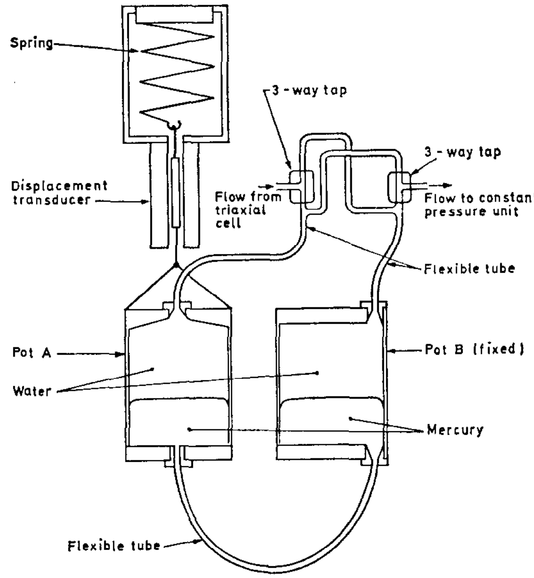

Fig. 1. Schematic diagram of volume measuring system

To maintain the mercury levels a spring of stiffness 196 N/m is used with pots of 63·5 mm internal dia. This gives a theoretical sensitivity of 0·63 mm change in spring length per mlitre of volume change.

The instrument has been tested for stability for periods of up to 48 h and gave readings within $\pm 0{\cdot}015$ mlitre. It has also been calibrated against a paraffin volume change indicator at flow rates of 0·1 mlitre/min and 0·5 mlitre/min. The calibrations showed the device to be accurate to within $\pm 0{\cdot}05$ mlitre and there was no significant change of calibration with rate of flow.

Using a $\pm 7{\cdot}5$ mm transducer a volume of 24 mlitre can be measured. If it is required to measure larger volumes a tap system as shown in Fig. 1 can be included to reverse the direction of flow through the instrument.

During testing considerable difficulty was encountered in de-airing the prototype. The pots were therefore modified as shown so that the mercury could be pumped into pot B which is then rotated to a horizontal position allowing a free flow of water through the device.

At present the device appears to offer a simple and convenient method for automatically recording volume changes with sufficient accuracy and stability for routine testing. Further evaluation of the device for use with the triaxial test is currently being done at the Laboratory.

The increase in bearing capacity resulting from consolidation

TAYLOR, P. W. and OOI, T. A. (1971). *Géotechnique* **21**, No. 4, 376–389.

S. B. Bhide and P. N. Sundaram, Indian Institute of Technology, Bombay

The Authors have presented an excellent analysis of the effect of consolidation on increase in bearing capacity of soft clays and cite examples of preloading of oil storage tanks to achieve an increase in bearing capacity of such soft clays.

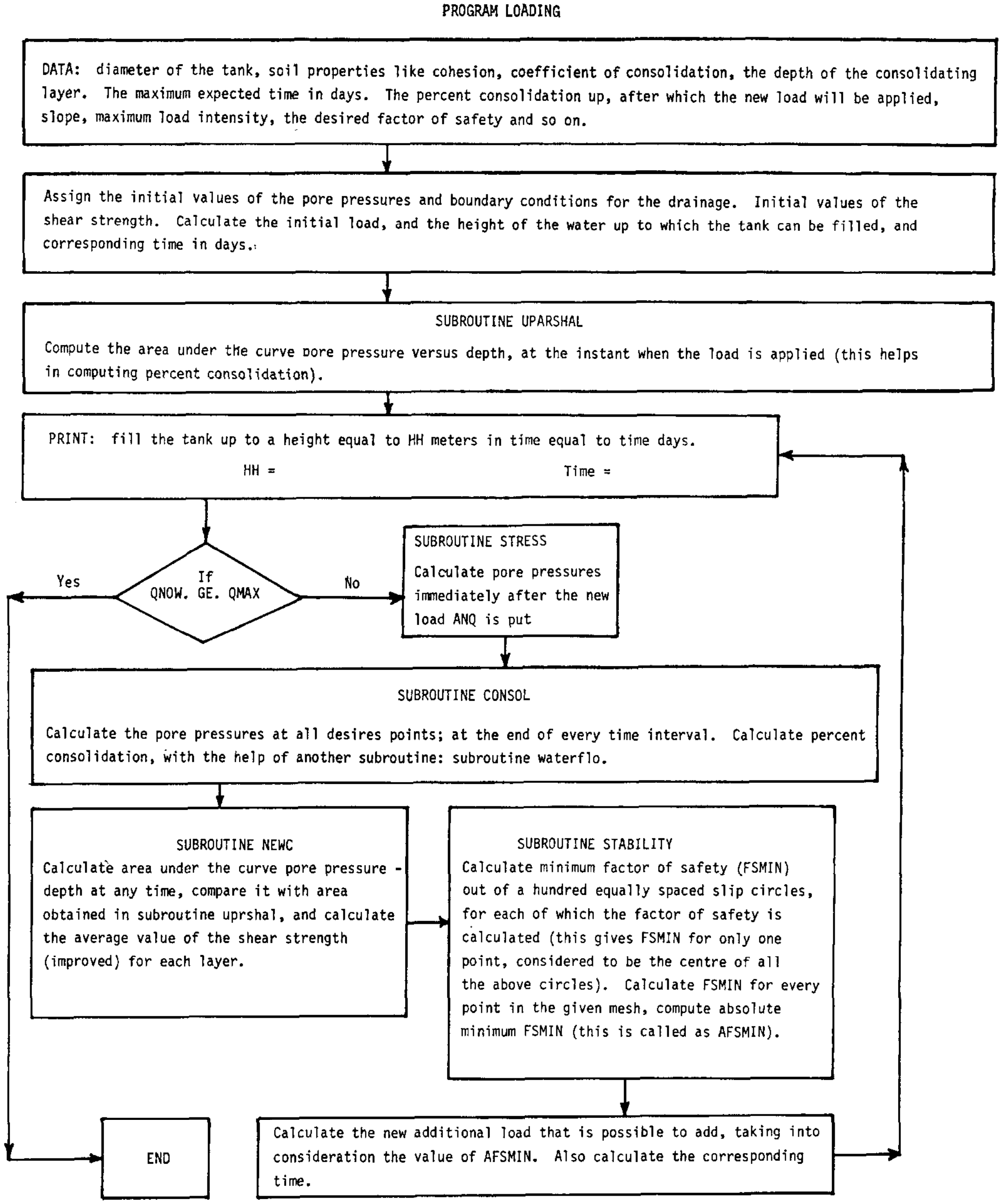

Fig. 1. Block flow diagram of computer operations

A similar analysis has been done (Bhide, 1972) wherein the improvement in shear strength of the soft clay layer during consolidation has been considered for step-loading of tanks. A generalized computer program was developed to automatically analyse the stability of such tanks at periodic intervals during loading, for all combinations of tank compressible layer geometry, strength variation, and drainage conditions of the compressible layer. The block flow diagram of computer operations is shown in Fig. 1.

The output consists of pore pressures at different depths below the centre of the tank,

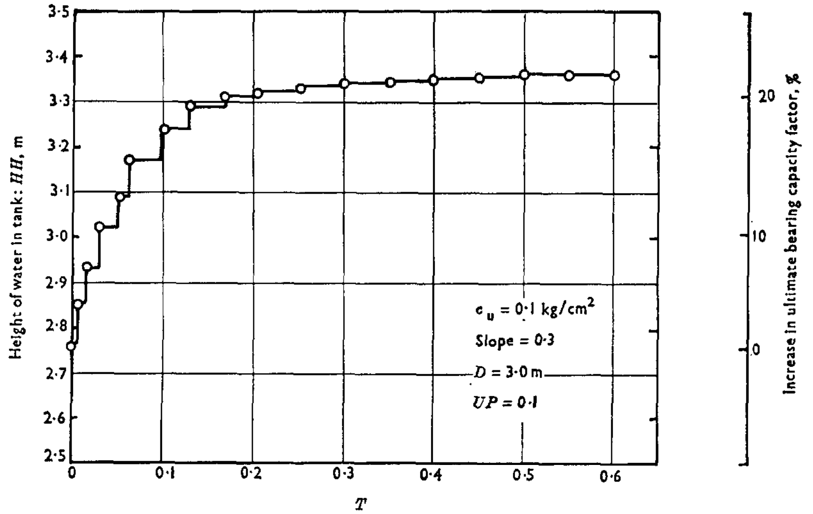

Fig. 2. Height of water vs time factor T (single drainage): slope = ratio of increase in shear strength vs consolidating pressure

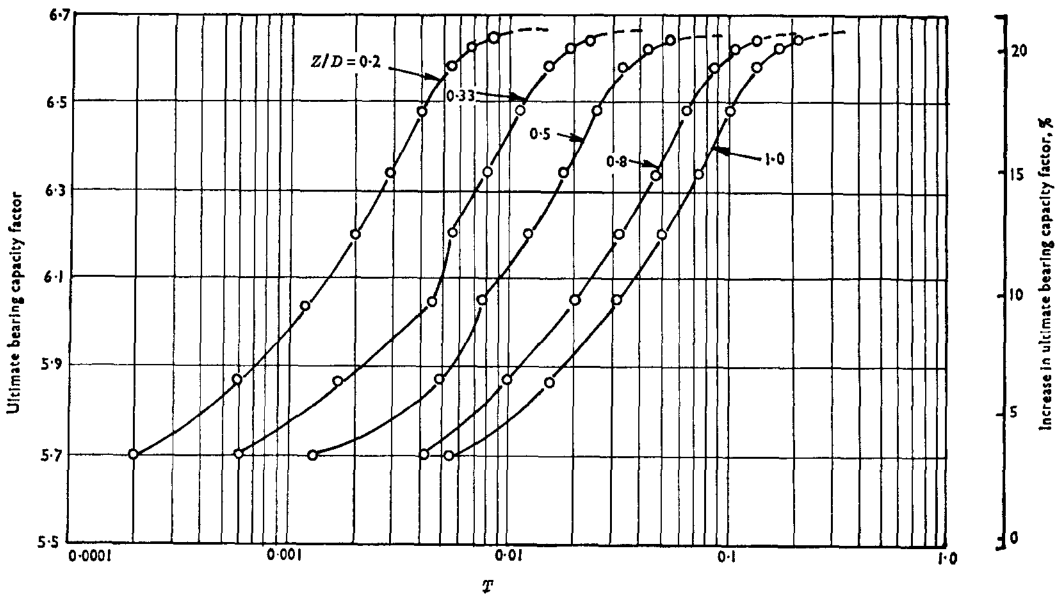

Fig. 3. Ultimate bearing capacity factor vs time factor T (single drainage). For various (thickness of clay layer/diameter of tank) ratios = Z/D, T is calculated on the basis of depth of clay layer = diameter of the tank: C_u = 0·1 kg/cm²; slope = 0·3

altered cohesion C_u values and minimum factor of safety, out of approximately 5000 trial failure circles, at different time intervals. The entire analysis on CDC–3600 computer takes approximately 5 min for 18 consecutive step loadings.

The analysis shows that it is possible to fill the tank continuously (but with a varying rate of filling), maintaining a certain desired factor of safety (Fig. 2).

Even though the analysis was done generally for depth of the clay layer equal to the diameter

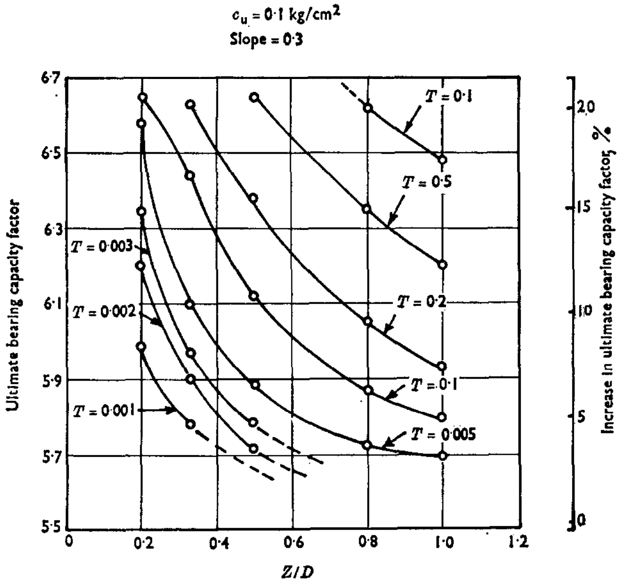

Fig. 4. Ultimate bearing capacity factor vs thickness of clay layer/diameter (Z/D) for different values of T (single drainage)

of the tank, approximate solutions were obtained for depths smaller than the diameter of the tank, for either single or double drainage conditions. Fig. 3 gives the ultimate bearing capacity factor plotted against T for different Z/D (depths of clay layer/diameter of the tank) ratios, while Fig. 4 gives the ultimate bearing capacity factor against Z/D for various values of T.

The assumptions made in the analysis are: (*a*) drainage occurs in the vertical direction, and (*b*) the rate of loading does not cause appreciable lateral flow of the clay soil.

The Writers agree that lack of field pore pressure measurement and relevant data hinders comparison of proposed theories with actual developed values.

REFERENCES

Bhide, S. B. (1972). *Analysis of steel storage tanks and foundations.* M.Tech. dissertation, Indian Institute of Technology, Bombay.

An earth slip at Tiverton, Devon

CROFTS, J. E. & BERLE, D. A. (1972). *Géotechnique*, **22**, No. 2, 345–351.

R. A. H. Burton, Chief Civil Engineer's Department, British Railways Southern Region

In the Paper, the Authors say that an area of clayey slipped waterbearing soil was stabilized by conventional ground water lowering using well points. I can confirm the Authors' experience that such soil (silty–clayey) can be so stabilized over a period of weeks, despite little water being removed. In the case with which I am familiar (the soil was firm clay with (as it proved) a random wet silty layer) well points removed 'teaspoonfuls of water' from the silt over a period of four weeks. However, this small extraction rate was enough to stabilize the running soil for the time of installation of a thrust bored drain by a third party, beneath private property.

It seems to be generally accepted that ground water lowering, in soils of particle size distribution finer than sand, is impracticable. However, I am convinced that, where soil stabilization only is desired, prolonged pumping in silts is sufficient to eliminate running soil instability.

In a similar case even the close proximity of a stream did not prevent drying out of the soil for the same purpose, because of the poor soil permeability.