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**AUTHOR'S REPLY TO DISCUSSION OF PAPER
"DIFFUSION BEHAVIOR OF CHLORIDE IONS IN CONCRETE"*
BY S. CHATTERJI**

The authors wish to thank Dr. Chatterji for his interest in the above paper. Based on the mechanisms involved, he discusses the practical chloride diffusion problem in concrete by further simplification and empirical treatment. Such a contribution is highly appreciated.

The objective of the above paper, however, has been to provide a general discussion and analysis of the diffusion behavior of chlorides in concentrated solutions based on fundamental theories. In a porous material like concrete, a complex interaction between the salt solution and the solid does also take place. In the literature, most discussions and treatments of chloride diffusion in concrete are either based on Fick's law or a modification of this law. Fick's law, which is based on diffusion in an non-interacting system (e.g. infinite dilute solution), is not strictly valid for ionic diffusion in highly concentrated electrolytic solutions. Also, it does not take into account effects of the complex interaction between the solution and the porous solid as discussed in the present paper. This is the background why the authors would like to draw attention to some very important but long-ignored mechanisms for chloride diffusion in concrete such as that of ionic interaction and electrical double layer.

Only by taking these fundamental mechanisms into account, it is possible to reach a further basis for practical applications. This is also pointed out by Dr. Chatterji in his discussion. Dr. Chatterji also points out, however, the general problem with most practical models that implicitly assume the concrete to be fully water saturated. Even after 25 to 30 years of continuously submerged concrete in seawater, it has been observed that only a thin surface layer of the concrete may be water saturated (1). However, by knowing the fundamental mechanisms involved as discussed in the present paper, a better basis for understanding and discussing various observations on chloride diffusion in concrete can be obtained.

Reference

1. Gjrv, O. E., "Long-Time Durability of Concrete in Seawater", ACI Journal, 68-10, 1971, pp. 60-67.

*CCR 26(6) 907-917, (1996).