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Failure Mechanism of Foamed Concrete Made with/without Additives and Lightweight Aggregate

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Abstract

It has been reported that owing to a densification of the internal structure of concrete, adding mineral admixtures leads to a more brittle behaviour. Therefore, with the intention of modifying (increasing the strength of) foamed concrete to make it suitable for structural purposes by means of admixtures and lightweight aggregate addition, the effect of these additions on the failure mechanism under compressive and tensile loading using different techniques is evaluated and discussed in this paper. Eight different mixes, made using a pre-formed foam, were investigated with varying density (different foam volumes), nominally 1300, 1600 and 1900 kg/m3, without/with admixtures (silica fume, fly ash and superplasticizer) and lightweight aggregate. The Digital Image Correlation (DIC) technique was adopted to measure the deformations and strains on the surface of a specimen under uniaxial compressive load. Meanwhile, a Video Gauge technique was used to measure the horizontal deformation of discs during a splitting tensile test. From elasticity, fracture and fractal points of view, it was found that, for the same density, brittleness increases with many of the additives while it reduces with inclusion of lightweight aggregate. However, for all mixes, the lower the density (higher added foam volume), the higher the ductility.

Keywords

Foamed concrete, lightweight aggregate, Additives, Failure

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