A Planar-Frame Model for Nonlinear Response of Low-Rise URM Buildings

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Abstract:

This paper makes a contribution to the seismic evaluation of low-rise URM existing buildings nonlinear response through the development of a simpli- fied analytical model. Currently, almost all guidelines and prestandards provide methodologies for the determination of URM components nonlinear response. However, only a little insight is provided into the coupling between piers and spandrels, and the impact of their behavior on the overall building response. In this context, the proposed model is a planar frame with openings that can be decomposed into parallel individual walls. Each individual wall is made of pier elements and a portion of spandrels with or without rigid offsets. The model performs in a way that smeared cracks and distributed plasticity approaches are adopted. The mechanical model undergoes flexural as well as shear deformations with variable axial load. Specific biaxial failure criteria are implemented for masonry components in terms of both bending moments–axial forces and shear forces–axial forces. The present formulation uses a simple Pushover analysis based on the event-to-event strategy. A simplified algorithm for systems with interaction effect is presented through an equilibrium correction at each iteration. The model was validated against an experimental test in order to generate capacity curves with damage identification. An analysis of sensitivity was conducted to demonstrate the ability of the model to capture all features of URM struc- tures. For the development of capacity curves, the obtained results from the proposed model show good agreement with experiment and numerical results from ETABS software. The model has proven its capability to satisfactorily predict the maximum strength in the range of nine percent. The study concludes that the present model could be used as an alternative for seismic analysis in the *Prestandard for the Rehabilitation of Existing Structures* FEMA 356.

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