

Discussion

Reply to the discussion by William G. Hime of “The use of tension testing to investigate the effect of w/c ratio and cement type on the resistance of concrete to sulfate attack”[☆]

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The authors wish to thank Mr. Hime for his comments. We agree with him on at least one point: the use of the word “ratio” in the title is indeed redundant.

Mr. Hime has apparently misunderstood the intent of the paper, which was to examine the use of a novel tension testing technique to determine the extent of internal damage to concrete. The paper was not intended to deal with the mechanisms of sulfate attack. However, we take issue with Mr. Hime’s assertion that “physical salt attack” is, in this case, different from sulfate attack. In our view, this is a distinction without a difference. In common engineering usage, “sulfate attack” is the term used for chemical processes involving sulfate ions reacting with the components of the cement paste, such as the formation of ettringite, gypsum, thaumasite and sodium sulfate dihydrate. These are all through-solution reactions. The hydration

and dehydration of Na_2SO_4 is a chemical process, which may, under certain circumstances, lead to physical consequences such as volume change. These physical consequences may lead to the loss of bond and internal cracking. Thus, what Mr. Hime terms physical salt attack is in reality a chemical attack involving sulfate salts with physical consequences: repeated recrystallization of hydrous and anhydrous Na_2SO_4 .

It should be noted that, for the high w/c mixes, the failure planes occurred exclusively in the portions of the specimens *below* the immersion line. This could not occur if salt crystallization at the surface was the primary source of the damage.

We appreciate Mr. Hime’s offer to carry out a further microscopic investigation of our specimens; regrettably, however, they have long since been discarded.

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