kerpic'13 – New Generation Earthen Architecture: Learning from Heritage
International Conference
Istanbul Aydın University, Turkey, 11-15 September 2013

Seismic Simulation Tests to Validate a Dual Technique for Repairing Adobe Historical Buildings Damaged by Earthquakes

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ABSTRACT

For more than ten years researchers at the Catholic University of Peru (PUCP) have been studying the possibility of repairing damaged historical adobe walls through the injection of mud-based grouts in the wall cracks. Although initial test results showed that grout injections based on the original soil were effective in restoring most of the strength of adobe walls subjected to diagonal compression and lateral cyclic loads, this repair procedure was not adequate in recovering the original structural properties of a full-scale adobe structural model tested on the PUCP's shaking table under simulated seismic loads. The main conclusion was therefore that, in order to ensure structural stability during future earthquakes, mud injection must be complemented with techniques which use minimal and reversible reinforcements made of materials compatible with adobe. This paper presents preliminary results obtained during a test program in which a previously damaged full-scale adobe model was repaired via mud injection combined with an external mesh made with nylon strings. The adobe model and the shaking sequence were identical to those used in previous tests. The behavior of the repaired model during a sequence of unidirectional earthquake motions of increasing intensity was considered to be excellent, as the external reinforcements worked to maintain structural integrity and stability, and prevented the partial collapse of wall portions that had separated during the shaking. It is expected that these preliminary but promising results will be a firm step towards the development of adequate reinforcement systems for earthen constructions –both historical monuments and people's dwellings- located in seismic areas of the world.

Keywords: Adobe, historical, earthquake, reinforcement, repair**.**