Damage correlation in flexural walls with a displacement approach method for boundary detailing

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Abstract

The 2010 Chile earthquake of magnitude Mw 8.8 showed the importance of using correct detailing at the wall boundary. Most design methodologies for wall boundary special detailing have been compared to testing, but at the building level have not been validated with evidence from actual earthquakes. For this purpose, two buildings that exhibited flexural wall damage were studied. An additional building that was not damaged, standing less than 100 m from one of the damaged buildings, was also included. The buildings were analyzed using linear-elastic models, as is common practice among designers, and the walls were analyzed in terms of compressive strain demands resulting from roof displacement. The strain demands were determined using a concentrated plasticity model, as well as a model that included the elastic and plastic components of deformation. In this last case, the elastic component was determined by pushing the building model with a pattern consistent with the first mode of lateral vibration until the first wall reached its moment capacity, including a reduced stiffness in the walls and slabs. Results indicate that the damaged walls were expected to reach moment capacity earlier than the other walls, obtaining compressive strain values greater than 0.003. Thus, the walls damaged during the 2010 earthquake correlated well with the estimations of compressive strains, since these were also the first walls to reach maximum capacity. On the other hand, the undamaged building presented generally lower levels of compressive strain values in the walls than those of the damaged buildings.

Palabras clave

Palabras clave de autor: Concrete crushing; Detailing; Shear wall; Displacement; Model; Flexure
KeyWords Plus: CONCRETE STRUCTURAL WALLS; SEISMIC DESIGN; EFFECTIVE STIFFNESS; CYCLIC RESPONSE; RC WALLS; ELEMENT

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