Experimental Testing of Out-Of-Plane Capacity of Semi-Interlocking Masonry Infill Panels

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Abstract:

The Masonry Research Group at The University of Newcastle has developed a new masonry system aimed to improve the seismic performance of framed structures by increasing frictional energy dissipation in the masonry panel during cyclic in-plane displacements. This new system is called Semi-Interlocking Masonry (SIM) infill panels. Rows of unbonded SIM units in these panels are capable of sliding in-plane of the panel but prevented against relative sliding in the out-of-plane direction. As a result, SIM infill panels have reduced in-plane stiffness, but increased frictional energy dissipation capacity and displacement ductility compared to traditional masonry panels.

Although the main structural effect of infill panels is in-plane with the frame, it is known that panels are vulnerable to out-of-plane collapse during earthquakes, especially panels which have sustained some in-plane cracking. The main objective of this study is to investigate experimentally and compare the out-of-plane load and displacement capacity of different SIM panels. This paper is based on the results of three full-scale SIM panel tests with different bricks, dimensions, and other construction details, which all have been damaged during previous in-plane tests. In the first test, the panel was dry stacked and semi interlocking was realised on both bed and head joints. The other two tests had only bed joint interlocking (topological and mechanical). A uniformly distributed lateral load was applied by an airbag in the first test and for the other tests the lateral load was applied by a hydraulic jack. The loading of panels was operated in displacement control and lateral displacement increased in regular increments. The results show that the SIM panels with interlocking on bed joints only had significant out-of-plane load and displacement capacity. Although the panel with both bed and head joint interlocking displayed smaller displacement by comparison, it was still able to displace to 180 mm (1.5 x panel thickness).

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