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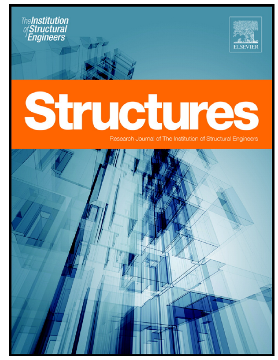

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PREDICTED VERSUS EXPERIMENTAL OUT-OF-PLANE FORCE-DISPLACEMENT BEHAVIOUR OF UNREINFORCED MASONRY WALLS

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ABSTRACT

Recognising that in situ conditions for URM walls rarely reflect the idealised conditions assumed in analytical predictive models, nineteen unreinforced masonry (URM) walls in six different buildings were physically tested in situ to establish their out-of-plane (OOP) force-displacement behaviour, and the measured results were compared to the forecasted results obtained from established predictive methods. The considered wall configurations represented a variety of geometries, boundary conditions, pre-test damage states, and material properties. The average ratio and associated coefficient of variation (CV) of predicted strengths to measured strengths were determined to be 0.84 (CV 0.56) and 0.93 (CV 0.25) for the "unbounded" and "bounded" wall conditions, respectively, where the latter group represents walls used to infill frames. Use of the existing predictive methods resulted in over-prediction of the measured displacement parameters, which was likely due to most of the predictive methods being based on historical walls tests in one-way spanning conditions and without rigid bounding restraints capable of effectuating arching action in the wall, in contrast to many of the wall test conditions employed in the current study.

KEYWORDS: *unreinforced masonry (URM), earthquakes, out-of-plane, infill walls, airbag proof-testing, analytical methods*

1 INTRODUCTION

1.1 Background

Unreinforced masonry (URM) building construction is prominent in the form of loadbearing, partition, and infill walls. Significant out-of-plane (OOP) damage and collapse of URM walls often occurs during moderate and severe earthquake shaking, and such walls are often identified in structural engineering assessments as being amongst the elements most vulnerable to earthquakes (e.g., Moon et al. 2014). Predictive analytical models that apply to particular wall configurations and to various performance parameters have been developed over the past few decades (Sorrentino et al. 2017). However, the accuracy of such methods relative to in situ proof testing

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