Influence of microcracking on water absorption of reinforced concrete beams under sustained lateral loads

Junjie Wang[1)], Sreejith V. Nanukuttan[1)], Yun Bai[2] and P.A.M. Basheer[1)]

[1)]School of Planning, Architecture and Civil Engineering,
Queen's University Belfast, Northern Ireland, UK
[2)]Department of Civil, Environmental & Geomatic Engineering
University College London, UK
Correspondences to: m.basheer@qub.ac.uk

Abstract

The water absorption characteristic of concrete is very important in the context of the durability of concrete infrastructure. Most of the previous research projects in this respect have focused on 'laboratory' concretes that are usually not cracked or not withstanding any structural loading. In reality, microcracking can easily develop on the tension face of beams when they are subjected to lateral loads. In order to assess this effect, particularly that of cracks that are formed at low load levels, concrete beams made using 4 different mixes were subjected to three loading levels (0%, 50% and 100% of the load that can induce crack with a width of 0.1 mm on the tension surface of the beam - $F_{0.1}$). The microcracking was quantified my measuring the ultrasonic pulse velocity in the indirect method. The change in ultrasonic pulse velocity from without loading to under loading was described as a damage degree of the concrete surface caused by loading. The *in situ* water absorption was measured using the Autoclam Permeability System and a sorptivity index was determined for each of the test condition and the mix. The results have indicated that the sorptivity index (SI) increased rapidly with the increase of the load applied and there was an exponential relationship between the sorptivity index and the damage degree for all the mixes. The influence of loading on the sorptivity index was much higher than that due to the different mixes. It was also found that Air Permeability measured using the Autoclam Permeability System was more sensitive to microcracking than the sorptivity and hence the former could be used to detect microcracking of concrete surface *in situ*.