

## Experimental Research on Progressive Collapse Resistance of

### Fully Assembled Precast Concrete Frame Sub-structures

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#### Abstract

The progressive collapse resistance performance of reinforced concrete (RC) structures is one of the most critical failure scenarios, which has becoming a great concern for structure engineering community. However, the behavior of the precast concrete (PC) structures especially with dry connections are few researched. In this paper, three half-scale frame sub-structures including a cast-in-situ RC test specimen and two PC test specimens were designed to explore the structural progressive collapse resistance performance under the removal of middle column scenario. The PC specimens were fully assembled by the dowel screw embedded in the bracket, and the strength of the connection zone was enhanced by the U type anchorage rebars arranged at the dowel rod, and the steel plates on the upper surface at beam-end were employed for moment transmission. The difference of the two tested PC specimens lies in the bracket position. The static loading test was conducted on the upper surface of the middle column, and the specimens performance as load-displacement characteristics, ultimate load and deformation capacity were discussed respectively. The tested results revealed that both the compressive arch action (CAA) and the catenary action (CTA) were formed for the RC specimen, while only the CAA action was mainly existed in the PC specimens. The ultimate load capacity of the tested PC specimens was 76% and 81% of the RC specimen at CAA stage respectively, and the ultimate displacement was 72% and 77% correspondingly which leading a lower ductility.

**Keywords:** Fully assembled; Precast concrete structure; Progressive collapse; Dowel screw; Structure performance

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