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Relocation of Plastic Hinge of Interior Beam Column Connections with Intermediate Bars in Reinforced Concrete and T-Section Steel Inserts in Precast Concrete Frames

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Abstract : Failure of typical seismic frames has been found by plastic hinge occurring on beams section near column faces. Past researches shown that the seismic capacity of the frames can be enhanced if the plastic hinges of the beams are shifted away from the column faces. This paper presents detailing of reinforcements in the interior beam–column connections aiming to relocate the plastic hinge of reinforced concrete and precast concrete frames. Four specimens were tested under quasi-static cyclic load including two monolithic specimens and two precast specimens. For one monolithic specimen, typical seismic reinforcement was provided and considered as a reference specimen named M1. The other reinforced concrete frame M2 contained additional intermediate steel in the connection area compared with the specimen M1. For the precast specimens, embedded T-section steels in joint were provided, with and without diagonal bars in the connection area for specimen P1 and P2, respectively. The test results indicated the ductile failure with beam flexural failure in monolithic specimen M1 and the intermediate steel increased strength and improved joint performance of specimen M2. For the precast specimens, cracks generated at the end of the steel inserts. However, slipping of reinforcing steel lapped in top of the beams was seen before yielding of the main bars leading to the brittle failure. The diagonal bars in precast specimens P2 improved the connection stiffness and the energy dissipation capacity.

Keywords : relocation, plastic hinge, intermediate bar, T-section steel, precast concrete frame
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