Abstract

This paper summarizes the experimental results from a comprehensive research program to study the fundamental stress-strain behavior of damaged concrete repaired by two techniques: increased concrete section and bonding fiber reinforced polymer (FRP). In this work, two types of FRP composite jackets were used, carbon fiber reinforced polymer (CFRP) and glass fiber reinforced polymer, and two types of concretes were used to repair the damaged concrete by increased concrete section: ordinary concrete and ultra high-performance fiber reinforced concrete (UHPFRC). Fifteen circular columns of concrete (110 × 220) cm^3 were initially pre-damaged up to intense cracking, repaired by increased concrete section and by bonding FRP, and tested under uni-axial compression by loading up the damage. The impact of different design parameters, including plain concrete strength, types of composites, and type of concrete used for increasing section, was considered in this study. The strength enhancement and ductility improvement of specimens are discussed. A simple model is presented to predict the compressive strength of repaired damaged concrete columns. A significant strength and an increase in ductility were achieved, particularly when the columns were repaired by increasing section with UHPFRC and by bonding CFRP. These preliminary tests indicate that the use of UHPFRC is an effective technique for rehabilitating damaged concrete columns, highly competitive with the repaired concrete by wrapping specimens with FRP composite jackets