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PERFORMANCE ANALYSIS OF CORRUGATED STEEL PLATE SHEAR WALL WITH VISCOUS DAMPER IN A BUILDING

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Abstract - *Steel plate shear walls(SPSW) are an innovative lateral load resisting system capable of effectively bracing a building against wind and earthquake forces. The system consists of steel plate connected to the surrounding beams and columns. Among these SPSW corrugates steel plate shear wall(CoSPSW)construction is relatively new, innovative and efficient lateral force resisting construction. This system has great advantages compared to other similar systems such as reinforced shear walls and steel braces. This study is an investigation of comparison of normal shear wall, vertical corrugated steel plate shear wall and horizontal corrugates steel plate shear wall. And also analyse the performance of vertical corrugated steel plate shear wall in a building.*

***Key Words*: Steel plate shear wall, Corrugated steel plate shear wall, Viscous damper**

1. INTRODUCTION

Steel plate shear walls (SPSW) are an innovative lateral load resisting system capable of effectively bracing a building against both wind and earthquake forces. The system consists of steel plates connected to the surrounding beams and columns. Corrugated steel plate shear wall (CoSPSW), which consists of a steel boundary frame and a corrugated steel wall panel with the corrugation in the horizontal or vertical direction, is a new type of lateral load-resisting system in the family of steel plate shear walls. Compared with the unstiffened special plate shear walls(SPSW),CoSPSW would have greater elastic buckling capacity and more resistance to the gravity loads transferred to the wall panel or neatly avoid them , depending on the corrugation direction. Viscous dampers are hydraulic devices that dissipate the kinetic energy of seismic events and cushion the impact between structures. They are versatile and can be designed to allow free movement as well as controlled damping of a structure to protect from wind load, thermal motion or seismic events

1.1 Objectives

The main objectives of this study is to analyse the behaviour of normal steel plate shear wall, vertical corrugated steel plate shear wall and horizontal corrugated steel plate shear wall. And also anlyse the effect of normal steel plate shear wall and vertical corrugated steel plate shear wall in a building. To obtain the performance of vertical corrugated steel plate shear wall with viscous damper in a building.

2. MODELLING AND ANALYSIS

In this study three comparitive study and one analysis can be done. The first two comparative study was done by using the software ANSYS Workbench and other one comparative study and one analysis was done by using the software ETABS 2015.

M20 grade of concrete and Fe 415 grade of Steel are used for all slabs and beams of the building whereas M20 is used for slab with same grade of Steel. Fe 415 grade steel is used for steel plate shear wall. Elastic materialproperties of these materials are taken as per IS 456-2000. For the Steel rebar with stress and modulus of elasticity is taken as per IS 456-2000. For steel plate shear wall design IS 800:2007 is used. The different structural elements considered are I-beam,I-columns, slabs and shear wall with variable sections are provided..

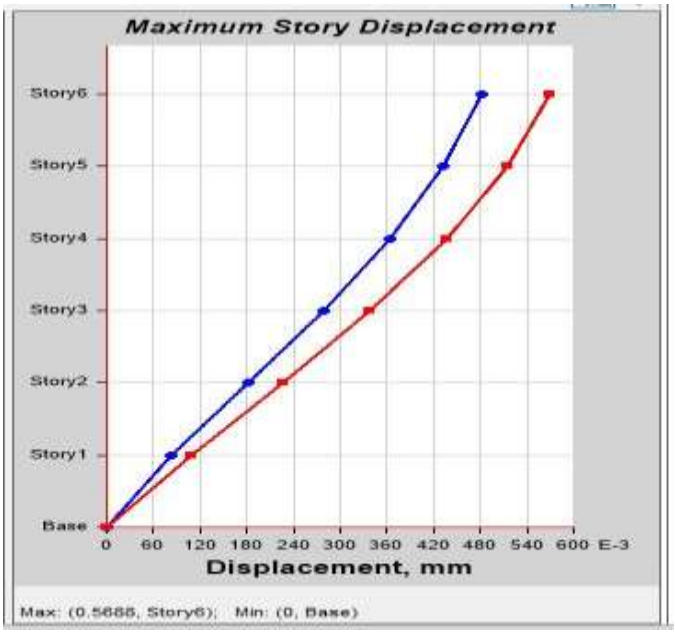

Fig -1: Displacement of building with steel plate shear wall.

For the analysis of vertical corrugated steel plate shear wall with viscous damper in a building, The ETABS viscous damper element is a uniaxial damping device. The damper elements are modeled in ETABS by assigning a panel zone with a non-linear link property to the structure. The link properties use the uniaxial damper property. On proving damper on vertical corrugated steel plate shear wall also reduces the deformation and base shear.

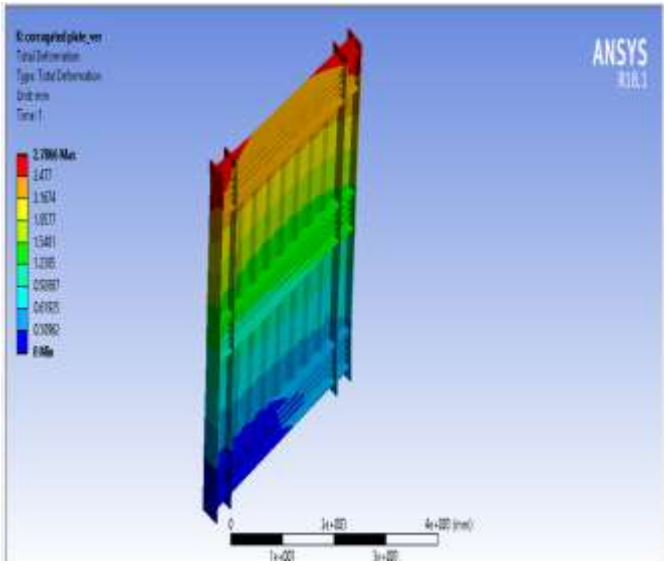

Fig-2:Equivalent deformation of vertical corrugated steel plate shear wall**.**

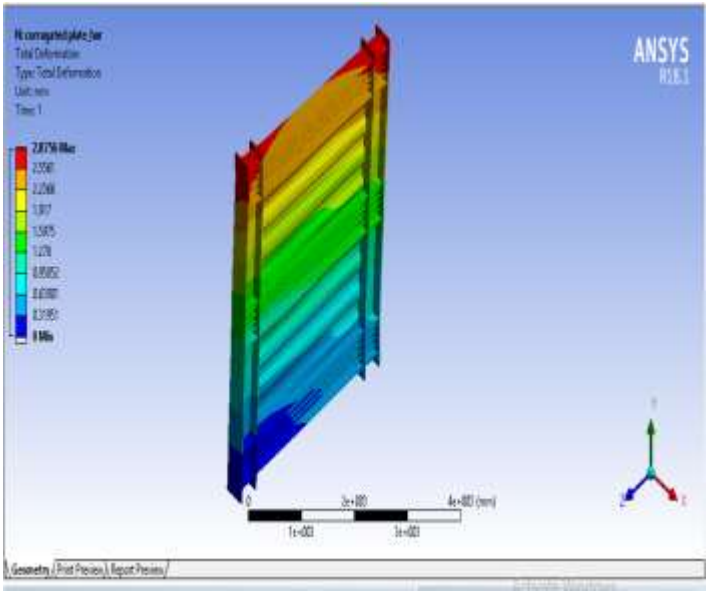

Fig-3:Equivalent deformation of horizontal corrugated steel plate shear wall.

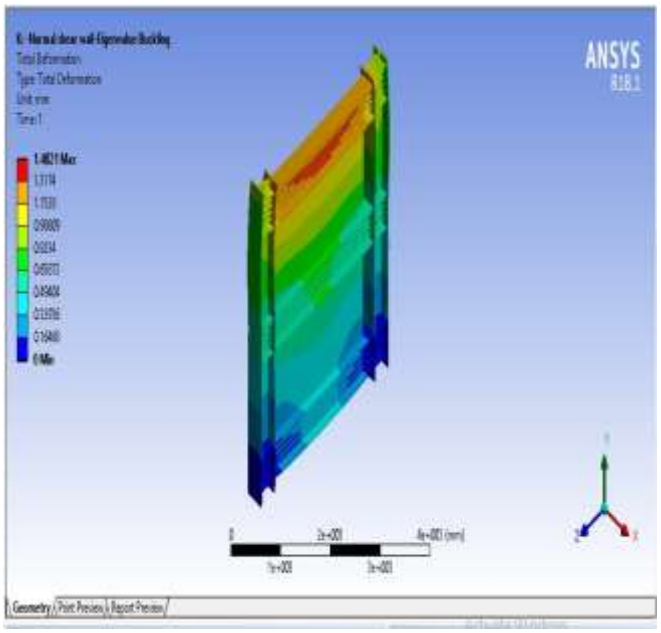

Fig-4:Equivalent deformation of steel plate shear wall from eigen value buckling analysis.

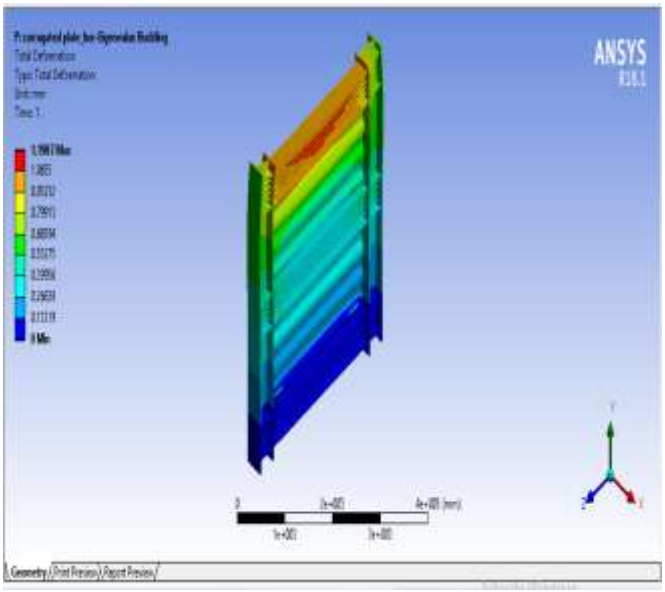

Fig-5: Equivalent deformation of horizontal corrugated steel plate shear wall from eigen value buckling analysis.

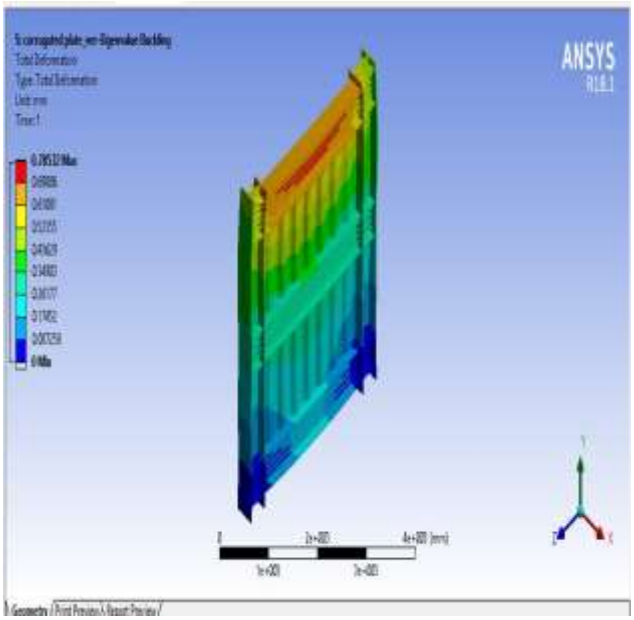

Fig-6: Equivalent deformations of vertical corrugated steel plate shear wall from eigen value buckling analysis.

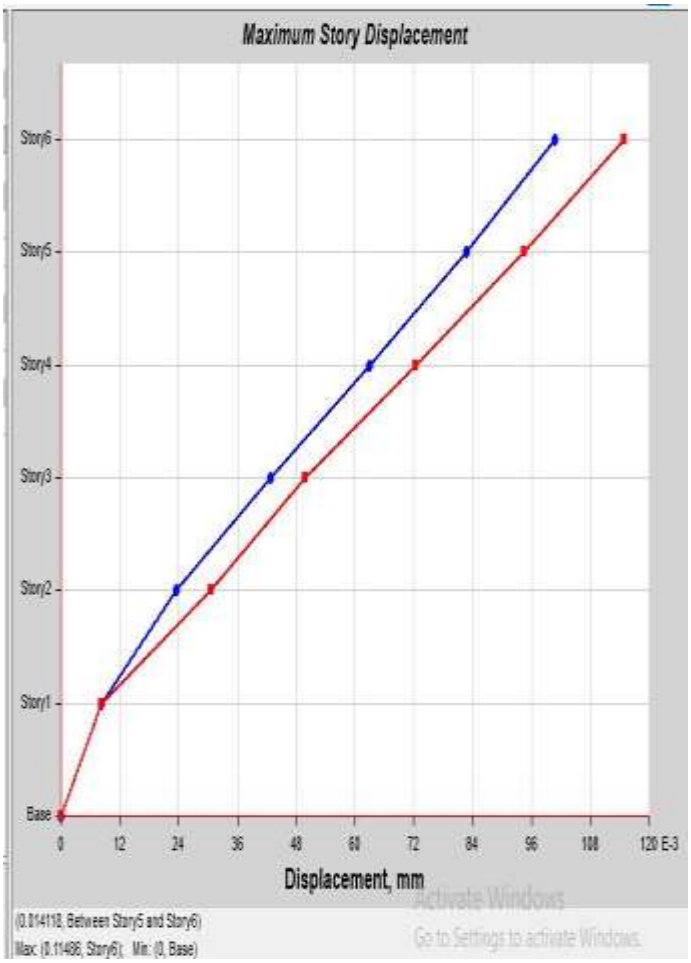

Fig-7:Deformation of building with damper.

3. CONCLUSION

Steel plate shear wall (SPSW) is an effective and economical lateral load resisting system against both wind and earthquake forces. Corrugated steel plate shear wall(CoSPSW) construction is relatively new, innovative and efficient lateral force resisting construction. On single frame analysis the vertical corrugated steel plate shear wall shows least deformations as compared to normal steel plate shear wall and horizontal corrugated steel plate shear wall. As the the analysis of steel plate shear wall and vertical corrugated steel plate shear wall in a building the vertical corrugated steel plate shear wall shows least deformation and base shear. On proving damper on vertical corrugated steel plate shear wall also reduces the deformation and base shear.

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