

Durability of self compacted concrete containing slag in hot climate

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Abstract. This paper aims to investigate the effects of replacing cement with ground granulated blast furnace slag (GGBFS) in self compacting concrete in the fresh and hardened state. The performance of SCC in moderate climate is well investigated but few studies are available on the effect of hot environment. In this paper, the effect of initial water-curing period and curing conditions on the performance of SCC is reported. Cement was substituted by GGBFS by weight at two different levels of substitution (15% and 25%). Concrete specimens were stored either in a standard environment (T=20°C, RH=100%) or in the open air in North Africa during the summer period (T=35 to 40°C; R.H=50 to 60%) after an initial humid curing period of 0, 3, 7 or 28 days. Compressive strength at 28 and 90 days, capillary absorption, sorptivity, water permeability, porosity and chloride ion penetration were investigated. The results show that the viscosity and yield stress are decreased with increasing dosage of GGBFS. The importance of humid curing in hot climates in particular when GGBFS is used is also proved. The substitution of cement by GGBFS improves SCC durability at long term. The best performances were observed in concrete specimens with 25% GGBFS and for 28 days water curing.

Keywords: self-compacting concrete, slag, rheology, hot climate, compressive strength, durability

1. Introduction

Concrete is the most widely used material in construction industry and the knowledge of its behavior in the fresh and hardened state is of great interest. Recent developments in concrete technology led to the development of self-compacting concrete (SCC) that could be made without vibration.

SCC is characterized by its high paste content and hence various cementitious materials such as slag, natural pouzzolana, limestone and metakaolin are added to the mix. The performance of SCC in moderate climate is well investigated (Boukendakdji *et al.* 2009, Belaidi *et al.* 2012, Benabed *et al.* 2012, Boukendakdji *et al.* 2012). Several studies have been conducted on the performance of

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