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A Review on effect of positioning of RCC shear walls of different shapes on seismic performance of building resting on sloping ground using STAAD-Pro

M.Tech Scholar Ayush Kumar Agrawal, Prof.Nitesh Kushwaha
Department of Civil Engineering
MIT&S, Bhopal,India

Abstract- **Reinforced concrete (RC) buildings often have vertical plate-like RC walls called Shear Walls in addition to slabs, beams and columns. These walls generally start at foundation level and are continuous throughout the building height. Their thickness can be as low as 150mm, or as high as 400mm in high rise buildings. Shear walls are usually provided along both length and width of buildings. Shear walls are like vertically-oriented wide beams that carry earthquake loads downwards to the foundation.Properly designed and detailed buildings with shear walls have shown very good performance in past earthquakes. Shear walls provide large strength and stiffness to buildings in the direction of their orientation, which significantly reduces lateral sway of the building and thereby reduces damage to structure and its contents. Shear walls in high seismic regions require special detailing. However, in past earthquakes, even buildings with sufficient amount of walls that were not specially detailed for seismic performance (but had enough welldistributed reinforcement) were saved from collapse. Shear wall buildings are a popular choice in many earthquake prone countries, like Chile, New Zealand and USA.**

Keywords: RCC, shear wall, building, earthquake loads.

Keywords- **islanding detection; distributed generation; integrated power distribution network; non-detection zone; islanding detection method.**

I. INTRODUCTION

Shear wall is a rigid vertical diaphragm capable of transferring lateral forces from exterior walls, floors, and roofs to the ground foundation in a direction parallel to their planes. Whenshear walls are designed and constructed properly, they will have the strength and stiffness to resist the horizontal forces.

Shear walls are especially important in high-rise buildings subject to lateral wind and seismic forces. Lateral loads can develop high stresses, produce sway movement or cause vibration. Therefore, it is very important for the structure to have sufficient strength against vertical loads together with adequate stiffness to resist lateral forces. Shear walls are constructed to counter the effects of lateral load acting on a structure.

In residential construction, shear walls are straight external walls that typically form a box which provides all of the lateral support for the building. When shear walls are designed and constructed properly, they will have the strength and stiffness to resist the horizontal forces. Shear walls are one of the most effective building elements in resisting lateral forces during earthquake. By constructing shear walls damages due to effect of lateral forces due to earthquake and high winds can be minimized. Shear walls construction will provide larger stiffness to the buildings thereby reducing the damage to structure and its contents.
The ideal position of shear wall will be a symmetric position. This will help to avoid torsion as the first mode and brings in a lot of lateral resistance. Generally, multistorey high rise buildings suffer higher lateral displacement in the presence of wind and earthquake loads. It becomes important to reduce such lateral movement within the acceptable limits. Larger the displacement, higher the induced moments, shear and discomfort. The Indian Standard code IS 1893 (Part 1): 2002 Criteria for Earthquake resistant design of structures suggests the permissible lateral displacement to be not more than 0.004 times the height of the building.

II. ROLE OF SHEAR WALL

Shear walls are easy to construct, because reinforcement detailing of walls is relatively straight-forward and therefore easily implemented at site. Shear walls are efficient, both in terms of construction cost and effectiveness in minimizing earthquake damage in structural and non-structural elements (like glass windows and building contents). In a high rise building, a shear wall shall continue from basement to a desired level up to which the effect of lateral forces due to design earthquake load reaches its permissible limit. An ordinary brick wall

also acts as a shear wall as it prevents a building frame fromdistortion, but in modern high rise buildings brickwork is very little instead we use other material like glass wood or partition wall hence there is extra provision for shear wall. It is generally provided in lift pit and outer walls or in any portion inside a frame where there is very little opening for doors and windows as a shear wall should be continuous from top to bottom.

To avoid the failure, a diaphragm on roof take earthquake load and convert it as vertical load and transfer to shear wall. So the earthquake load is beared by shear walls. So we provide reinforcement in shear wall to bear that load. These are load bearing walls. Normal brick walls are not load bearing walls.

III. LITERATURE REVIEW

Bahrami et al. (2020) presented nonlinear analysis of composite shear walls (CSWs) with a gap between reinforced concrete wall and steel frame is investigated under cyclic loading by the use of the finite element method (FEM) software ABAQUS. For the purpose of the verification, an experimental test is modelled and comparison of its obtained result with that of the experimental test demonstrates an inconsiderable difference between them; therefore, the reasonable accuracy of the modelling is revealed.

Kucukgoncu et al. (2020) presented the seismic behaviours of the exterior shear walls used to strengthen intact and damaged frames were investigated experimentally. For this purpose, reinforced concrete shear walls were positioned in parallel to the exterior sides of the damaged and the intact three-dimensional frames. Both frames were tested under cyclic loads. After the investigation, the hysteresis curve, strength envelope, stiffness degradation, and the energy dissipation capacity were obtained to reveal the seismic behaviour of the strengthening exterior shear walls. In addition to these, the differences in behaviours of the shear walls applied to damaged and intact frames were identified.

Xian et al. (2020) presented to facilitate construction and on-site quality testing, a new type of panel joint using cast-in-place connecting beams was developed and studied. The proposed connecting beams consist of overlapping vertical U-shaped steel bars stretching out of the wall and the footing, longitudinal prestressed steel strands, L-shaped steels and infilled high-strength grout.

Poul et al. (2020) presented the usage of Shear walls at different locations in a G + 20 multi storied residential building and to study the nature of the structure exposed to earthquake by adopting Response Spectrum Analysis. The Multi storied building with G + 20 is analyzed for storey drift, base shear, maximum allowable displacement and torsional irregularity. The analysis and modeling for the whole structure is done by using prominent FEM integrated software named Etabs 2015 in all the seismic zones of India prescribed by IS 1893 (Part-1) −2016.

Saravanan et al. (2020) presented the effect of soft storey configuration in the building and Remedying it by using RC shear wall. Shear walls are structural element members provided in the high Rised Multistorey Building to seismic action during earth quake. They are generally provided in the taller structure to with stand against the total collapse of structure under earth movement. It is most important to determine efficient and ideal location of shear wall.. The linear dynamic analysis (Response spectrum analysis) is adopted for various symmetrical structural models having (G+14) 15 storey high rise building. The results of responses obtained from the models, are in terms of storey drift, lateral displacement, storey shear and bending moment variation are compared with different configurations are tabulated.

Kosare et al. (2019) presented the response of shear walls placed in the buildings subjected to seismic loads and to study best possible location for positioning of shear wall to resist the seismic load efficiently. Shear wall is a structural member designed to counteract the lateral forces acting on a structure. These walls are more important in seismically active zones when shear forces on the structure increases due to earthquakes. Shear walls have more strength, stiffness and resist in-plane loads that are applied along its height. Buildings with shear walls which are properly designed and detailed have shown very good performance in past earthquakes.

Sungaria et al. (2019) presented the optimum structural configuration of a multi-story building by changing the shear wall locations radically. Four different cases of shear wall position for G+10 storey building with keeping zero eccentricity between mass center and hardness center have been analyzed and designed as a frame system by computer application software ETABS. The framed structure is subjected to lateral and gravity loading in accordance with IS provision and the results are analyzed to determine the optimum positioning of the Shear wall as Shear wall systems are one of the most feasible and hence commonly used lateral load resisting mechanism employed in high rise buildings.

Gupta et al. (2019) presented the performance of various geometries of shear wall namely: C-shaped, L-shaped, I-shaped, Rectangular-shaped. In this study G+6, G+16 and G+25 storeyed building is modelled and analysed for lateral displacement, storey stiffness, storey drift using ETABS-2016 software. The analysis of the building is done by using equivalent static method and the results obtained from this method are plotted graphically.

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