DISCUSSION

The filtration behaviour of construction fabrics under conditions of dynamic loading

SNAITH, M. S. & BELL, A. L. (1978). *Géotechnique* **28**, No. 4, 466–468

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We are carrying out a large number of tests to investigate the relative performances of various commercially available construction fabrics under dynamic loading conditions to filter fine subgrade soils. This work is part of a test programme for the International Union of Railways (UIC). The apparatus used is as described in the paper by King and Pitt (1957). This apparatus is similar to the one described by Snaith and Bell although the parameters employed have different values. We have concentrated our efforts on non-woven materials. Manufacturers of woven materials approached did not consider that their product would filter clay under the test conditions.

Of the test parameters the particle size distribution (psd) of the subgrade is probably the most important. It is understood that the Authors have used a soil containing 58% sand and with a $D_{85} = 0{\cdot}7$ mm in relation to a specific highway project. However, it would be inadvisable to compare the inherent filtering characteristics of the various fabrics against cohesive soils on the basis of their filtering performance on such a soil. This is because the sand fraction which such a soil contains, is capable of building up an efficient back filter beneath the fabric. Consequently, the test is of the effectiveness of the fabric in selecting sand from the parent soil rather than of the above-mentioned filtering characteristics. The mechanism of filtration for a parent soil of much finer psd may be very similar to that for the soil used—the fabric merely having to select silt particles, say, rather than sand particles. However, it is possible that with increasingly finer particle size distributions of the parent soil the changes that occur may involve other mechanisms.

We are using an undisturbed clay from the Lower Lias containing no sand and can find no commercially marketed fabrics in Europe which can prevent the passage of clay fines in their test. As these include the non-wovens tested by the Authors the disagreement with their test No. 7 would appear for the above reasons to be due to the different subgrade used.

No mention has been made of the repeatability of the tests. Did the Authors carry out two or more tests on a particular fabric? If so, were the results consistent?

In addition to the type of measurements made by the Authors, we have found that readings of movement of platen plotted against time provide a useful means of comparing the behaviour of fabrics.

REFERENCE

King, K. H. & Pitt, L. C. (1957). Tests to determine the behaviour of railtrack formations on various soil subgrades with particular reference to clays. *Proc. Second Int. Conf. Soil Mech. Fdn Engng, London* **2**, 128–133.

Authors' reply

We welcome the interest shown by the Writers in what we consider to be an important practical problem. We agree that the particle size distribution is an important factor and for this reason we are currently conducting tests in which subgrade type is included as a variable. So far, the results indicate that the finer the subgrade, the larger will be the amount of clay particles passing. The relative performance of the various fabrics remains similar to that found from our earlier tests. We do not regard the Writers' findings as conflicting with our own and would point out that, apart from our cautionary note, we have made no claims for any fabric beyond the conditions of our test.

In answer to the question concerning repeatability we have found that this is generally very good, with woven fabrics performing a little more consistently than non-wovens. The Writers also mention the value of using platen movement against time as a means of comparing the behaviour of fabrics. For the current test series we conducted platen movement and subgrade porewater pressures are being monitored with time in addition to the measurements made in the earlier tests.

Finally, we feel that the work of the Writers reinforces our opinion that much care should be taken with the selection and use of filter fabrics in civil engineering.

The behaviour of axially and laterally loaded single piles embedded in non-homogeneous soils

BANERJEE, P. K. & DAVIES, T. G. (1978). *Géotechnique* **28**, No. 3, 309–326

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Banerjee and Davies describe an approximate analysis for predicting the behaviour of piles embedded in non-homogeneous elastic soils. The method is relatively economic and is capable of application to groups of piles; it is a welcome addition to the computer-based methods of analysis available to the pile designer. In the Paper, results are presented for single piles under axial or lateral loading. The results for axially loaded piles are in reasonable agreement with those obtained by other methods (for example, finite element analysis, or the closed form solution proposed by Randolph and Wroth, 1978). However, it is considered that the charts of influence factors presented for laterally loaded piles (based on piles of length to diameter ratio of 20) may be misleading when applied to piles of higher length to diameter ratios.

As the Authors point out, the majority of piles encountered in practice behave as flexible piles under lateral loading; that is the deformations and bending moments are confined to the upper region of the pile (typically about ten diameters). It thus seems inappropriate to define a stiffness ratio K_R in terms of the total pile length, which is no longer a relevant parameter for flexible piles. For the same reason, it seems illogical for the pile length to appear in the expressions for the deformation of the pile at the ground surface. For example, two piles of the same cross-section, embedded in a particular soil to different depths (sufficient so that both behave as flexible piles), will have different values of stiffness ratio K_R and thus different values for the influence coefficients I_H, etc. However, both piles will deform identically under lateral loading.

A more logical approach would be to non-dimensionalize the pile stiffness ratio by means of the pile width D. Thus the stiffness ratio would, in effect, be a ratio of pile modulus to soil modulus (similar to that for axially loaded piles) with the addition of a factor which will depend on the geometry of the pile cross-section. For non-homogeneous soils, the relevant soil modulus is not that at the pile base but an average value over the active length of the pile (i.e. that part which deforms appreciably). Some iteration will be necessary since the active length of pile will itself be a function of the ratio of pile and soil moduli (Randolph, 1977).

Banerjee and Davies state that, for their definition of stiffness ratio K_R, the influence coefficients are largely independent of the ratio of pile length to diameter (for constant value of