located at the ends of the wall.

Shear walls are used in buildings to resist the lateral load induced during earthquakes. Conventional Shear walls generally have rectangular cross section with the high concentration of vertical reinforcement at the boundary elements. The use of conventional reinforced concrete shear wall in multistoried buildings is sometimes limited because of the high concentration of reinforcement provided at the boundary element. Later, steel plate shear walls proposed as a promising alternative of concrete walls. Thin plate walls contribute to weight reduction of the structures with greater stiffness, higher ductility and enable rapid construction.

Composite steel-concrete shear wall with encased vertical steel sections provide good alternative. The composite shear walls is consist a steel plate shear wall with reinforced concrete walls attached to one side or both sides of the steel

plate using mechanical connectors such as shear studs or bolts. In the AISC Seismic Provisions (AISC, 1997) these systems are denoted as "Composite Steel Plate Shear Walls, (C-SPW). The composite shear walls have been used in buildings in recent years although not as frequently as the other lateral load resisting systems. Composite shear walls offer the advantages like flexural stiffening, strengthening of compression elements, improved deformability, increased floor area, fire protection, easy repairs and economy. A lot of studies have been reported on the seismic behavior of the RC shear walls. However, limited studies are available for the seismic behavior of such composite shear walls and their performance

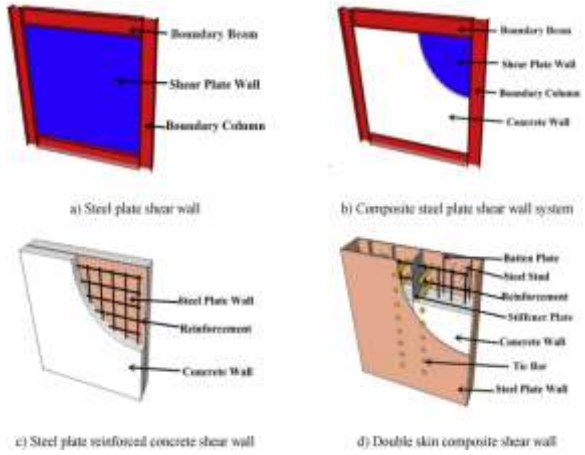

Fig -2: Type of Composite Shear walls

1.2 Types of Shear walls used in Structure:

There are mainly three types of shear wall used in structure:

1. Conventional shear wall
2. Steel plate shear wall
3. Composite shear wall

2. MODELLING

To study the behavior of Conventional and Composite Shear wall Building under lateral load in Zone 5 is considered. Response spectrum method is used in the ETAB analysis process.

Structure considered in this analysis is used to be a public building with importance factor taken as 1.0. Bay size has taken as 5 meter in both the direction. Building size in plan is 25 m x 25 m. Typical height of the floor is taken as 3.2 m.

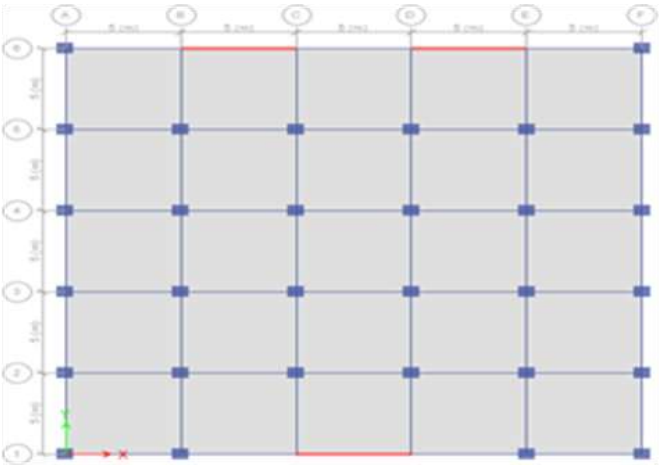

Fig -3: Plan of Building with Non-parallel Force System

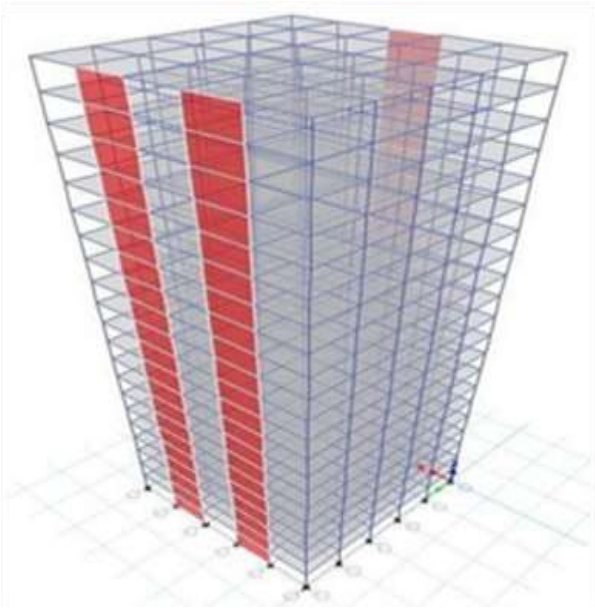

Fig -4: 3D Model of building with Non-Parallel Force System

3. RESULT AND DISCUSSION

With different type of Indian standard section using as a boundary element in shear wall storey shear increasing hardly 6% to 8%. Increasing of Storey Shear is Depend on Type of Section Which is used in the Shear wall. In Tubular and Angle Section Increasing of Storey Shear is 8% and 2% respectively. This increment of Storey Shear is Depend on per meter Weight and Type of Indian Standard section.

Result- Comparison of Displacement

Here, displacement of g+20 multi-storey building is compared for conventional and composite shear wall.

A. Displacement

Storey displacement depends on the lateral stiffness of the structure.

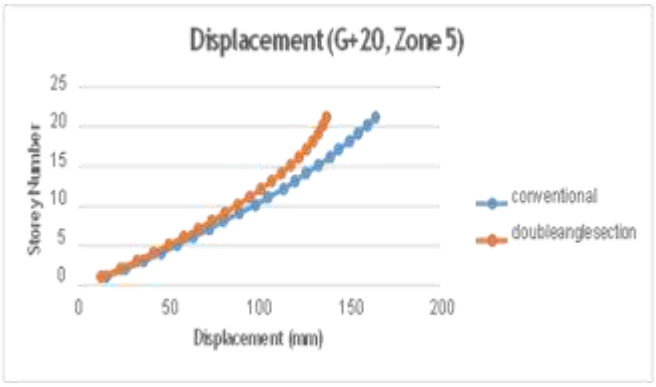

Fig -5: Storey Displacement comparison in Zone5 for G+20 building (Conventional Vs. Double Angle Section Wall)

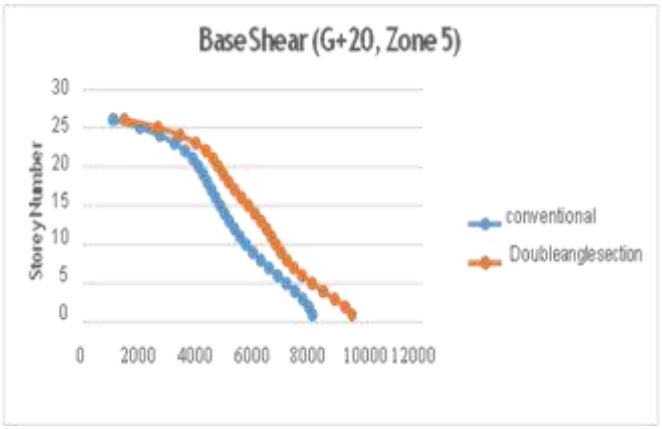

Fig -6: Storey Shear comparison in Zone 5 for G+20 building (Conventional Vs. Double Angle section)

4. CONCLUSIONS

1. On the bases of Analytical results that has been derived that as compare to the conventional reinforced concrete shear wall, composite shear wall gives better results in terms of resistance and ductility.

2. As shown in graph value of storey shear is increase in building with Composite Shear wall compare to building with R.C shear wall. Weight of Composite wall is more than the R.C shear wall beams so the storey shear is increase.

3. Weight of Composite Shear wall is increase due to more thickness than conventional shear wall and also due to different Indian slandered section at Boundary region.

4. Displacement of building with Composite Shear wall in particular zone is shown. From result displacement in Composite shear wall is less as compare to conventional shear wall.

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