TEMPERATURE EFFECTS ON PERMEABILITY OF HIGH-PERFORMANCE CONCRETE

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ABSTRACT

This research was carried out to investigate the effects of curing environment temperature on strength and permeability of high-performance concrete (HPC). Two different concrete mixtures were proportioned to have a 28-day compressive strength of 69 MPa (10,000 psi). The first mixture (10P) contained 15% Class C fly ash and the other contained 40% Class C fly ash (10E) by total weight of cementitious materials. Two types of curing, standard moist curing and a Variable Temperature Curing Environment (VTCE) with temperature ranging from 29.4 ± 2.8°C, for 12 hours each day, to 40.6 ± 2.8°C for the remaining 12 hours of each day, were used. For each mixture strength, chloride ion, air and water permeabilities were recorded. Concrete specimens cured in the VTCE produced higher early age strength than moist room cured specimens for both the mixtures. The chloride ion permeability of the 15% fly ash mixture was substantially higher compared to the 40% fly ash mixture. For moist-cured specimens at 91 days, the chloride permeability values were about 70% higher for the 10P mixture compared to the 10E mixture (40% fly ash). The respective values were 435% higher for the 10P mixture compared to the 10E mixture at the 91-day age for specimens cured in the VTCE. Test results for air and water permeabilities obtained using the Figg Method were not consistent for the HPCs tested in this work.