EFFECTS OF AXIAL LOAD ON THE BEHAVIOR OF STRUCTURAL WALLS WITH OPENING USING FINITE ELEMENT ANALYSIS

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ABSTRACT

Structural walls are used frequently in buildings as the main components to resist lateral loads. RC walls exhibit a relatively high strength and stiffness when exposed to lateral pressure. In fact, walls are designed such that they can endure significant inelastic deformation while sustaining strength RC walls usually contain openings and punches that cause discontinuities. Openings are needed to meet the architectural requirements. Additionally, axial loads vary in walls depending on the function of the structure and its gravity load. Analyses and design of walls with openings under higher axial load are complicated. Experimental and simulation data show that to simulate the response of walls with openings it is essential to use continuum-type models that accounts for the interaction of bending and shear response mechanisms and shear transfer mechanisms.

This study utilizes nonlinear finite element analysis to simulate the response of RC walls with openings under low to high axial load ratios subjected to lateral loading to investigate the effects of axial load on walls with opening. The finite element model is developed and calibrated using an extended data set that includes planar and nonplanar experimental wall specimens with and without openings. Analyses results are linked with experimental data to improve recommendations for design procedures for RC walls.

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