

Effect of Shape and Size of Concrete Specimen and Strength of Concrete Mixture in the Absence and Presence of Fiber

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Abstract : In this study, the effect of shape and size of the concrete specimen on the compressive and splitting tensile strength of the concrete mixtures in the absence and presence of steel fiber was investigated. For this aim, ten different concrete mixtures having w/c ratio of 0.3, 0.4, 0.5, 0.6 and 0.7 with and without fiber were prepared. In the mixtures containing steel fibers having aspect ratio (L/D) of 64 were used by 1% of the total mixture volume. In all concrete mixtures, CEM I 42,5R type Portland cement and crushed Lime-stone aggregates having different aggregate size fractions were used. The combined aggregate was obtained by mixing %40 0-5 mm, %30 5-12 mm and %30 12-22 mm aggregate size fraction. The slump values of concrete mixtures were kept constant as 17 ± 2 cm. To provide the desired slump value, a polycarboxylate ether-based high range water reducing admixture was used. In order to investigate the effect of size and shape of concrete specimen on strength properties 10 cm, 15 cm cubic specimens and 10×20 cm, 15×30 cm cylindrical specimens were prepared for each mixture. The specimens were cured under standard conditions until testing days. The 7- and 28-day compressive and splitting tensile strengths of mixtures were determined. The results obtained from the experimental study showed that the strength ratio between the cylinder and the cube specimens increased with the increase of the strength of the concrete. Regardless of the fiber utilization and specimen shape, strength values of concrete mixtures were increased by decreasing specimen size. However, the mentioned behaviour was not observed for the case that the mixtures having high W/C ratio and containing fiber. The compressive strength of cube specimens containing fiber was less affected by the size of the specimen compared to that of cube specimens containing no fibers.

Keywords : compressive strength, splitting tensile strength, fiber reinforced concrete, size effect, shape effect

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