BEHAVIOR OF WELDED PLATE AND FRP COMPOSITE CONNECTIONS IN PRECAST CONCRETE PANELS UNDER SIMULATED SEISMIC LOADS

WELDED CONNECTION
FRP COMPOSITE CONNECTION
Research on loose-plate welded connections of precast concrete panels has been limited. As a result, design values for typical connections are being used in practice without support from testing. Quasi-static cyclic tests were performed on ten wall panels with typical loose-plate connectors, to investigate their performance under simulated seismic loads. The wall panels were loaded in the in-plane direction with lateral cyclic loads; this resulted in tension-shear and compression-shear forces being applied to the loose-plate connectors. The experience gained from the tests revealed that hollow-core precast concrete panels could be used in seismic regions, provided that the connections between them can be improved. To this end, a new welded connection is proposed. The project also included testing of fiber reinforced polymer (FRP) connections intended as a seismic retrofit of the welded connections. The FRP composite connection was applied on one side of the concrete panels. The experimental behavior of the FRP composite connection is linear up to failure, which is sudden and brittle. However, one could design for this type of linear behavior in seismic retrofit by following the FEMA 273 Guidelines for a force-controlled action. The capacity of the FRP composite connection could be increased significantly, compared to a currently used welded connection, by providing a longer vertical height of FRP composite. The results of this experimental study can be extended to FRP composite connections between horizontal panels in floor and roof diaphragms.