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The influence of uniaxial tensile strain on the pore size and filtration characteristics of geotextiles

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Abstract

The influence of uniaxial tensile strain on the pore size distribution and filtration characteristics of geotextiles is studied. An experimental apparatus was designed and used to conduct tests for pore size distribution, flow rate through the geotextiles and the gradient ratio. Four geotextiles made of polypropylene (two heat-bonded nonwoven and two slit film woven) were studied. Throughout the test series, the geotextiles were stretched to maintain 5%, 10% and 20% in-plane uniaxial strains. The strained specimen test results were compared with those from unstrained specimen. The experimental results illustrate the pore size and the mean flow rate through the plain geotextiles increase with the increase in tensile strain. The differences in changed percentages for apparent opening size and flow rate between the two nonwoven geotextiles are much higher than those between the two woven geotextiles. The increase in tensile strain results in reduction in the gradient ratio for the soil–geotextile system. This effect is more pronounced for nonwoven geotextiles. More testing is recommended to gain a deeper understanding into tensile strain effect on various geotextiles.

Keywords: Geotextile; Gradient ratio; Filtration; Flow rate; Pore size distribution; Uniaxial tensile strain