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DISCUSSION

A REPLY TO DISCUSSION OF THE PAPER, "INFLUENCE OF MINERAL ADMIXTURES ON THE ALKALI-AGGREGATE REACTION"[1]

P.J.M. Monteiro,[2]* K. Wang,† G. Sposito,* M.C. dos Santos,‡ and W.P. de Andrade‡

*Department of Civil and Environmental Engineering, University of California, Berkeley, CA 94720, USA

†ACBM, Northwestern University, USA

‡Furnas Centrais Elétricas, Goiânia, GO 74001970, Brazil

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We wish to thank Prof. Bensted for his insightful comments on our paper. He has correctly pointed out that our use of the term AAR (alkali-aggregate reaction) excluded the less commonly occurring alkali-carbonate reaction (ACR). However, the term AAR includes both the alkali-silica reaction and the alkali-silicate reaction. Historically, concrete technology researchers have paid more attention to the AAR damage involving alkali-silica attack and much less attention to the alkali-silicate attack. Charlwood and Solymar (1) analyzed national and international dams with AAR and reported 44 dams with alkali-silica reaction and 55 dams with alkali-silicate reaction. As Bensted points out, it is possible that the phylosilicate minerals themselves are nonreactive and that the reactive components are microcrystalline quartz or chalcedony. In our study we used quartzite as the reactive aggregate because recently two Brazilian dams (Furnas and Mascarenhas de Moraes) that used different sources of quartzite are beginning to show the first signs of AAR after over 30 years of normal operation.

We agree that with mix proportioning and selection of the cement type, mineral admixture, and aggregate type, one can minimize the deleterious consequences of the alkali-aggregate reaction. Also, as shown by our work, evaluation of the optimum amount of cement replacement with a given pozzolanic material is essential. Bensted's experimental research showed that the effect of sodium ions is greater than those of the potassium ions in the ASR, because sodium silicate gels tend to imbibe more water than the potassium silicate gels. We agree with him and recently we have obtained similar results (2) when studying the effect of chemical admixtures on the AAR.

Bensted notes that a small amount of steel reinforcement is able to reduce the expansion caused by AAR. Indeed, confinement has similar effect for many other expansive reactions as discussed by Lubliner and Monteiro (3) who used thermomechanics of deformable bodies with internal variables to account for the effect of stress on the irreversible expansion of

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[1]Cem. Concr. Res. 1899–1909 (1997).

[2]To whom correspondence should be addressed.

concrete. The lack of reinforcement in massive gravity dams makes them very susceptible to the damages due to AAR. This has been well-established since 1946, when the US Bureau of Reclamation performed a careful analysis of large dams affected by AAR.

References

1. R.G. Charlwood and Z.V. Solymar, Second International Conference on Alkali-Aggregate Reactions in Hydroelectric Plants and Dams, Chattanooga, Tennessee, p. 19, 1995.
2. M. Prezzi, P.J.M. Monteiro, and G. Sposito, ACI Mater. J. 95, 3 (1998).
3. J. Lubliner and P.J.M. Monteiro, Cem. Concr. Res. 16, 119 (1986).