

Effect of Carbon-Free Fly Ash and Ground Granulated Blast-Furnace Slag on Compressive Strength of Mortar under Different Curing Conditions

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Abstract : This study investigates the effect of using carbon-free fly ash (CfFA) and ground granulated blast-furnace slag (GGBFS) on the compressive strength of mortar. The CfFA used in this investigation is high-quality fly ash and the carbon content is 1.0% or less. In this study, three types of blends with a 30% water-binder ratio (w/b) were prepared: control, binary and ternary blends. The Control blend contained only Ordinary Portland Cement (OPC), in binary and ternary blends OPC was partially replaced with CfFA and GGBFS at different substitution rates. Mortar specimens were cured for 1 day, 7 days and 28 days under two curing conditions: steam curing and water curing. The steam cured specimens were exposed to two different pre-curing times (1.5 h and 2.5 h) and one steam curing duration (6 h) at 45 °C. The test results showed that water cured specimens revealed higher compressive strength than steam cured specimens at later ages. An increase in CfFA and GGBFS contents caused a decrease in the compressive strength of mortar. Ternary mixes exhibited better compressive strength than binary mixes containing CfFA with the same replacement ratio of mineral admixtures.

Keywords : carbon-free fly ash, compressive strength, ground granulated blast-furnace slag, steam curing, water curing

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