

Experimental investigation of the stress-strain behavior of FRP confined concrete prisms

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(Received February 21, 2013, Revised July 27, 2014, Accepted August 1, 2014)

Abstract. One of the main applications of FRP composites is confining concrete columns. Hence identifying the cyclic and monotonic stress-strain behavior of confined concrete columns and the parameters influencing this behavior is inevitable. Two significant parameters affecting the stress-strain behavior are aspect ratio and corner radius. The present study aims to scrutinize the effects of corner radius and aspect ratio on different aspects of stress-strain behavior of FRP confined concrete specimens (rectangular, square and circular). Hence 44 FRP confined concrete specimens were tested and the results of the tests were investigated. The findings indicated that for specimens with different aspect ratios, the relationship between the ultimate stress and the corner radius is linear and the variations of the ultimate stress versus the corner radius decreases as a result of an increase in aspect ratio. It was also observed that increase of the corner radius results in increase of the compressive strength and ultimate axial strain and increase of the aspect ratio causes an increase of the ultimate axial strain but a decrease of the compressive strength. Investigation of the ultimate condition showed that the FRP hoop rupture strain is smaller in comparison with the one obtained from the tensile coupon test and also the ultimate axial strain and confined concrete strength are smaller when a prism is under monotonic loading. Other important results of this study were, an increase in the axial strain during the early stage of unloading paths and increase of the confining effect of FRP jacket with the increase and decrease of the corner radius and aspect ratio respectively, a decrease in the slope of reloading branches with cycle repetitions and the independence of this trend from the variations of the aspect ratio and corner radius and also quadric relationship between the number of each cycle and the plastic strain of the same cycle as well as the independence of this relationship from the aspect ratio and corner radius.

Keywords: FRP confined concrete; corner radius; aspect ratio; cyclic and monotonic loadings; stress-strain behavior

1. Introduction

Retrofitting of concrete columns is a subject that has long been of special interest. So far several methods have been utilized to retrofit of the concrete columns. One of the most efficient strategies for enhancing both ultimate strength and ductility of the concrete columns, being used since the 1990s, is FRP confining. Some researchers investigated the stress-strain behavior of FRP

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