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Seismic Performance of Infilled RC Frames: from Lab Specimens to Actual Buildings

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Abstract

Assessing the seismic performance of infilled RC frames is a challenging task due to the variety and complexity of the possible failure mechanisms which can develop as a result of the interaction of the masonry infill with the bounding frame. This presentation will address this intricate issue experimentally, numerically, and analytically. The experiments involve quasi-static tests of single-bay infilled frames, shake-table tests of a large-scale, three-story, two-bay frame, as well the nonlinear dynamic tests of an actual building in El Centro, California. The experimental data have been used to validate a nonlinear finite element modelling approach which combines the smeared and discrete-crack approaches to capture the frame-infill interaction, the shear and flexural failure of RC members, and the mixed-mode fracture of mortar joints. The validated models have been used in parametric studies to evaluate the effect of material properties, design details, and geometric configurations. These studies have led to the development of a simplified analytical method for practicing engineers, as well as a novel modelling approach for the simulation of the nonlinear behaviour of actual multi-story buildings. The proposed modelling approaches have been validated with data from laboratory tests, as well the building in El Centro, and damaged structures instrumented following the 2015 Nepal earthquakes.

Short Bio

Andreas Stavridis is currently an Associate Professor at the University at Buffalo. He earned his Diploma from the National Technical University of Athens, and his MS and PhD from UC, San Diego. His current research focuses on assessing and improving the seismic performance of existing reinforced concrete and masonry structures, as well as improving the design guidelines for new construction. He tests large-scale structures in the laboratory and actual structures in the field, and develops and validates detailed and simplified numerical and analytical tools to simulate the performance of these structures under extrreme and ordinary loads. He is a member of technical committees within ASCE, ACI, EERI, and The Masonry Society and has contributed in the development of the assessment provisions in ASCE 41 and FEMA P-2018.

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