

PERFORMANCE OF HIGH-VOLUME CLASS C FLY ASH CONCRETE SYSTEMS UNDER FREEZING AND THAWING ENVIRONMENT

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ABSTRACT

The primary objective of this investigation was to evaluate salt scaling resistance and freezing and thawing durability of concrete incorporating large amounts of Class C fly ash. Air entrained concrete mixtures were developed to have cement replacement with fly ash in the range of 0-70% by weight of total cement. Each concrete mixture was tested for compressive strength, modulus of elasticity, water permeability, salt scaling resistance, air-void parameters, and freezing and thawing durability. The effect of entrained air content on these properties was also evaluated. All the mixtures up to 70% cement replacements passed the ASTM freezing and thawing resistance requirements, but the 70% mixture exhibited extremely poor resistance to deicer salt scaling resistance. Test data showed that high-strength concrete with excellent salt scaling resistance and freezing and thawing resistance can be manufactured up to 30% cement replacement with fly ash. However, it is possible to produce structural grade concrete up to 50% cement replacement with Class C fly ash with adequate resistance against both salt scaling, and freezing and thawing actions.