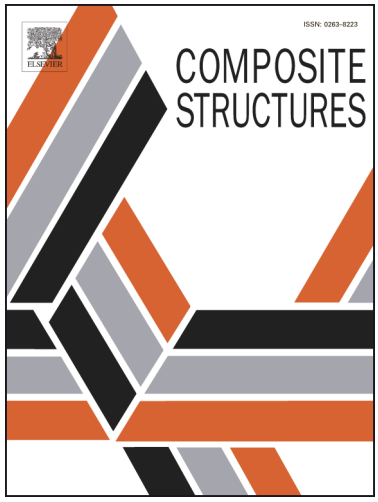

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Seok-Joon Jang, Hyun-Do Yun

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Combined effects of steel fiber and coarse aggregate size on the compressive and flexural toughness of high-strength concrete

Seok-Joon Jang[1] and Hyun-Do Yun[2*]

[1]Graduate Student, Department of Architectural Engineering, Chungnam National University, Daejeon, 305-764, Republic of Korea

[2]Professor, Department of Architectural Engineering, Chungnam National University, Daejeon, 305-764, Republic of Korea

[*]Corresponding Author: (E-mail: wiseroad@cnu.ac.kr, Tel. +82-42-821-5622)

Abstract

This paper investigates the effects of steel fiber content and coarse aggregate size on the mechanical properties of high-strength concrete with a specified compressive strength value of 60 MPa. The paper also explores the correlation between the compressive and flexural toughness of high-strength steel fiber-reinforced concrete (SFRC). For this purpose, twelve high-strength SFRC mixtures with four fiber volume fraction of steel fiber (V_f = 0.5%, 1.0%, 1.5%, and 2.0%) and different aggregate sizes were designed and fabricated. Compressive and flexural tests for each concrete mixture were conducted, and the test results were used to investigate the effects of steel fiber volume fraction and aggregate size on the compressive and flexural toughness of high-strength SFRC prims. The results indicate that the mechanical properties of SFRC are related more closely to volume fraction than to aggregate size. The compressive and flexural toughness ratios of the SFRC significantly improved with an increase in fiber content. Also, equations that are suggested to determine the compressive toughness ratio based on the equivalent flexural strength ratio were used to predict the mechanical properties of the SFRC in this study.

Keywords: Steel fiber, toughness, flexural testing, high-strength concrete