



## RELATIONSHIP OF POTASSIUM ACETATE-BASED RUNWAY DEICERS TO ASR (ALKALI-SILICA REACTION) IN CONCRETE

The use of potassium acetate-based (KAc) deicer on airport pavement does not appear to correspond with ASR distress observed in pavement core samples taken from various airports. The conclusion is that *“despite the fact that KAc deicer can induce severe ASR under the aggressive laboratory conditions, penetration into field airport pavements may be so limited that, in some cases at least, the KAc deicer does not appear to be the primary source of alkalis for the ASR distress observed in the field.”* (C. Balachandran, 2011)

ASR is a form of distress recognized in concrete for over 70 years. If the aggregate used in concrete contains a reactive form of silica, a chemical reaction between the alkali hydroxides in the pore solution and the silica in the aggregate may produce a silica gel. If excess moisture is also present, the gel can absorb water causing it to expand. The resulting pressure can crack the aggregate and ultimately cause the concrete to fail. ASR typically produces a characteristic “map cracking”, which also can be caused by unrelated mechanisms; therefore ASR can only be confirmed through petrographic analysis.

Approximately fifteen years after the introduction of KAc as an environmentally friendly airport pavement deicer, premature deterioration was observed on some airport pavements. The “map cracking” patterns found suggested ASR as a possible cause. It was suspected that ASR may be triggered or accelerated by KAc deicer.

The Federal Aviation Administration (FAA) did not change its policies on the use of deicing chemicals, but in 2005, they published EB-70, intended to identify potentially reactive aggregates while research continued. Gradually, it became apparent that the aggressive laboratory testing did not correspond well to field experience with either the aggregate or use of KAc deicers.

Further where ASR was found, it was evident throughout the depth of the concrete. Yet, in 2011, Clemson University researchers presented study results showing that KAc deicer does not penetrate concrete to a significant extent. Even in a relatively aggressive wetting and drying exposure regime, the ingress of the deicer into the concrete was limited to the top few millimeters.

For more information, please see:

Engineering Briefs page ([www.faa.gov/airports/construction/engineering\\_briefs/](http://www.faa.gov/airports/construction/engineering_briefs/)): The FAA has cancelled EB-70. It is replaced by Advisory Circular 15/5370-10E, Standards for Specifying construction of Airports. A modified EB-70 aggregate screening protocol has been proposed. It is currently under review, but has not yet been implemented.  
R&T Update #11.01: Mitigating Deicer Induced Distress Potential: A Revision of an Interim Procedure