ABSTRACT

This report describes an investigation of seismic performance of a ribbed slab system constructed with an innovative re-usable sheet metal formwork system. Experimental results from quasi-static cyclic lateral load tests on half-scale reinforced concrete interior beam-slab-column subassemblages are presented. The test specimen was detailed according to the Australian code (AS 3600) without any special provision for seismicity. This specimen was tested up to a drift ratio of 4.0 %. Some reinforcement detailing problems were identified from the first test. The damaged specimen was then rectified using Carbon Fibre Reinforced Polymer (CFRPs), considering detailing deficiencies identified in the first test. The repaired test specimen was tested under a lateral cyclic load as per the original test arrangement up to a drift level of 4%. The performance of the repaired specimen showed significant improvement with respect to the level of damage and strength degradation. The results of the rectified specimen indicate that the use of CFRPs may offer a viable retrofit/repair strategy in the case of damaged structures, where this damage may be significant.

Two finite element analysis models were created and results of the first test were used to calibrate the FE model. The second FE model was used to obtain detail information about stress and strain behaviour of various components of the beam-column subassemblage and to check the overall performance before carrying out expensive lab tests. It was concluded that finite element modelling predictions were reliable and could be used to obtain more information compared to conventional type laboratory tests.

Time-history analyses show that the revised detailing is suitable to withstand very large earthquakes without significant structural damage.