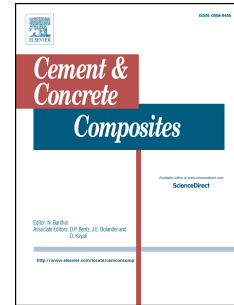


Accepted Manuscript

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PII: S0958-9465(16)30808-3

DOI: [10.1016/j.cemconcomp.2017.10.002](https://doi.org/10.1016/j.cemconcomp.2017.10.002)

Reference: CECO 2918

To appear in: *Cement and Concrete Composites*

Received Date: 6 December 2016

Revised Date: 6 June 2017

Accepted Date: 2 October 2017

Please cite this article as: S. Ghourchian, M. Wyrzykowski, L. Baquerizo, P. Lura, Susceptibility of Portland cement and blended cement concretes to plastic shrinkage cracking, *Cement and Concrete Composites* (2017), doi: 10.1016/j.cemconcomp.2017.10.002.

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Susceptibility of Portland cement and blended cement concretes to plastic shrinkage cracking

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Abstract

The market share of different types of blended cements is increasing year by year. Generally, blended cements are ground to higher fineness and exhibit a slower development of mechanical properties compared to Ordinary Portland Cement (OPC), which might affect the concrete performance in terms of shrinkage cracking at early ages.

In this paper, the performance of concretes made with different cement types are compared according to the ASTM C1579-13 standard for plastic shrinkage cracking. The cracking behavior was further correlated to the deformations of both unrestrained and restrained specimens measured by a 3D image correlation system. The main factors influencing the cracking behavior were discussed based on poromechanics. It is concluded that the bulk modulus evolution has a dominant effect on controlling the plastic shrinkage cracking. Concretes made of more reactive cements, in particular with higher clinker content, are less susceptible to plastic shrinkage cracking. For cements with the same clinker content, increasing the cement fineness reduces the risk of plastic shrinkage cracking.

Keywords: cement type, blended cement, plastic shrinkage cracking, bulk modulus, fineness, capillary pressure.

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