

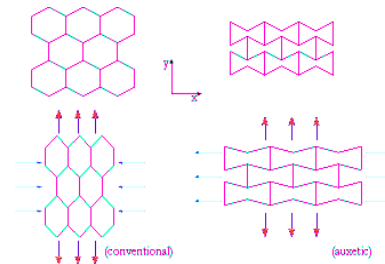
A New Approach to Reinforcing Soils with Auxetic Materials

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Objectives

The research focused on a feasibility study involving an experimental investigation into potential applications of auxetic inclusions in soil reinforcement.

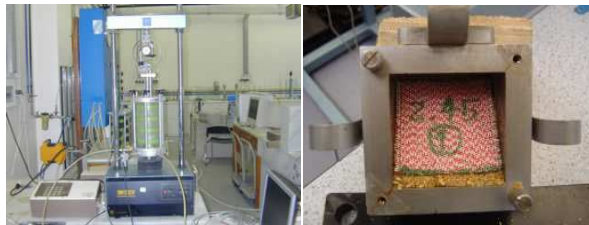
Auxetic materials differ from conventional materials by the manner in which they respond to stretching; they tend to get fatter when stretched, resulting in a negative Poisson's ratio.



Experimental programme

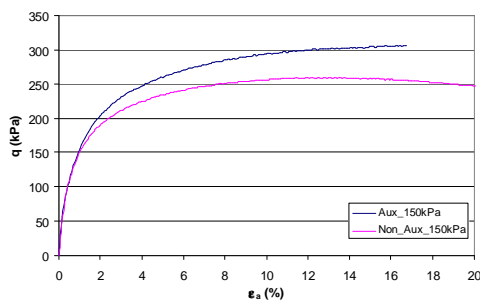
1- A series of undrained triaxial tests on identical cylindrical specimens (50mm diameter and 100 mm long) of a clay reinforced with auxetic material, and reinforced with an equivalent non-auxetic material.

2- Shear box tests on identical samples of a sand reinforced with auxetic material, and reinforced with an equivalent non-auxetic material, and unreinforced soil.



Results

The results indicate that the strength envelope for the auxetic reinforced soil lies above the one for the non-auxetic soil indicating that reinforcing the soil with auxetic material results in higher shear strength than reinforcing with an equivalent non-auxetic one. However, the main contribution of the auxetic reinforcement appears to be in controlling the volumetric expansion of the soil. The auxetic fabric appears to control the volumetric expansion of the soil during shearing.



Deviator stress-axial strain curves for samples tested at confining pressure of 150kPa (Triaxial tests)

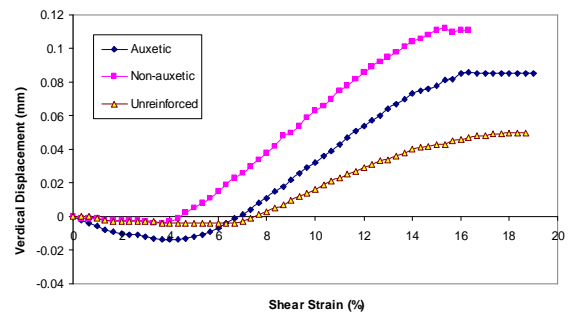
A more comprehensive programme of research is currently underway in the Computational Geomechanics Group at the University of Exeter. The results of this research could have significant technological and financial implications and could potentially lead to the introduction of a new generation of reinforcing elements, for certain types of problematic soils.

Contact:

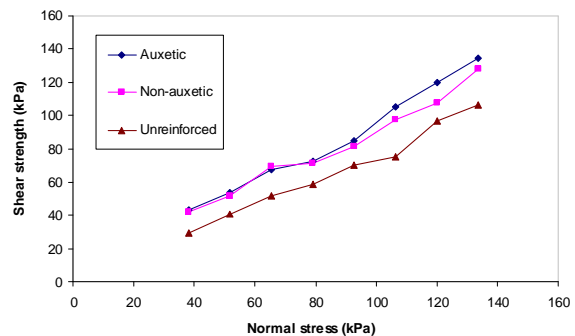
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Results of Vertical displacement vs shear strain (Shear box tests)



Strength envelopes for auxetic-reinforced, non-auxetic-reinforced and unreinforced soils (Shear box tests)