

The Secretary,
The Institution of Civil Engineers.

DEAR SIR,

The correspondence from Mr T. Cameron Kenney in *Géotechnique* (11 : 1 : 54) uses a Paper by Osterberg and myself as a reference. I would like to add some comments that seem appropriate.

The shear strength components usually referred to as true cohesion and true angle of internal friction are not defined in the same way as the cohesion and friction components in the reference. The definitions used by Hvorslev and subsequent workers involves the assumption that at the same void ratio a given soil has the same cohesion. Any strength differences between specimens with different histories which result in different values of effective stress on the failure plane at the failure strain, but at the same void ratio on that plane, are then assumed due to the influence of the friction component of strength. It is on the basis of this assumption that the experimental determination of c_e and ϕ_e is carried out.

On the other hand, the definitions used in the reference are based on the manner in which the ability of a specimen to sustain deviator stress varies with imposed changes of effective stress—at any given strain condition. The effective stress is changed by means of controlled pore-pressure changes. Duplicate specimens with different histories are not required because a single specimen, either remoulded or undisturbed, is adequate. These definitions do not assume constant cohesion at constant void ratio. Comparison with the above shows that they are not similar. However, the Writer agrees that the use of the terms “cohesion” and “friction” in the reference may be confusing. It may help the reader to think of the definitions used in the reference as the “pore-pressure insensitive” and “pore-pressure sensitive” components rather than as cohesion and friction.

In view of the above, the manner in which Mr Kenney used this reference could cause some confusion. However, the Writer believes that strain should be included as an independent variable in any definition of the components of soil strength and agrees with the philosophy of Mr Kenney's comments and questions.

Yours faithfully,

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Department of Civil Engineering,
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11 May, 1961.

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The Institution of Civil Engineers.

DEAR SIR,

I have read with great interest the Paper “Tunnel stress analysis” by H. D. Morgan (*Géotechnique*, 11 : 1 : 54).

To calculate the maximum bending moment in the lining, the Author has assumed that the lining is distorted into the shape of an ellipse; he has also assumed the active loading conditions on the lining.

In 1957, I developed a method of designing tunnel linings which does not require these assumptions to be made. The results are given by the following formulae.

Symbols

D = depth, vertical distance.

E, E_m = modulus of elasticity of a mass of soil.