URM Infill in-Plane and out-of-Plane Interaction in Damage Evaluation of RC Frames

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Abstract : Unreinforced masonry (URM) infill walls are widely used throughout the world, also in seismic prone regions, as partitions in reinforced concrete building frames. Even if they do not represent structural elements, they can dramatically affect both strength and stiffness of RC structures by acting as a diagonal strut, modifying shear and displacements distribution along the building height, with uncertain consequences on structural safety. In the last decades, many refined models have been developed to describe infill walls effect on frame structural behaviour, but generally restricted to in-plane actions. Only very recently some new approaches were implemented to consider in-plane/out-of-plane interaction of URM infill walls in progressive collapse simulations. In the present work, a particularly promising macro-model was adopted for the progressive collapse analysis of infilled RC frames. The model allows to consider the bi-directional interaction in terms of displacement and strength capacity for URM infills, and to remove the infill contribution when the URM wall is supposed to fail during the analysis process. The model was calibrated on experimental data regarding two different URM panels thickness, modelling with particular care the post-critic softening branch. A frame specimen set representing the most common Italian structures was built considering two main normative approaches: a traditional design philosophy, corresponding to structures erected between 50's-80's basically designed to support vertical loads, and a seismic design philosophy, corresponding to current criteria that take into account horizontal actions. Non-Linear Static analyses were carried out on the specimen set and some preliminary evaluations were drawn in terms of different performance exhibited by the RC frame when the contemporary effect of the out-of-plane damage is considered for the URM infill.

Keywords : infill Panels macromodels, in plane-out of plane interaction, RC frames, URM infills

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