

**FREEZING AND THAWING DURABILITY OF CONCRETE  
INCORPORATING CLASS C FLY ASH**

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**ABSTRACT**

This research was undertaken to evaluate the freezing and thawing durability of concrete made with or without Class C fly ash. Two series of tests were planned. For the first series of tests (Series A) concrete mixes were proportioned to have cement replacement with one source of Class C fly ash in the range of 0-70% by weight, whereas for the second series (Series B) of tests concrete mixtures were made with several fly ashes for replacing cement in the range of 35 to 55% by weight. This report includes extensive review of the previous investigations and the experimental results for the first series of tests only. Air entrained reference concrete mixtures without fly ash was proportioned to have the 28-day compressive strength of 6000 psi (41 MPa). For each concrete mixture compressive strength, flexural strength, air-void characteristics of hardened concrete, and freezing and thawing durability were determined. Concrete resistance to freezing and thawing actions were evaluated in accordance with ASTM C 666, Procedure A. In general, concrete mixtures up to 50% cement replacement showed satisfactory performance with respect to strength properties as well as freezing and thawing resistance. The 30% fly ash mixture showed the best results. All the concrete mixtures with adequate air contents up to 70% cement replacement with fly passed the freezing and thawing requirements per ASTM C 666, Procedure A.