

# **HIGH-PERFORMANCE CONCRETE FOR MANUFACTURE OF PRECAST/PRESTRESSED CONCRETE PRODUCTS**

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## **ABSTRACT**

This research was carried out to demonstrate technical and economic feasibility of high-performance concrete (HPC) for manufacture of precast/prestressed concrete products. In this investigation, two HPC mixtures were proportioned to have the 28-day compressive strength of 86 MPa (12,500 psi). The first mixture (12.5 P) contained 20% Class C fly ash and 5% silica fume and the other mixture (12.5 E) contained 30% Class C and 20% Class F fly ash by total mass of cementitious medium. Two types of curing, standard moist curing and a Variable Temperature Curing Environment (VTCE) were used. For each concrete mixture, compressive strength, chloride-ion penetration resistance, air and water permeability, sulfate resistance, and alkali-silica reaction were evaluated. In general, concrete specimens cured in the VTCE produced slightly higher early-age strength than moist-cured specimens. The chloride-ion penetration resistance was rated to be "low" for Mix 12.5 E and "very low" for Mix 12.5 P in accordance with ASTM C 1202 at the age of 56 days. Both mixtures exhibited high resistance to sulfate attack. No alkali-silica reaction occurred in either mixture. Both HPC mixtures (12.5P and 12.5E) were found to be appropriate for manufacture of precast/prestressed products. However, due to lower cost of HPC Mix 12.5E, it was recommended for commercial manufacturing of precast/prestressed products.