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AN INVESTIGATION OF THE WEAK LINKS IN THE SEISMIC LOAD PATH OF UNREINFORCED MASONRY BUILDINGS

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ABSTRACT

A large proportion of domestic and low rise building stock in Australia is of unreinforced masonry (URM) construction and has not been designed to resist earthquake loads. Previous researchers have identified that under current Australian design conditions the two predominant weak links in the seismic load path for URM buildings are the shear connections between the walls and floor or roof and out-of-plane wall flexure.

This report documents the experimental and analytical research undertaken at The University of Adelaide aimed at providing the fundamental tools required to successfully avoid the identified brittle 'weak link' failures in the design of new and the assessment of existing URM buildings. This was achieved for the DPC connections through an extensive series of shaking table tests, which provided realistic data on the dynamic capacity of these connections. For the out-of-plane failure of walls in the upper stories of URM buildings, an extensive series of shaking table tests was used to develop a better understanding of the physical processes governing the collapse behaviour. Following this realistic analytical models were developed to provide accurate and reliable assessment of actual wall capacities. Since these were necessarily complex, a further refinement was undertaken to produce a more simplistic but rational analysis procedure for practical applications based on the 'Displacement-based' failure criteria.