

Simplified method for the lateral strengthening of adobe walls in Andean churches

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ABSTRACT

The evaluation of the seismic safety of Andean colonial churches is of high importance as those buildings represent part of the identity of the society and are historical emblems for the communities. Most of these buildings are composed of adobe masonry systems with flexible (or nonexistent) diaphragms which generates potential out-of-plane failure mechanisms. In the last decades, different methodologies using advanced numerical analyses have been developed that allow to evaluate with great accuracy the structural behavior of historical constructions at the expense of an arduous computational effort to provide accurate results. In the present paper, a simplified tool is proposed for the design of walls lateral reinforcement using buttresses. The tool uses kinematic limit analysis and provides an adequate buttress design according to the configuration of the wall and seismicity of the area where the church is located.

The results of the application of the methodology showed that the developed tool provides fast and accurate alternatives for the seismic strengthening of Andean adobe churches. The use of buttresses as structural reinforcement control the development of out-of-plane failure mechanisms, and provide lateral stability and resistance to the structure.

Key words: Kinematic limit analysis, buttress design, Andean colonial churches