Accepted Manuscript

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PII: S0958-9465(16)30430-9

DOI: 10.1016/j.cemconcomp.2017.08.002

Reference: CECO 2880

To appear in: *Cement and Concrete Composites*

Received Date: 5 August 2016

Revised Date: 12 July 2017

Accepted Date: 7 August 2017

Please cite this article as: J.-C. Souche, P. Devillers, M. Salgues, E. Garcia Diaz, Influence of recycled coarse aggregates on permeability of fresh concrete, *Cement and Concrete Composites* (2017), doi: 10.1016/j.cemconcomp.2017.08.002.

INFLUENCE OF RECYCLED COARSE AGGREGATES ON PERMEABILITY OF FRESH CONCRETE

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Summary: The following work is an experimental study of the behaviour of very early-age concrete. Six different concretes, four of them containing recycled coarse aggregates were studied for the first 2.5 hours. The studies were carried out in a ventilated tunnel in order to imitate severe desiccation conditions. In order to indirectly obtain the permeability coefficient, settlement, capillary depression and evaporation were measured for all six concretes. The initial permeability coefficient of each concrete is determined starting from initial bleeding rate. The use of recycled coarse aggregates leads to a high bleeding rate for high water to cement ratios. Permeability coefficients at air entry are then determined starting from capillary depression gradients. Recycled coarse aggregates do not seem to influence the air entry value which is highly dependent on the paste quality. At air entry, the permeability coefficient of recycled coarse aggregates concrete mixes is higher than that of natural aggregates concrete mixes. At high evaporation rates, in severe desiccation conditions, recycled coarse aggregates seem to reduce bleeding for mixture with low water cement ratios. Permeability coefficient is a key physical parameter to understand drying of fresh concrete.

Keywords: evaporation rate; capillary depression; bleeding; permeability; air entry.

1. INTRODUCTION

The life of concrete starts when concrete components come into contact with water in the mixer. Immediately after placement, gravitational forces and the environment begin to influence the microstructure of concrete. Fresh concrete is a humid granular mixture made up of different sized particles. As the solid particles settle and a corresponding volume of water rises the top of the specimen, a microstructural gradient will be established throughout the thickness of concrete [1]. Settlement and bleeding strongly depend on fresh concrete permeability [2], [3]. The homogeneity of concrete is thus directly linked to the ability of water to