

SEISMIC REINFORCEMENT OF ADOBE HOUSES USING EXTERNAL POLYMER MESH

M. Blondet¹, D. Torrealva², J. Vargas³, J. Velasquez⁴, and N. Tarque⁵

ABSTRACT

Earthquakes occurring in developing countries demonstrate again and again that adobe houses are highly vulnerable and that millions of people who live in these houses are at great risk. This underscores the urgency to find simple and economic solutions to reinforce adobe houses.

This paper summarizes a research project developed to explore the use of plastic meshes as reinforcement for adobe structures. Four full-scale adobe house modules were tested on the shaking table of the Catholic University of Peru. The first module was unreinforced and represented a typical adobe dwelling. Its behavior under strong shaking was quite poor, with brittle failure of the walls. The second module was overreinforced by completely wrapping all walls with a polymer mesh. During the dynamic tests the module moved practically as a rigid body, with little damage on the adobe walls and a sliding failure of the walls on their concrete foundation. The third module had a more sparse reinforcement consisting of bands of a lighter polymer mesh, placed at selected locations. Its seismic behavior was quite good, because although the walls were damaged, the reinforcement bands were able to hold the pieces together and collapse was therefore averted. The fourth module was reinforced with a plastic mesh used as protection during road works, which is far cheaper than the polymer mesh used for the previous two modules.

The seismic simulation test results show that it is possible to use plastic mesh as a convenient seismic reinforcement of adobe houses. The next steps will be to optimize the reinforcement design and to develop guidelines for the retrofit of existing houses and the design and construction of new seismic resistant adobe houses.

¹ Professor of Civil Engineering, Department of Engineering, Catholic University of Peru

² Professor of Civil Engineering, Department of Engineering, Catholic University of Peru

³ Professor of Civil Engineering, Department of Engineering, Catholic University of Peru

⁴ Lecturer, Department of Engineering, Catholic University of Peru

⁵ Lecturer, Department of Engineering, Catholic University of Peru