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Analysis of Steel Plate Shear Wall System Using Finite Element Analysis: A Review

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Abstract: ***The shear walls are lateral load resisting system used in high rise buildings located in earthquake prone zone. The current research reviews various researches conducted in improving shear behaviour of high rise building using shear walls. These researches are conducted using both experimental and numerical techniques. The analytical equation evaluating deformation and shear stress on shear wall is also presented.***
Keywords: Shear wall, stability

I. INTRODUCTION

Shear walls have been long used as lateral load resisting systems. The main function of steel plate shear wall is to resist horizontal story shear and overturning moment due to lateral loads. Steel plate shear walls (SPSW) can be used as lateral load resisting system for buildings. A typical SPSW (Fig.1) consists of stiff horizontal and vertical boundary elements (HBE and VBE) and infill plates.[1] Recent researches have demonstrated that steel plate shear walls, SPSWs, can act as effective and economic seismic load resisting systems in the high risk zones. SPSWs have high elastic stiffness, large displacement ductility, and stable hysteretic behavior and high energy dissipating capacity.[2] There are two types of SPSW system,(1) Standard system used sole lateral load resisting system and pin type beam to column connection.(2) Dual system is a part of a lateral load resisting system and installed in a moment resisting frame. Force are resisted by frame and SPSW.

II. LITERATURE REVIEW

P.PChandurkar [3]conducted a detailed study to find a solution for a barbecue area in a multi-storey building with the help of four different models. Model buildings using ETAB Nonlinear software v 9.5.0.After analyzing the ten-story earthquake structure in zone II, zone III, zoneIV and zoneV key parameters such as lateral removal, story drift and total total cost required of the lower floors found on both. cases by changing the column with the shear wall and the conclusion was drawn that the short-cut wall in the corner (model 4) is economical compared to other models. It was noted that the barbershop wall is economical and efficient in high-rise buildings and the provision of barbecue walls in adequate areas greatly reduces migration due to earthquakes. If the size of the shear wall is large, a large amount of horizontal force is taken by the shear wall

Varsha R. Harneanalysed [4] is a six-story building under earthquake in zone II using STAAD Pro and seismic calculation using the seismic coefficient method (IS 1893 Part II). Four different cases were analyzed including a barbed-wire building, an L-shaped bar-shaped structure, a bar-shaped bar near the surrounding area, and a bar-shaped bar-shaped structure. The lateral deviation of the construction column by the shear wall near the boundary is reduced compared to other types of shear walls.

Anshuman S.et al. [5] expandable and elasto-plastic analysis was performed using STAAD Pro and SAP V 10.0.5 (2000) on a 15-story building located in earthquake zone IV with calculated bending time and floor erosion in both cases. The shear strength and bending time were greatly reduced after providing the shear wall. It was found that the performance point of the inelastic analysis was small and within the scope of the extension so the results obtained using the expandable analysis are sufficient.

Drs. B. Kameswari et.al [6] studied the drift and inter storey drift of a very high-rise structure of different shear wall panels and compared it to that of an empty frame. Considered configurations (1) Standard haircuts (2) Other haircuts (3) Diagonal layout of haircuts (4) Zigzag layout of haircuts (5) Influence of lifting walls. The horizontal layout of the barber wall has been found to be better than other suspensions as it enhances the strength and durability of the structure by reducing lateral erosion and erosion of the inter storey than other types of walls and works best in earthquake-prone areas.

Qiuhong ZHAO et al [7] studied a combination of traditional barbershops and new barbershops. The solid concrete wall is in direct contact with the boundary steel frame while in the new system there is a gap in the middle.

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He performed cyclic tests on both systems and both showed high gravitational and inelastic behavior and both were able to withstand more than 17 cycles of inelastic shear shifts and achieve an intermediate frequency of over 0.05. Shear wall system the new compound was found to be more ductile than the traditional integrated shear wall but the strength and durability of the traditional system were found to be higher. By introducing a gap in the new system, the damage to the concrete wall under larger cycles was significantly less than the damage to the concrete wall in the traditional system.

UgaleAshish B. and RautHarshlata R [8] performed analysis of the steel plate shear wall structure of the G + 6 building in the seismic zone III using STAAD Pro and compared it to the Building frame without the shear wall. The structure with the wall of the steel shear plate showed very slight deviation, shear strength and bending moment and total stiffness was found to increase. It was found that Steel plate shear walls take up less space than RCC Shear wall.

Shahadin.Zaregairizi [9] investigated using shear wall and infill to improve the seismic performance of existing buildings. When a vertical analysis was performed to compare the efficiency of both methods it was noted that concrete fillings show greater strength than single brick but brick filling received greater displacement than concrete filling. Therefore, when used in combination, their side effects will diminish.

Men Jinje et al [10] proposed the planned construction of the RC shear wall structures after conducting a research based on the method of conceptual design. A 30-story building with a RC shear wall and a rectangular structure was considered. research was carried out on shear wall building plans and parameters such as lateral strength, slope rate between floors, seismic response capacity, rate of rotation time and translation time were calculated and it was concluded that shear wall arrangements have an impact on material and concrete use. the use and utilization of the metal increases with the increase of the aspect ratio of the structure.

Chun Ni et al [11] studied the operation of a barbershop with a diagonal sheathing of wood by examining 16 scale shear walls and obtaining the results of holder holder, direct load and width of logs in the shear volume of the plane. The shear strength of the aircraft for double-decked wood shavings was found to be 2 - 3 times higher than that of barbecue with a single diagonal rabbit.

T. Sonos et al [12] proposed the use of interlocking sloping bars in a joint region to improve earthquake resistance of reinforced external concrete column joints.

Ravi Kumar et al [13] conducted extensive research to determine the shear wall solution in a multi-storey building based on its behavior and elasticity and elasto - plastic. He analyzed a 10-storey building, 40m high to deal with earthquakes using ETABS. He concluded that shear walls are one of the most efficient structures

NatalinoGattesco et al [14] conducted a comparative study of the provision of code on particleboard shafts and single window openings. From the experiments it was found that there was a very small difference in shear volume, swelling and scattering power between the perforated and solid walls of equal size and there was a significant increase in the shear volume on the two-pinned panels.

Wen - I Liao et al [15] performed a four-dimensional wall cutter, two barbecue walls under a moving table inspection and two barbecue walls under loaded peripheral cycle. The steel rods were given 45 degrees to the horizontal closest to the applied pressure area .The powerful loading on the two shaving walls caused by the shake table was processed and the response times for acceleration and acceleration and hot loops were introduced. Moving power loops were also provided on the shaving walls under the rotation of the rotating load and it was concluded that with the placement of the steel rods the pressure applied to the high earthquake performance was achieved.

A.B. Karnale et al [16] analyzed the different configurations of the 6-dimensional wall (low height) and 14storey) using ETABs software. Comparisons were made between the results observed due to the height of the building and it was found that the shear wall works better in high-rise buildings than in low-rise buildings.

III. CONCLUSION

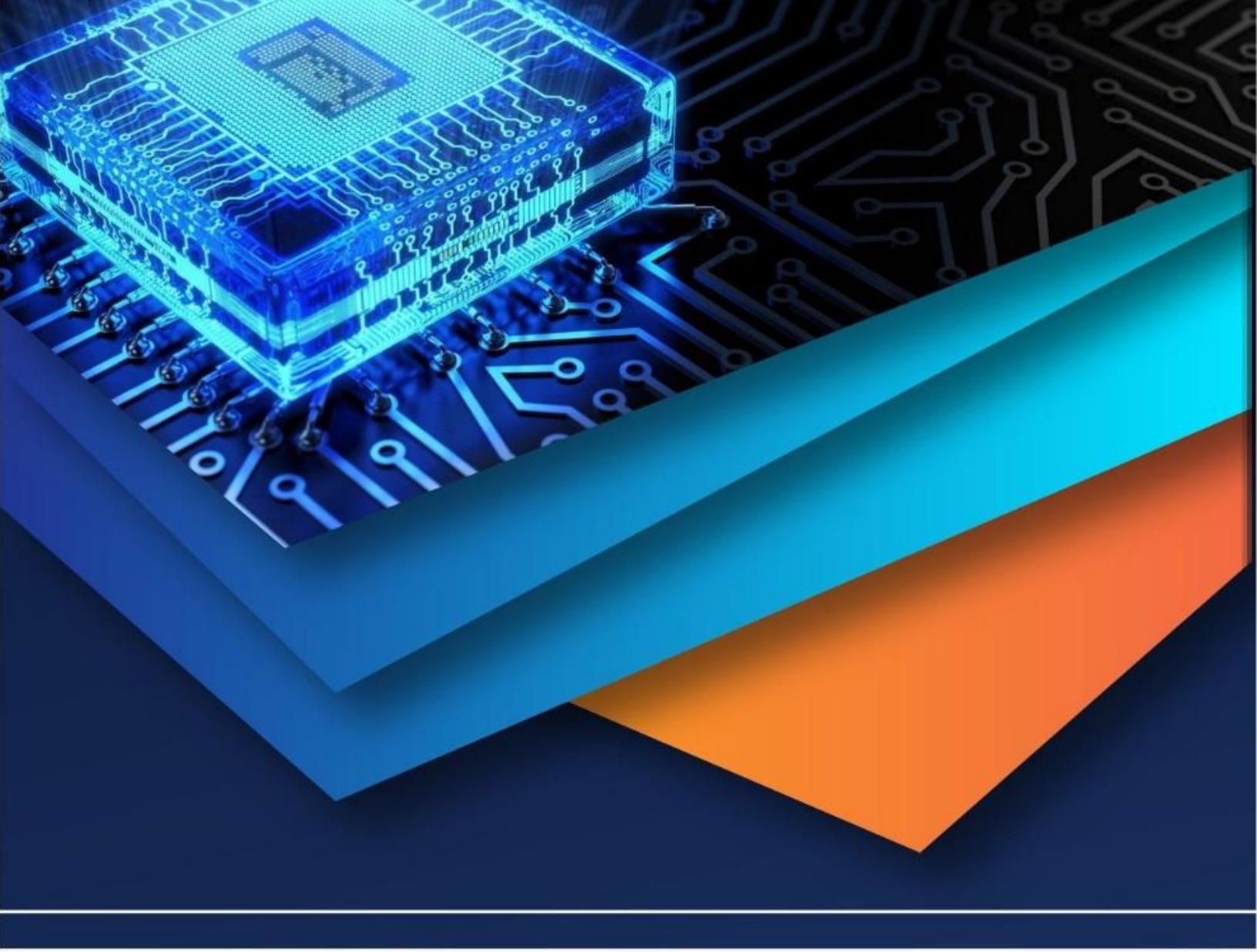
The shear wall acts as lateral load resisting member and is used in high rise buildings. From various researches it is evident that steel plate shear wall is better than RCC shear wall and occupies lesser space also. From the research findings it is evident that shear capacities of shear walls with double diagonal lumber has higher strength than that of shear walls with single diagonal lumber sheathing. The shear wall arrangement in zigzag arrangement has higher strength than parallel arrangement.

REFERENCES

[1] FariborzNateghi and ErfanAlaviFariborz Nateghi1 and ErfanAlavi 2The 14 the World Conference on Earthquake Engineering, October 12-17, 2008, Beijing, China.

[2] Ricky Chana, FarisAlbermanib and S. Kitipornchai Stiffness and Strength of Perforated Steel Plate Shear Wallthe Twelfth East Asia-Pacific Conference on Structural Engineering And Construction.
[3] P.P Chandurkar, DR. P.S. Pajgade, "Seismic analysis of RCC building with and without shear wall" IJMER, Vol.3, Issue 3, may- june 2013,pp- 1805 - 1810,2013
[4] Varsha. R. Harne "Comparative study of strength of RC Shear wall at different location on multistoried Residential building", International Journal of civil Engineering Research. ISSN 2278-3652 Volume5,Number 4(2014)pp 391-400
[5] Anshuman.S, DipenduBhunia,BhavinRamjiyani,"Solution of shear wall location in multistoreybuilding",International Journal of Civil and Structural Engineering , Volume 2, No 2,2011.
[6] Dr. B.Kameswari , Dr. G Elangovan ,P. Sivabala, G. Vaisakh, "Dynamic Response of High rise Structures under the Influence of discrete staggered shear wall", IJEST,2011
[7] Qiuhong ZHAO, AbolhassanAstaneh -ASL ," Cyclic Behaviour of traditional and innovative composite shear walls" 13th World Conference on Earthquake Engineering.
[8] UgaleAshish B. and RautHarshlata R," Effect of steel plate shear wall on behavior of structure" International Journal of civil Engineering Research. ISSN 2278-3652 Volume5, Number 3(2014)pp 295-300.
[9] Shahabodin. Zaregairizi,"Comparative investigation on using shear wall and infill to improve seismic performance of existing buildings", 14th World Conference on Earthquake Engineering.
[10] Men Jinjie,ShiQingxuan,HeZhijian,"Optimal Design of Tall Residential Building with Shear wall and with Rectangular layout" International Journal of High Rise Buildings Volume 3 Number4.
[11] Chun Ni ErolKaracabeyli, Performance of Shear Walls with Diagonal or Transverse Lumber Sheathing, Journal of Structural Engineering 14. Mark Fintel, Performance.
[12] Tsonos AG, Tegos IA, PenelisGGr. “Seismic resistance of type 2 exterior beam-column joints reinforced with inclined bars, ACI structuraljournal, 89,. 3-12,1992.
[13] A. Ravi Kumar K. Sundar Kumar "Analysis and Design of Shear Wall for an Earthquake Resistant Building using ETABS"International Journal for Innovative Research in Science & Technology, Volume 4 , Issue 5, October 2017
[14] NatalinoGatteso, Allen Dudine, Rita Franceschinis, “Experimental investigation on the seismic behaviour of timber shear walls with practicle boards”. World conference on Timber Engineering, Auckland (2012).
[15] Wen - I Liao , JianxiaZhong ,C.C.Lin,Y.L.Mo,Chin- Hsiung " Experimental studies of high seismic performance shear walls" 13th World Conference on Earthquake Engineering Vancouver, B.C., Canada August 1-6, 2004 Paper No. 501
[16] A.B. Karnale and Dr. D. N. Shinde, Comparative Seismic Analysis of High Rise and Low Rise RCC Building with Shear Wall, International Journal of Innovative Research in Science, Engineering and Technology, September 2015.

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