Accepted Manuscript

Geopolymer Concrete-Filled FRP Tubes: Behavior of Circular and Square Columns under Axial Compression

Togay Ozbakkaloglu, Senior Lecturer, Tianyu Xie, PhD candidate

PII: S1359-8368(16)30230-X

DOI: 10.1016/j.compositesb.2016.04.013

Reference: JCOMB 4211

To appear in: *Composites Part B*

Received Date: 31 December 2015

Revised Date: 25 February 2016

Accepted Date: 3 April 2016

Please cite this article as: Ozbakkaloglu T, Xie T, Geopolymer Concrete-Filled FRP Tubes: Behavior of Circular and Square Columns under Axial Compression, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.04.013.

Geopolymer Concrete-Filled FRP Tubes: Behavior of Circular and Square Columns under Axial Compression

Togay Ozbakkaloglu[1] and Tianyu Xie[2]

ABSTRACT

This paper presents the results of an experimental study on the axial compressive behavior of concrete-filled fiber-reinforced polymer (FRP) tubes (CFFTs), prepared using either ordinary Portland cement (OPC) concrete (OPCC) or fly ash-based geopolymer concrete (GPC). Thirty-six CFFTs were tested under axial compression. The effects of the type of the concrete and FRP tube material, number of FRP layers used in the FRP tube, and specimen cross-sectional shape were studied. The results suggest that the axial stress–strain behavior of CFFTs is affected by the type of concrete, with GPCFFTs developing a similar strength enhancement ratio to but a lower axial strain enhancement ratio than the companion OPCCFFTs. Owing to the higher shrinkage of the OPCC, OPCCFFTs exhibit a plateau at the transition region of their stress-strain curves, which is not seen in GPCFFTs. At a similar confinement ratio, OPCCFFTs confined with different fibers exhibit comparable strength and strain enhancement ratios, whereas slight differences are seen among GPCFFTs manufactured with different fibers. The strength and strain enhancement coefficients of both OPCC- and GPC-FFTs decrease with an increase in the thickness of FRP tube.

Keywords: Geopolymer concrete (GPC); A. Fibers; B. Plastic deformation; B. Strength; D. Mechanical testing.

[1] (Corresponding author) Senior Lecturer, School of Civil, Environmental and Mining Engineering, University of Adelaide, Australia. Tel : +618 8313 6477; Fax : +618 8313 4359; E-mail: togay.ozbakkaloglu@adelaide.edu.au

[2] PhD candidate, School of Civil, Environmental, and Mining Engineering, University of Adelaide, Australia.