Proceedings of the Institution of Civil Engineers
Geotechnical Engineering 155
April 2002 Issue 2
Pages 149–151

Recently in *Géotechnique*

A. Bond, *Honorary Editor*

The following are a selection of papers published recently in *Géotechnique* that readers of *Geotechnical Engineering* may find of particular interest. The selection concentrates on applied rather than pure research topics and covers issues published from September 2001 to March 2002.

Consolidation of naturally gassy soft soil

G. C. Sills and R. Gonzalez
Géotechnique, 2001, **51**, Sept., 629–639.

Biogenic gas is produced and contained in fine-grained soils in environments such as river estuaries and landfill sites. Planning dredging operations or predicting the volume capacity of a landfill requires information about the amount of gas that can be held in the soil, and about the effect that the gas has on the soil behaviour. The purpose of this paper is to present some experimental results and interpretation relevant to these and related topics. A series of experiments has been carried out at Oxford University with soil of estuarine origin from the Slufter disposal site in the Netherlands. The soils were introduced in settling columns, and the different stages of consolidation were documented by measuring height, densities, excess pore pressures and amount of gas. At the end of primary consolidation the gassy soil was consolidated to higher stress levels by applying a hydraulic gradient. The growth rates of bacteria producing gas within the soil were accelerated or reduced by controlling the temperature in the range 10–30+C. The experimental results show a sequence of events during consolidation. In the first phase, gas was produced and accumulated within the soil. The overall density of the gassy soil decreased and pore pressures fluctuated unpredictably. At the end of this phase the amount of gas within the soil reached a critical threshold value and thereafter began to escape through cracks and fissures. This marked the start of a second phase of events. Although the gas production continued to be high, the total amount of gas within the soil slowly decreased. The soil began a new phase of consolidation, with the settlement accelerating, as the cracks and fissures provided a quick route for pore water dissipation. The self-weight stresses in these experiments do not exceed 1 kPa, so that higher stress levels were achieved by the application of a hydraulic gradient. During this stage, the gas within the soil became less influential as the soil gained in strength.

Stabilisation of leaning structures: the Tower of Pisa case

S. M. T. Ranzini
Géotechnique, 2001, **51**, Sept., 647–648.

Technical note (no synopsis available).

Vertical stress formula for pressure over rectangular areas

H. M. Algin
Géotechnique, 2001, **51**, Oct., 719–722.

Technical note (no synopsis available).

Upper-bound load estimates on square and rectangular footings

R. L. Michalowski
Géotechnique, 2001, **51**, Nov., 787–798.

Limit analysis of square and rectangular rough footings is presented in this paper. All mechanisms of failure considered in the analysis consist of four regions, each characterised by plane deformation. However, the geometry of the mechanisms is three-dimensional. Both continuous deformation and multi-block patterns are considered. A common feature in all mechanisms is truncation of the blocks with conical surfaces. Standard calculations of the work dissipation rate are complex because of the elaborate three-dimensional geometry. However, a theoretical development is shown indicating that the tedious calculations of work dissipation on curved velocity discontinuity surfaces and within the deforming regions of cohesive-frictional soils can be substituted with an integral over the surface of the mechanism. While this method cannot be used easily for soils with an arbitrary distribution of properties, its application is straightforward for homogeneous soils, and it can also be used for layered soils. Calculations of bearing capacity are performed for both square and rectangular footings. It was surprising to find that the least upper-bound estimates of loads on square footings occur for mechanisms with no symmetry with respect to diagonal planes. The results are given in terms of the bearing capacity coefficients, and shape factors applicable as modifiers in the bearing capacity solution for strip footings. As expected, these factors approach unity with an increase in the footing aspect ratio L/B. The factors calculated are typically larger than earlier empirical proposals in the literature.

Three-dimensional site characterisation: neural network approach
C. H. Juang, T. Jiang and R. A. Christopher
Géotechnique, 2001, **51**, Nov., 799–809.

Site characterisation is an important task in geotechnical engineering practice. The ultimate goal in site characterisation is to be able to estimate in situ soil properties at any half-space point at a site based on limited tests. This estimate may be a point estimate or expressed in terms of some statistical parameters. Geostatistical and random field methods have been applied with limited success. This paper presents a new approach, based on artificial neural networks, for site characterisation. Emphasis is placed on the application of generalised regression neural networks for site characterisation. The results show that the neural network approach has the potential to be a practical tool for site characterisation.

Obituary: Alec Westley Skempton
R. J. Chandler, M. M. Chrimes, J. B. Burland and P. R. Vaughan
*Géotechniqu*e, 2001, **51**, Dec., 829–834.

Soil consolidation with grouting during shield tunnelling in soft clayey ground
K. Komiya, K. Soga, H. Akagi, M. R. Jafaris and M. D. Bolton
Géotechnique, 2001, **51**, Dec., 835–846.

The effectiveness of grouting to reduce surface settlements during underground construction in clayey ground was investigated by a field trial and laboratory tests. The field trial was carried out during shield tunnelling work conducted in alluvial clay deposits in Koto-ku, Tokyo. Grout was injected at some distance away from the tunnel, and both surface and subsurface settlements above the tunnel were monitored. Although the initial heave was achieved immediately after the grout injection, the ground continued to settle with time, owing to soil consolidation and grout shrinkage. A laboratory investigation was conducted to investigate the parameters that control the long-term behaviour of grouting in clay. It was found that better long-term grout efficiency can be achieved in overconsolidated clay than in normally consolidated clay, and the efficiency increased with increasing injection volume. Finite element analysis of the laboratory experiments confirmed that the amount and extent of excess pore pressures generated during injection govern the long-term grout efficiency. Finite element analysis of the field trial was also performed to simulate the long-term ground deformation after grout injection.

Horizontal slice method of analysis
M. Shahgholi, A. Fakher and C. J. F. P. Jones
Géotechnique, 2001, **51**, Dec., 881–885.

Technical note (no abstract available).

On the application of the Hiley formula in driving long piles
T. Triantafyllidis
Géotechnique, 2001, **51**, Dec., 891–895.

Technical note (no abstract available).

Arminou Dam, Cyprus, and construction joints in diaphragm cut-off walls
A. J. Brown and D. A. Bruggemann
Géotechnique, 2002, **52**, Feb., 3–13.

This paper is in two parts. The first part describes the foundation seepage cut-off to a new 42 m high gravel fill dam with central clay core. A single 0.8 m wide plastic concrete diaphragm wall, together with adjacent bentonite cement alluvial grouting, provides a seepage cut-off through the 15 m depth of underlying granular alluvium. The discovery of bentonite infill in construction joints in trial panels for the diaphragm wall led to the introduction of alluvial grouting, to inhibit erosion of this bentonite infill into coarse zones in the alluvium. The second part of the paper discusses the main factors governing the effectiveness of diaphragm walls as seepage cut-offs and related dam safety issues, including construction joints, hydraulic gradients and hydraulic fracture. There are a number of issues relating to the use of diaphragm walls as seepage cut-offs that are not well understood, which should be considered in design, construction and monitoring of such walls and where further research is needed.

Behaviour of reinforced embankments on soft rate-sensitive soils
R. K. Rowe and A. L. Li
Géotechnique, 2002, **52**, Feb., 29–40.

The behaviour of reinforced embankments constructed over rate-sensitive soft foundation soils is studied. Factors such as the viscoplastic properties and hydraulic conductivity of the soil, reinforcement stiffness and construction rate are examined. The time-dependent responses of excess pore pressures, reinforcement strains and foundation deformations are investigated. The short-term embankment stability is of particular interest. The construction of reinforced embankments to the height determined based on a limit equilibrium design is simulated to examine the assumptions made in the conventional undrained analysis. It is shown that creep and stress-relaxation of viscoplastic soils after the end of embankment construction may be significant for rate-sensitive soils. The embankment stability is shown to be critical during creep and stress-relaxation of foundation soils after construction. The undrained shear strength measured in laboratory triaxial tests using currently recommended strain rates without an appropriate correction may lead to unsafe design for rate-sensitive soils. For such soils, the increase in reinforcement strain shortly after the completion of construction can be higher than that developed during the construction. Excess pore pressures increase after construction owing to the viscoplastic behaviour of the foundation soil. Reinforcement is shown to have the potential to both increase stability and decrease long-term creep deformations.

Bearing capacity of strip and circular foundations on undrained clay subjected to eccentric loads
H. A. Taiebat and J. P. Carter
Géotechnique, 2002, 52, Feb.,61–64.

Technical note (no abstract available).

Seismic bearing capacity factors for spread foundations
J. Kumar and V. B. K. Mohan Rao
Géotechnique, 2002, **52**, March, 79–88.

The effect of horizontal earthquake body forces on the bearing capacity of foundations has been examined computationally in a rigorous manner by employing the method of stress characteristics. The bearing capacity factors Nc, Nq and NUNKNOWN CHARACTER 227, due to the components of soil cohesion, ground surcharge pressure and soil unit weight respectively, have been plotted as a function of earthquake acceleration coefficient (áh) for different values of soil friction angle (ö). The inclusion of earthquake body forces causes a considerable reduction in the bearing capacity factors. The bearing capacity factors Nc and Nq are seen to be approximately of the same magnitude as those reported in the literature on the basis of different solution methods. However, the obtained values of NUNKNOWN CHARACTER 227 are found to be significantly smaller than the available results. The nature of the pressure distribution along the footing base and the geometry of the observed failure patterns vary with the consideration of earthquake body forces.

Centrifuge model tests on embedded retaining walls supported by earth berms
W. Powrie and M. P. Daly
Géotechnique, 2002, **52**, March, 88–106.

Earth berms are often used for the temporary support of embedded retaining walls, but there is a lack of information concerning the factors that influence their behaviour. In this paper, the results of a series of plane strain, 1:100 scale centrifuge model tests on berm-supported embedded retaining walls in overconsolidated clay are presented. It is shown that earth berms will probably be more effective in reducing soil and wall movements than an increase in the depth of wall embedment; that an increase in the depth of embedment of a wall of given stiffness supported by a berm of a given size will lead to an increase in wall bending moments, but only a small reduction in wall and soil movements; and that the presence of the berm in limiting wall movements and possibly preventing collapse becomes more significant as drainage occurs.

The performance of pressure cells for sprayed concrete tunnel linings
C. R. I. Clayton, J. P. Van Der Berg, G. Heymann, A.V. D. Bica, and V. S. Hope
Géotechnique, 2002, **52**, March, 107–115.

The paper examines the factors that affect the performance of tangential cells embedded in shotcrete tunnel linings. New data, derived from field monitoring, numerical modelling, and calibration tests carried out to simulate the embedment and crimping processes, are presented. These suggest that although well-designed embedded total pressure cells will have cell action factors close to unity, they cannot be assumed to provide reasonable estimates of the stresses within sprayed concrete linings, unless the influences of installation effects, temperature changes, shrinkage and subsequent crimping can be taken into account.