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Sheet-pile walls in clay †
by
Peter Walter Rowe, D.Sc., Ph.D., A.M.I.C.E.

Discussion

The following contributions were received in writing.

Mr N. J. Cochrane (Senior Engineer, Sir William Halcrow & Partners) stated that the Author's analysis was penetrating and also salutary in some respects. The purely mechanical interpretation of the behaviour of clays became, of necessity, more elaborate and it seemed essential to explain the Author's basic parameters in more detail. He had used three kinds of cohesion which were denoted "immediate", "apparent", and "true". Would he say which of the laboratory or field tests was to be used to establish their values? For example, if he used a vane test he might obtain a value for "cohesion" of, say, $1\frac{1}{2}$ times the value given by unconfined compression or quick triaxial test. If he used a slow drained triaxial test he might conclude that there was no cohesion at all, merely shear strength.

The Author, in reply, pointed out that the "immediate" cohesion should be measured using a series of undrained triaxial compression tests, plotting Mohr's circles of total stress. The unconfined test was a particular case but it was not always suitable, for low results could be obtained with fissured clay. The vane test was usually reserved for soft or sensitive clays where flexible retaining walls would be unsuitable, but in principle it measured the same property. Mr Cochrane's ratio of $1\frac{1}{2}$ seemed a little high (see reference 17 below).

In order to determine the active pressures for a driven and dredged wall a long time after construction the effective-strength parameters c' and ϕ' had been advised, taking $c'=0$. They were measured in the consolidated-undrained triaxial compression test with pore-pressure measurement plotting Mohr's circles of effective stress. The parameters c_d and ϕ_d from the slow-drained test were closely related to c' and ϕ' and where the retained clay could expand with time the slope of the locus of the slow-drained circles of effective stress ϕ_d was the more appropriate ultimate-strength parameter, taking $c_d=0$. Detailed treatment of the equations of shear strength could be found in references 18 and 19.

† Proc. Instn civ. Engrs, vol. 7, p. 629 (July 1957).

17. H. Q. Golder and D. J. Palmer, "Investigation of a bank failure at Scrapsgate, Isle of Sheppey, Kent". Géotechnique, Lond., vol. 5 (1955), p. 55.

18. "Building materials—their elasticity and inelasticity" ed. by M. Reiner. Ch. 10—"Soils" by A. W. Skempton and A. W. Bishop.

19. A. W. Bishop and D. J. Henkel, "The measurement of soil properties in the triaxial test". Arnold, Lond., 1957.