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FROM PLASTIC HINGE TO SHELL MODELS: RECOMMENDATIONS FOR RC WALL MODELS

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ABSTRACT

The severe damage and collapse of many reinforced concrete (RC) wall buildings in the recent earthquakes of Chile (2010) and New Zealand (2011) have shown that RC walls did not perform as well as expected based on the design calculations required by the modern codes of both countries. This observation suggests an unsatisfactory ability to accurately predict indicators of damage, in particular local engineering demand parameters such as material strains, which are central to the application of performance-based earthquake engineering. Potential modelling improvements will necessarily build on a thorough assessment of the limitations of current state-of-the-practice simulation approaches. This work aims to compare the response variability given by a spectrum of numerical tools commonly used by researchers and specialized practitioners, namely: plastic hinge analyses, distributed plasticity models, and detailed finite element simulations. It is shown that a multi-level assessment—wherein both the global and local levels are jointly addressed during the response analysis—is fundamental to define the dependability of the results. The latter is controlled by the attainment of material strain limits and the occurrence of numerical pathologies. Finally, the influence of shear deformations is analysed according to the same methodological framework.

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