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A Reply to a Discussion by John Bensted of the Paper "A STUDY OF THE HYDRATION AND SETTING BEHAVIOR OF OPC-HAC PASTES"*

Ping Gu, Yan Fu,* Ping Xie* and J.J. Beaudoin****

*** Department of Civil Engineering, University of Ottawa**
Ottawa, Ontario, Canada K1N 6N5
**** Materials Laboratory, Institute for Research in Construction**
National Research Council, Ottawa, Ontario, Canada K1A OR6

We wish to thank Dr. Bensted for his informative comments on our previous work related to the impedance-capacitance of OPC-HAC systems during early hydration. The fast set phenomenon in OPC-HAC mixes has been a concern since the 1920's.(1) It is a problem that has limited the application of these systems. The setting time, as reported by Lea,(2) varies with the proportion of the two cements. It is our contention that ettringite formation is one of the factors responsible for fast set. It is apparent that simultaneous formation of CAH_{10} and/or C_2AH_8 also contribute to the process as indicated by Dr. Bensted.

The hydration mechanism of HAC in the presence of calcium hydroxide (CH) has been recently reported.(3) Quick formation of calcium aluminate hydrates (CAH_{10} and/or C_2AH_8) on the surface of HAC particles in the presence of CH plays an important role in the fast set process. The aluminate hydrates formed retard the further hydration of HAC. The early strength of HAC is therefore largely reduced by adding CH. In OPC-HAC systems, the early strength remains relatively higher as indicated by Dr. Bensted. This is attributed to further formation of ettringite and aluminate hydrates. The former process consumes a large amount of CH, aluminate hydrates and gypsum. It consequently accelerates the hydration of both HAC and OPC at early ages.

Use of A.C. impedance spectroscopy as a non-destructive tool has proved useful in characterization of cement hydration processes and microstructural development. It has also recently been used in investigations of concrete systems.(4,5) It is hoped that this technique will find wider application in the field.

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