

INFLUENCE OF THE ASPECT RATIO ON SEISMIC PERFORMANCE OF ADOBE BUILDINGS

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ABSTRACT

Adobe buildings usually are characterized by having walls with small and uniform slenderness ratios; nevertheless, there are some historical adobe buildings with existing large walls, where the influence of the aspect ratio becomes quite important in the seismic behavior. This article analyzes the seismic behavior of adobe buildings with larger walls in one axis than the other orthogonal axis. Also, the influence of the aspect ratio of the wall height respects on the wall length is analyzed by varying the wall length. Finite element models were elaborated using the concrete damaged plasticity model to study the influence of the aspect ratio on the seismic behavior of adobe buildings. Four models of buildings having different aspect ratios, varying in length from eight meters to fifty-two meters have been considered. Nonlinear time history analyses with three Peruvian seismic records are conducted. Regarding material, environmental vibration tests were carried out on a historic building, then the properties of the adobe were estimated using a numerical model of the historic building. The results were compared with the experimental data obtained by different authors. From the non-linear simulations, the cracking patterns of the four buildings were identified. The decrease in seismic capacity with the aspect ratio is analyzed. Finally, the influence of higher order modes on the response of the structure is analyzed and a simplified methodology for the detection of seismic damage using the spectral modal analysis is proposed.

Keywords: Aspect Ratio, Adobe building, Structural behavior, Seismic assessment

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