Evaluation of Modeling Scheme for Unreinforced Masonry Under Seismic Loading

Laura Redmond[1], Andreas Stavridis[2], and Reginald DesRoches[3]

Abstract:

Unreinforced masonry (URM) buildings are vulnerable to earthquakes as their performance during seismic events around the world indicates. Predicting the seismic performance of URM structures can be challenging, as their behavior is nonlinear and their failure can involve a number of failure mechanisms. A finite element (FE) modeling scheme for unreinforced masonry utilizing smeared crack and discrete crack elements is presented in this paper. The capabilities of the model are assessed using data from four, previously tested, unreinforced masonry walls with different aspect ratios and imposed vertical loads. The comparison of experimental and analytical results shows good agreement in terms of the cracking patterns, but also in terms of the initial stiffness, peak strength, and post-peak regime for the four walls. The validated models are used in a parametric study conducted to examine the sensitivity of the model to the input material parameters. For the parameters which significantly influence the behavior of the models, tests to determine their values are proposed or a strategy to assign values which would produce conservative, yet accurate, results is discussed.

DOI: 10.70803/001c.138227

[1] TMS Member, Ph.D. Candidate, School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA, laura.redmond@gatech.edu

[2] TMS Member, Assistant Professor, Dept. of Civil, Structural, and Environmental Engineering, State University of New York at Buffalo, Buffalo, NY, astavrid@buffalo.edu

[3] Karen and John Huff School Chair and Professor, School. of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA, reginald.desroches@ce.gatech.edu