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An experimental study on optimum usage of GGBS for the compressive strength of concrete

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Abstract

This paper presents a laboratory investigation on optimum level of ground granulated blast-furnace slag (GGBS) on the compressive strength of concrete. GGBS was added according to the partial replacement method in all mixtures. A total of 32 mixtures were prepared in four groups according to their binder content. Eight mixes were prepared as control mixtures with 175, 210, 245 and 280 kg/m³ cement content in order to calculate the Bolomey and Fret coefficients (K_B , K_F). For each group 175, 210, 245 and 280 kg/m³ dosages were determined as initial dosages, which were obtained by removing 30 percent of the cement content of control concretes with 250, 300, 350, and 400 kg/m³ dosages. Test concretes were obtained by adding GGBS to concretes in an amount equivalent to approximately 0%, 15%, 30%, 50%, 70%, 90% and 110% of cement contents of control concretes with 250, 300, 350 and 400 kg/m³ dosages. All

specimens were moist cured for 7, 14, 28, 63, 119, 180 and 365 days before compressive strength testing.

The test results proved that the compressive strength of concrete mixtures containing GGBS increases as the amount of GGBS increase. After an optimum point, at around 55% of the total binder content, the addition of GGBS does not improve the compressive strength. This can be explained by the presence of unreacted GGBS, acting as a filler material in the paste.



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Keywords

Calcium silicate hydrate (C-S-H); Compressive strength; Efficiency; GGBS; Strength development

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