Saturated Water Permeability: of Interest, but of Relevance for Assessing Durability?

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Since the late 1800s, researchers have been trying to apply Henri Darcy's equation, with various degrees of success, to measure the water permeability of concrete. In some cases, the condition of saturated flow was not achieved within the time of the experiment, and with equipment limitations, typically only for high w/cm concretes: of little interest where durability is a concern. The time required to obtain results as well as the variability of results using some methods is also extremely high [1]. In spite of many attempts, measurement of water permeability using Darcy's equation has rarely been successfully applied to low w/cm concretes, especially with blended cements [2]. As a result, various non-steady state methods, such as the Valenta equation [3], have been used and specified.

Another approach is the use of the pulse decay method, adopted from its use in the study of tight rock formations for oil and gas exploration [4]. In addition, G. Scherer [5] has used a dynamic pressurization method to measure permeability of cement pastes.

While permeability is one of many mechanisms of fluid transport, for concrete durability in most exposure conditions, other transport mechanisms such as capillary absorption, ionic diffusion and wick action are typically also involved and can be more important [6].

These issues will be discussed.

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