DISCUSSION

Distribution of earth pressure on a retaining wall

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The author in his paper has suggested a method of determining the distribution of active earth pressure against the back of a vertical retaining wall on the basis of an assumed linear failure surface. The discussor would like to commend the efforts made by the author in achieving mathematically a closed-form solution for the unit earth pressure at any point on the wall. The magnitude of total active force becomes exactly the same as given by the conventional Coulomb's approach. The discussor, however, would like to raise the following issues with regard to the applicability of the proposed methodology.

The basic governing differential equation for the problem has been derived by considering the horizontal and vertical force equilibrium of the quadrilateral soil element as shown in Fig.1 of the paper. The contribution of shear stresses on the top and bottom horizontal planes of this element has been totally ignored. This assumption cannot be simply justified for a non-zero value of wall friction angle (rough wall), although for a smooth vertical retaining wall it is satisfied, as demonstrated by the Rankine active state of stress.

The satisfaction of the moment equilibrium condition of the soil element is not addressed in the proposed approach. The solution obtained by the author will not be able to satisfy the moment equilibrium condition in all cases.

The distribution of the proposed formula for the pressure distribution on the wall depends on the magnitude of the earth pressure coefficient, K , although the magnitude of the total

earth pressure remains independent of K . The value of K still needs to be assumed before obtaining the earth pressure distribution. It has been mentioned by the author that the value of K varies between the active earth pressure coefficient, K_a , and the coefficient of earth pressure at rest, K_0 . Variation in K will alter the distribution of earth pressure on the wall.

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The value of the angle θ is not made explicit in this paper, but it is crucial. This value is not $\pi/4 - \phi/2$ (or $\pi/4 - \phi/2$); it is equal to $\pi/4 - \phi_0/3$. See Reimbert (1989), pp. 11, 13 and 98–104.

For angle ϕ_0 see Reimbert (1989) p. 6 and pp. 115–116. For the relation between ϕ and ϕ_0 see Reimbert (1989) p. 117 and all of Appendix 5, p. 159 *et seq.*

The experimental results in Fig. 2(a) of Wong's paper and the curve 'present theory' are incompatible with the natural equilibrium described in Reimbert (1989) p. 119 *et seq.* Similar comments apply in the case of horizontal backfill.

Rankine's theory, is, we feel, obsolete. See pp. 104–108 and 124–126 of Reimbert (1989).

REFERENCE

Reimbert, A. M. (1989). *Retaining structures: a guide of engineering design*. Paris: Lavoisier.