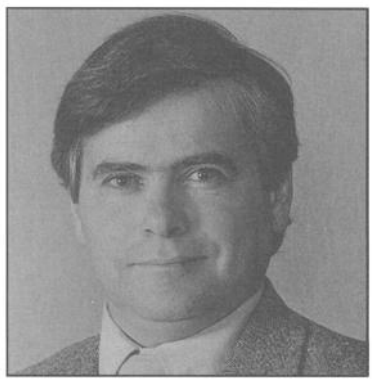
EDITORIAL

If it Looks Like a Duck, Walks Like a Duck, and Sounds Like a Duck . . .



In June, I attended a Special Session on Mitigation of alkali silica reactivity (ASR) by supplementary cementing materials (SCM) (mineral admixtures and pozzolans to most of my ASTM colleagues) at the Canadian Standards Meetings in Charlottetown.

One of the problems discussed was how to replace the ever unpopular and questionable ASTM C 441 pyrex mortar bar test for qualification of SCM for mitigation of ASR (for example, pyrex releases its own alkalis). This is also a topic of discussion at ASTM and is related to the reason that the Institute for Standards Research (ISR) funded Leslie Struble's program on developing ASR performance test for portland cements.

We discussed our current standard for concrete that requires SCM's to be tested by ASTM C 1293 concrete prisms for two years; that is not very practical for job mixtures!

A number of papers have been published since 1987 indicating that the ASTM C 1260 (80°C, 14-day mortar bar) test appears to work for evaluation of SCM. Expansions of deleteriously reactive aggregates are reduced to less than 0.10% at replacement levels typically found to be effective in concrete prisms (ASTM C 1293) and in structures. However, because in this accelerated test, the bars are stored in 1.0 normal NaOH solutions (equivalent to a 1.4% Na_2O_e cement) which inundate the pores, the alkali-content of the portland cement has very little impact on expansions.

Hence the problem! If the alkalies get into the portland cement mortar bars when immersed after two days of curing, then why would the SCM be effective in controlling expansions? For example, one wouldn't think that the hydration of a Class F ash at two days of age (even if one day is at 80°C) would be sufficient to restrict the penetration of the alkali solution. Could the reduction in expansion be partially due to uptake of alkali by the lower Ca/Si calcium silicate hydrates or is it a function of available calcium hydroxide or of something else?

Because of these questions, the current C 1260 (and its predecessor P 214) makes no mention of its potential use for evaluation of SCMs ability to mitigate ASR. (However, some highway agencies are reported to be ignoring the stated Significance and Use section and doing this anyway.)

At the end of several hours discussion (during the evening too, when thoughts of beer were dancing in our heads), Al Innis of Lafarge stood up and made an impassioned plea (not bad for a self-described poor farm boy from New Brunswick) that (1) industry needs a quick test soon, (2) the existing C 441 test was suspect at best, (3) we will not, in the short term, understand all the complexities of C 1260, and (4) C 1260 appears to work. He finished with the duck analogy. Even I, the ultimate sceptic, was moved by his argument. (Maybe I was only hungry and duck sounded good?) As a result of this, extensive testing by Marc Andre Bérubé and J. Duchesne (*Cement and Concrete Research* 1994) and a push from my colleague Mike Thomas, we will be balloting a modification to CSA A23.5 to replace the C 441 test with a C 1260-based test for evaluation of the percentage of SCM required to control deleterious ASR expansions for a given aggregate (with some requirements for retesting if compositional changes take place). I think that there will be opposition to this approach but we will give it the old college try.

Similarly, in September, a small group of concerned ASTM citizens met in Omaha to come up with a similar proposal for ASTM (and to see the Cornhuskers first game) and to propose testing in a variable strength storage solution (suggested in Dave Stark's SHRP C 343 report for evaluation of low-alkali cements).

It may take 10 to 20 years if we wait for all the answers about the interaction of C 1260 and SCMs, and in the end, will the answer be any different? The potential downside of not having a test for the next 20 years that industry can use to specify SCM for content of deleterious ASR could be enormous. Use of SCM to control ASR is the most energy-efficient choice since it allows exploitation of more aggregate sources (and sources black listed by C 1260 in the first place) and doesn't force the cement industry to manufacture low-alkali cement in areas where it is not practical.

So maybe if a modified C 1260 has all those duck qualities, it really could be called a duck. I'm sure I'll hear from you when I next migrate south but I'd better avoid the duck hunters.

R. Doug Hooton
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