

EFFECTS OF TEMPERATURE AND FLY ASH ON BEHAVIOR OF HIGH-PERFORMANCE CONCRETE

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ABSTRACT

Based on investigations conducted at the UWM Center for By-products Utilization, two different HPC mixtures were proportioned to have the 28-day compressive strength of 85 MPa. The first mixture (Mix 15P) contained 9% Class C fly ash and 14% silica fume and the other mixture (Mix 15E) contained 25% Class C fly ash, 17% Class F fly ash and 6% silica fume by weight of cementitious materials. Two types of curing methods, standard moist-curing and Variable Temperature Curing Environment (VTCE), were used. For the VTCE, temperature was varied from $29 \pm 3^{\circ}\text{C}$ for 12 hours each day to $41 \pm 3^{\circ}\text{C}$ for the remaining 12 hours each day, to simulate hot weather curing. Tests were conducted to study the influence of temperature on compressive strength, resistance to chloride-ion penetration, air and water permeabilities, sulfate attack, and alkali-silica reaction. At 28 days, compressive strengths of the mixtures were 99 MPa and 100 MPa for Mix 15P, and 84 MPa and 88 MPa for Mix 15E for the moist-cured and VTCE-cured specimens, respectively. Both HPC mixtures show excellent performance with respect to compressive strength, resistance to chloride-ion penetration, sulfate attack, and alkali-silica reaction.