Arkansas Department of Transportation  
Transportation Research Committee  
RESEARCH PROBLEM STATEMENT

DATE: 09/11/2017 PROJECT AREA: Materials

TITLE: Investigating Susceptibility of Arkansas Concrete to Calcium Oxychloride

PROBLEM STATEMENT:
Calcium Oxychloride (CAOXY) is a lesser known reaction occurring in concrete pavements which leads to cracking and deterioration. Often mistaken for freeze-thaw deterioration, CAOXY is perhaps more worrying since damaging expansion can occur at temperatures above freezing (32-100 F). CAOXY forms in concrete when de-icing salts containing calcium chloride react with a cement reaction product, calcium hydroxide. De-icing salts are necessary to reduce ice buildup on roads and bridges, but ponding of these salts, at pavement joints in particular, can cause deterioration. Cracking due to CAOXY can occur within 5 years of construction and is further exacerbated by freeze-thaw cycles and corrosion. Since this reaction has been studied little, it is possible that Arkansas bridges and pavements have already experienced cracking due to CAOXY. In particular, D-cracking in concrete pavements could be related to this reaction. Research is needed to determine if Arkansas concrete is susceptible to CAOXY and if so, how to mitigate it in new concrete.

OBJECTIVES:
Survey Arkansas pavements to look for areas where CAOXY may have caused damage. Test samples from these locations to determine if CAOXY is occurring. Cast concrete and mortar mixtures with local materials conforming to ARDOT Class PCCP and Class S and S(AE) standards to determine susceptibility to CAOXY. Finally, Class C fly ash and limestone filler will be used at varying replacement rates to examine the effectiveness of these materials to mitigate CAOXY damage.

FORM OF RESEARCH IMPLEMENTATION:
Known damage due to CAOXY has been found in pavements in Iowa and Indiana. This work will determine if CAOXY is a cause of pavement and bridge deck deterioration in Arkansas. If so, this research will lead to mitigation strategies. Hopefully, the addition of fly ash (already being used increasingly in Arkansas) and limestone filler can help reduce CAOXY.

Estimated Project Duration: 24 months
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Standing Subcommittee Ranking  Advisory Council Ranking  Statement Combined with Statement Number(s)  

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