



Technical Service Memo

Date: August 7, 2009

To: ACPA Contractor Members

From: Gary L. Mitchell, PE
Director of Airports and Pavement Technology

Copy: Gerald F. Voigt, PE; President & CEO
Chapter/State Association Executives

RE: Alkali-Silica Reaction (ASR) Testing for Federal Aviation Administration (FAA) Projects Utilizing Airport Improvement Program (AIP) Project Funding;
Aggregate screening test protocol and FAA Engineering Brief Number 70

Recently, ACPA has received several inquiries from contractor members about the current FAA aggregate screening protocols for FAA AIP projects. Additionally, we have reviewed a number of project-specific P-501 concrete pavement specifications for compliance with the FAA aggregate screening requirements. It is clear from our recent experiences that the current aggregate screening requirements are not well understood by all parties (contractor, producer, engineer, and testing firm). Misinterpretation or overlooking the referenced specification requirements could lead to rejection of materials or mixtures, delaying projects and causing undue costs. ***We encourage you to read this memo and become familiar with the requirements and current protocol to protect your company from potential project hang-ups.***

The requirements in question are outlined in FAA Advisory Circular 150/5370-10D, which is the current FAA Guide Specification for construction. Of particular importance is Paragraph 5-1-2.1: Aggregates, Section A: Reactivity. We also believe part of the confusion is related to Engineering Brief Number 70 (EB#70) that the FAA issued in September, 2005.

EB#70 outlines a non-standard interim test protocol to test the effects on aggregates exposed to pavement deicers or anti-icing agents, particularly Potassium Acetate. The engineering brief does not outline screening requirements against the more prevalent standard forms of alkali-silica reactivity (ASR).

EB#70 is based on an American Concrete Pavement Association (ACPA) Research and Technology (R&T) Update (No. 6.04) published in 2005. We published the R&T Update based on limited data from early anti-icing agent/concrete material interaction research conducted by the Innovative Pavement Research Foundation (IPRF). The test protocol we developed from the IPRF research (which was also issued by FAA as EB#70) is only intended to screen

aggregates for reaction to the deicers and anti-icers, which is a relatively new materials durability challenge we are trying to solve. Standard testing is necessary to screen aggregates against traditional forms of ASR.

There is a misnomer that the de-icer testing requirements of EB#70 are more stringent than the traditional ASR tests, and therefore the other tests are not necessary if EB#70 testing is required for a project. The deicer test is not necessarily the worse-case scenario. For some material combinations, the standard test based on a standard soak solution creates more expansion in mortar bar test specimens. *Therefore, EB#70 tests are not a substitute for other ASR tests; both tests are required to effectively assess the concrete materials under the current testing protocol.*

Guidance for FAA's complete regime for screening aggregates is contained in the FAA P-501 guide specification. It is a multi-step process. As outlined in the guide specification, project aggregates should first be tested for deleterious reactivity with alkalis in the project cement. Both the coarse and fine aggregate should be tested in accordance with ASTM C 1260. If the coarse aggregate does not exceed 0.10% expansion at 16 days from casting, the aggregate can be accepted as non-reactive against standard ASR. *Note that each FAA Region has the prerogative to modify the guide specification to meet the locally available materials. As such, some regions require the ASTM C-1260 test to be monitored with a comparative reading taken for 28 days with a maximum expansion of 0.08% as the threshold to be accepted as non-reactive against standard ASR.*

If the expansion based on ASTM Standard C 1260 exceeds 0.10% at 16 days (or 0.08% at 30 days from casting in some regions), FAA allows the combined materials test in accordance with ASTM C 1260 or ASTM C 1567. If the expansion of the proposed combined materials test is greater than 0.10% (or 0.08% in some regions) at 30 days from casting, a different combination or new aggregates must be selected and retested. The soak solution for both the 16-day standard ASTM C 1260 and the 30-day ASTM C 1260 or ASTM C 1587 is sodium hydroxide (NaOH).

The FAA's 30-day test does not follow the standard ASTM C 1260 or ASTM C 1567 protocols. It can be considered very conservative. However, research has shown that some supplementary cementitious materials can retard expansion for a brief time before the expansion accelerates. Some supplementary cementitious materials (e.g. class C fly ash) can actually exacerbate expansion. The standard 16-day test may not catch these cases, so FAA requires the test to run for 30-days from casting (28 days in the NaOH soak solution).

If ASR is a concern in your area, we recommend that Class C fly ash be removed as a cementitious material in a project mixture. A note to the engineer in the P-501 guide specification also points this out.

In addition to these NaOH soak tests, the P-501 guide specification contains a note to the engineer that if deicing (or anti-icing) chemicals will be used on the pavement, then EB#70 should be employed. The intent is not to replace the 16- and 30-day NaOH soak tests, but to augment them because of the potential exposure to pavement deicing (or anti-icing) chemicals.

You should be aware that your supplier or whoever is responsible for the mixture design may need to run concurrent trial mixes with various mitigation strategies in case test expansion criteria are not met.

ACPA is currently working on an update to replace EB#70 based on the latest research from IPRF Project 05-7. The current protocol has been considered interim and the intent has been to replace the procedure when new information was discovered. Recent research has exposed some shortcomings in the current EB#70 protocol. Additionally, because the protocols in EB#70 and P-501 differ from the ASTM standards, they are somewhat confusing. We have helped many contractors and consultants with properly implementing screening procedures over the past several years.

We highly recommend that you monitor your projects closely to ensure current protocols are being followed. Some engineers may not fully be aware of or understand the consequences of not following the current guidelines, and may set up inadequate or conflicting test requirements. Even so, once a project has been awarded the project specifications govern and are enforceable – whether they are right or wrong. Therefore, it is imperative that as a contractor, you and your material supplier understand and follow the requirements in the project specifications. This may become a point of dispute with the engineer if the required testing protocol has been mishandled in the project specification, and unfortunately, these situations usually do not arise until project start-up when time is of the essence for paving.

We also recommend that you review the material requirements prior to bidding to make sure current protocols are outlined in the project specifications. If proper aggregate screening protocols are not communicated correctly in the project specifications, we encourage you to bring this to the attention of the engineer at the pre-bid stage. It can be very difficult to get the protocols altered once the project has been awarded.

Should you have any questions, concerns or need clarification, please do not hesitate to call me.

A handwritten signature in cursive script that reads "Gary J. Mitchell". The signature is written in black ink and is positioned in the lower-left quadrant of the page.