

Seismic Out-of-Plane Retrofit of URM Walls

Using Timber Strong-Backs

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Abstract:

The susceptibility of unreinforced masonry (URM) walls to collapse under seismic loading has been repeatedly observed and documented across a multitude of earthquakes worldwide. The out-of-plane failure of walls is commonly the critical failure mechanism for URM structures and poses a significant risk to life. Despite various seismic improvement techniques being applied previously there is a significant lack of experimentally validated simple and cost-effective solutions that also consider the impact on the building tenants, building aesthetics, and heritage fabric of the structure. Such retrofits are needed to facilitate the preservation of the URM building stock and to ensure the safety of those who work and live in and around these structures. The retrofit technique studied herein consisted of connecting vertical timber elements (strong-backs), to the interior surface of a building's walls using mechanical anchors. Non-structural timber framing commonly exists to support the inner wall lining of URM buildings and its use, as a part of the retrofit, results in a cost effective and low impact solution. The out-of-plane behavior of as-built and retrofitted masonry walls was investigated by conducting full scale semi-static cyclic airbag tests. The outcomes of this testing regime include (i) quantification of improvement in seismic capacity and out-of-plane displacement capacity and (ii) comparison of the performance using different strong-back configurations.

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