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Performance of Reinforced Concrete Wall with Opening Using Analytical Model

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Abstract : Earthquake is one of the most catastrophic events, which makes enormous harm to properties and human lives. As a piece of a safe building configuration, reinforced concrete walls are given in structures to decrease horizontal displacements under seismic load. Shear walls are additionally used to oppose the horizontal loads that might be incited by the impact of wind. Reinforced concrete walls in residential buildings might have openings that are required for windows in outside walls or for doors in inside walls or different states of openings due to architectural purposes. The size, position, and area of openings may fluctuate from an engineering perspective. Shear walls can encounter harm around corners of entryways and windows because of advancement of stress concentration under the impact of vertical or horizontal loads. The openings cause a diminishing in shear wall capacity. It might have an unfavorable impact on the stiffness of reinforced concrete wall and on the seismic reaction of structures. Finite Element Method using software package 'ANSYS ver. 12' becomes an essential approach in analyzing civil engineering problems numerically. Now we can make various models with different parameters in short time by using ANSYS instead of doing it experimentally, which consumes a lot of time and money. Finite element modeling approach has been conducted to study the effect of opening shape, size and position in RC wall with different thicknesses under axial and lateral static loads. The proposed finite element approach has been verified with experimental programme conducted by the researchers and validated by their variables. A very good correlation has been observed between the model and experimental results including load capacity, failure mode, and lateral displacement. A parametric study is applied to investigate the effect of opening size, shape, position on different reinforced concrete wall thicknesses. The results may be useful for improving existing design models and to be applied in practice, as it satisfies both the architectural and the structural requirements.

Keywords : Ansys, concrete walls, openings, out of plane behavior, seismic, shear wall
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