E06

Mechanism of Force Transfer of SFRCC Slabs in Beam-to-Column Connections

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1. Introduction

A method using SFRCC to repair seismically damaged composite beam-to-column connection is proposed. Two-phase full-scale member tests consisting of two cruciform connection specimens were tested under horizontal cyclic loading to investigate feasibility and performance of the proposed repair method. The objective of this study is to investigate the mechanism of force transfer of SFRCC slabs in beam-to-column connections.

2. Experimental study

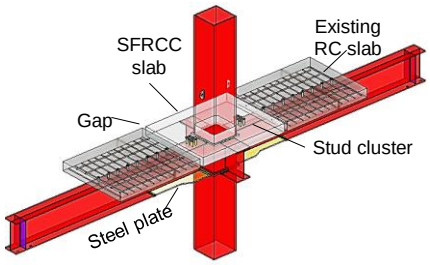

Fig.1 Illustration of proposed repair method

Fig.1 shows the conceptual illustration of the proposed repair method. Widened steel plates are used to replace the fractured or buckled bottom flange, then the SFRCC slab without steel reinforcement is cast to replace the seriously damaged RC slab portion. Headed studs are welded to the top flange and embedded in the SFRCC slab to transfer the force from the top flange. A Gap between the SFRCC slab and the existing RC slab is made to move the plastic hinge away from column face.

Three failure modes, including the tensile failure at the abrupt changed section, the cone-shape break out failure in front of the stud cluster and the split failure propagating from the stud cluster to slab free edge, are assumed as shown in Fig.2. Steel rebars was placed in SFRCC slab to serve as the strain indicator for each critical failure faces as illustrated in Fig.2.

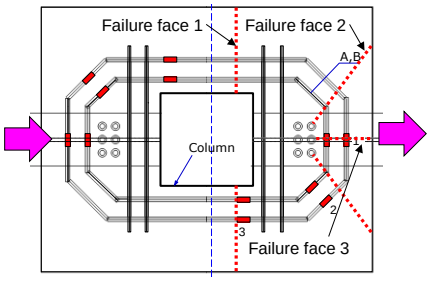

Fig.2 Steel rebar arrangement and possible failure modes

3. Results

Based on the section force equilibrium, the section resisting force on the SFRCC slab was calculated from the strain gauges on the steel beam section. The rebar resisting force at the corresponding section was obtained from the strain gauge installed on rebars. Fig.3 shows the comparison of the rebar resisting force to the total section resisting force. It is notable that the SFRCC material burdened about 90% of the section resisting force. Contribution of steel rebar is substantially small at the other two potential failure locations. It suggests that SFRCC slab without steel reinforcement may be able to resist the force transferred from the top flange. This would make the proposed method very promising.

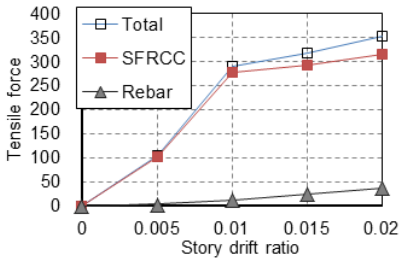

Fig.3 The tensile force acting on failure face 1