

## Research on Fracture Models for Shear Joint Using Cementitious Materials and New Joint Systems

The main issues of prize-winning papers are the studies on "Deformation Control", in which further consideration for deformation of structural systems is required. The studies are categorized into three parts. Part 1 is intended to construct mathematical modeling methodology for deformation behaviors of shear key joints based on fracture mechanics. A prototype of new structural systems is presented, and the fracture model is constructed for the deformation behavior of shear key joints. Part 2 is intended to expand the fracture model with introducing the new concept of "Shear Softening" for shear failure of concrete. In order to develop new joint systems, the fracture model for reinforced concrete shear failure is constructed based on the achievement of studies in Part 1. Part 3 is intended to develop new joint systems with cementitious materials, which can be applied to a variety of structural systems. New joint systems using fiber reinforced cementitious composites are created, and the generalized fracture model developed in Part 2 is applied to the evaluation of the fracture behavior of the joint systems. Finally, the usefulness of proposed joint systems and the accuracy of fracture model are clarified by means of a series of structural experiments and numerical analyses.