Investigations of Early Age Material Properties of Normal and High Strength Concrete Including Fracture Energy

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Abstract This paper illustrates the experimental investigations results on the material properties of both high strength concrete (HSC-N60) and normal strength concrete (NSC-N32) at early ages. The experiments included compression strength test, splitting tensile strength, modulus of elasticity and fracture energy test by wedge splitting test. The tests were conducted at ages of 18 h, 24 h, 48 h, 72 h, 7, 14 and 28 days. The experimental programs included testing of 126 compressive, tensile strength test and modulus of elasticity cylinders. In addition, wedge splitting specimens size (150 × 150 × 150) mm were tested. It was found that the strength gain rate of HSC was higher than that of NSC at early ages. The results showed that the compressive strength, splitting tensile strength and modulus of elasticity for both NSC and HSC increased with the age of concrete. Accordingly, the fracture energy strengths of both NSC and HSC increased with as the concrete ages.

Keywords Early age concrete · NSC · HSC · Wedge splitting test · Fracture energy of concrete

1 Introduction

The essential variation between normal strength concrete (NSC) and high strength concrete (HSC) refers to their compressive strength which is the ultimate resistance of a concrete specimen to applied pressure. Although there is no exact separation point NSC and HSC, the American Concrete Institute [1, 2] classifies HSC as concrete with a compressive strength greater than 40 MPa.

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