

DURABILITY OF ROLLER - COMPACTED HVFA CONCRETE PAVEMENTS

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ABSTRACT

This investigation was conducted to collect the state-of-the-art information on strength and durability of roller-compacted concrete (RCC) made with and without supplementary cementitious materials, and to describe the construction experience gained in two pavement projects (Project I and Project II) recently completed in Wisconsin. Project I deals with performance of conventional high-volume fly ash (HVFA) concrete pavement having a roller-compacted, no-fines permeable base course containing fly ash obtained from SO₂ control technology, and Project II deals with RCC pavement containing 30% ASTM Class C fly ash. RCC is a zero slump, highly compacted concrete. Past studies have substantiated that mechanical behavior of RCC is similar to that of conventional paving concrete. Limited data exist on long-term strength and durability of roller compacted concrete pavement (RCCP). Non air-entrained RCC is susceptible to freezing and thawing (F & T) damage if it critically saturated when subjected freezing actions. To protect RCC from F & T actions, air entrainment is needed. However, due to the "dry" nature of RCC, air entrainment is difficult. Air entraining admixtures (AEA) have been added to RCC mixtures to entrain air with limited success. The most desirable method of providing sufficient F & T durability to RCC pavement is by judicious selection of mixture proportions, including low water to cementitious materials ratio, a free draining base course material, and achieving a high degree of RCC compaction, say 95 to 98 percent of air-free density, with the use of fly ash and/or other supplementary cementitious materials, and/or other materials that add fines to the RCC mixtures. Visual observations for the projects reported here (and other published information) show very good to excellent field performance of RCC pavement containing 30 % Class C fly ash.

Beam test specimens were saw cut from RCC pavement, and drilled cores were also obtained. Laboratory testing of specimens derived from the pavements showed excellent results for conventional HVFA pavement, and "satisfactory" performance of the RCCP. Specimens from the RCCP performed poorly in laboratory freezing and thawing testing according to ASTM C 666, Procedure A. Therefore, Procedure B data are being collected. Procedure B probably should provide a better simulation of F & T in the field.