

Title: Influence of Alkaline Earth Silicate Admixture on Durability of Pennsylvania Turnpike Bridges

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Abstract: Chlorides from deicing salts are the primary cause of premature corrosion of reinforcement in concrete bridge decks. An alkaline earth silicate admixture (AESA) can reduce the permeability of concrete, preventing the ingress of chlorides, delaying the onset of rebar corrosion, and therefore increasing the design life of bridges. The performance of an AESA in bridge decks that have been in service for more than 25 years is compared with the performance of identical control bridges of comparable age. Visual inspection reveals serious deterioration in the control specimens. The decks of the control bridges reveal cracks, delaminations, and spalling in many of the precast deck panels. In the bridges with AESA, there is minimal visible deterioration. The goal of this research is to identify and characterize the effect of AESA on in-service bridge decks. Chemical and microscopic techniques are used to determine the nature of AESA in hardened concrete. Water and chloride ion permeability tests are performed to quantitatively determine the relative effects between control concrete and concrete containing the AESA. Testing has shown that AESA has chemical characteristics that enable it to react with portland cement and control the microstructural development in concrete. Quantitative tests for permeability and environmental scanning electron microscopy (ESEM) reveal a microstructure that is more continuous and interlocked than that of the control samples, indicating that the AESA reacts with cement to provide a microstructure that is less permeable.