Quantification of plastic shrinkage cracking in mortars using digital image correlation

This study presents a digital image correlation (DIC) technique for the detection and quantification of plastic shrinkage cracking in thin restrained mortar overlays applied on concrete substrates. The non-contact 2D-DIC technique enables measurements of in-plane surface strain and displacement under continuous monitoring. A post-processing procedure to compute various crack parameters, such as crack location, width, length and area on the specimen surface is presented, which enables the crack patterns to be synthesized and digitally reproduced from DIC data. The formation of surface cracking is illustrated in histograms facilitating a quantitative analysis. The crack width measurements obtained by DIC data were verified using an optical microscope. The temperature evolution, evaporation rate and free shrinkage behaviour of unrestrained mortar specimens were also tested to increase the knowledge of the early-age behaviour. This method is intended for evaluation of various shrinkage mitigation strategies in cement-based mortars and other repair mortars.

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