

Shear Behavior of RC Beams Using Ultra High Strength Fiber Reinforced Concrete Precast Formworks

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Summary

This paper describes the results of an experimental study and nonlinear finite element method (FEM) in order to examine the shear failure mechanism of reinforced concrete (RC) beams using Ultra High Strength Fiber Reinforced Concrete (UFC) precast formworks by considering the effects of using UFC precast formworks, and with and without transverse reinforcement. The experimental results indicated that UFC precast formworks enhanced shear carrying capacity of RC beams. Moreover, the RC beam with the transverse reinforcement in UFC precast formworks can provide the highest shear carrying capacity, which is proven that the transverse reinforcements can work efficiently with UFC precast formworks. In addition, the shear resistance mechanisms and evaluation method were discussed in this paper.

Keywords: ultra high strength fiber reinforced concrete (UFC), shear carrying capacity, shear behavior, precast formwork, seismic resistance, nonlinear finite element method (FEM).

1. Introduction

Since the 1995 Great Hanshin Earthquake, the specification for seismic design has been revised to prevent the shear failure in RC members. Many structures have required a large amount of reinforcing bars and correspondingly, concrete became difficult to be cast. Recently, high-seismic performance RC piers using UFC [1] (developed by Kajima Corporation), which exhibits exceptional mechanical properties (design compressive strength = 180N/mm^2), superior physical

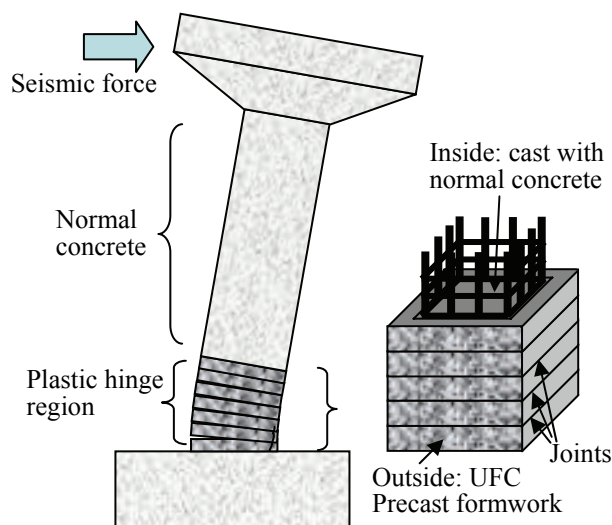


Fig.1: High-seismic performance RC piers using UFC precast formworks [2]

characteristics and unprecedented ductility (flexural strength = $24\text{-}40\text{N/mm}^2$), precast formworks [2] as shown in Fig.1 has been developed and proven to improve the deformation capacity, delaying the crushing of cover concrete and buckling of longitudinal reinforcing bars. This improvement can be succeeded by applying UFC and introducing the joints among UFC precast formworks as crack inducers in order to control the plastic hinge to occur only within the UFC precast formworks region. This structure is not only to improve the seismic performance of bridge pier, but the bridge pier can also be economically constructed comparing to the conventional method, since large cross section of bridge pier in conventional method might be required to obtain the comparable seismic performance. However, the research on the shear behavior of RC members using UFC precast formworks is