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The Effect of Randomly Distributed Polypropylene Fibers and Some Additive Materials on Freezing-Thawing Durability of a Fine-Grained Soil

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Abstract : A number of studies have been conducted recently to investigate the influence of randomly oriented fibers on some engineering properties of cohesive and cohesionless soils. However, few studies have been carried out on freezing-thawing behavior of fine-grained soils modified with discrete fiber inclusions and additive materials. This experimental study was performed to investigate the effect of randomly distributed polypropylene fibers (PP) and some additive materials [e.g.., borogypsum (BG), fly ash (FA) and cement (C)] on freezing-thawing durability (mass losses) of a fine-grained soil for 6,12 and 18 cycles. The Taguchi method was applied to the experiments and a standard L9 orthogonal array (OA) with four factors and three levels were chosen. A series of freezing-thawing tests were conducted on each specimen. 0-20 % BG, 0-20 % FA, 0-0.25 % PP and 0-3 % of C by total dry weight of mixture were used in the preparation of specimens. Experimental results showed that the most effective materials for the freezing-thawing durability (mass losses) of the samples were borogypsum and fly ash. The values of mass losses for 6, 12 and 18 cycles in optimum conditions were 16.1%, 5.1% and 3.6%, respectively.

Keywords : freezing-thawing, additive materials, reinforced soil, optimization
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