

Research on Water Penetration into Cracked Steel Reinforced Concrete by Means of Neutron Radiography

P. Zhang^{1,2)}, M. Haist¹⁾, H. S. Mueller¹⁾, T. Zhao²⁾, F. H. Wittmann^{2,3)}

1) Institute of Concrete Structures and Building Materials, Karlsruhe Institute of Technology, 76131 Karlsruhe, Germany

2) Center for Durability & Sustainability Studies, Qingdao Technological University, Qingdao 266033, PR China

3) Aedificat Institute Freiburg, D-79100 Freiburg, Germany

peng.zhang@partner.kit.edu

Abstract

The presence and penetration of water and chemical compounds dissolved in water into reinforced concrete play a crucial role in deterioration of material and, hence, for the durability and service life of structures. The problem will be more acute once cracking has occurred which is usually inevitable in real structures due to mechanical, physical or chemical actions. The objective of the project is to study the behavior of water penetration into cracked reinforced concrete induced by mechanical load. Three types of mixes were tested: mortar M1 and concrete C1 both with W/C ratio of 0.6 and same grade of compressive strength of C30, and another mortar M2 with W/C ratio of 0.4 and grade C50. Cracks with average widths ranging from 20 μm to 130 μm (measured after unloading, corresponding to 40 μm to 200 μm under loading) induced by three points bending were selected to perform water absorption test. The process of water penetration into these cracked reinforced concrete were followed visually by means of the technique of neutron radiography. The water distributions in cracked concrete have been calculated quantitatively. The results obtained will be presented and discussed in this paper.