

low stress levels nominally undisturbed samples behave very differently from the ground. Zero volume change on sampling cannot be achieved even if capillary tension due to stress relief limits expansion. However, incremental behaviour at higher stresses can be modelled more successfully in the laboratory.

The consolidation test is especially useful for establishing the preconsolidation pressure, coefficients of compressibility and expansion and their ratio. Soils showing very different behaviour when unloaded with and without surplus water should be treated with caution. The pressure at which expansion rates increase rapidly on further unloading indicates the tendency for surface swelling.

The results are modified by experience to give:

3. *nominal parameters* that are checked against experience and published correlations. The bases for broad published correlations should be understood and recognised as a qualification to their use. These correlations or 'prescriptions' should be reviewed critically if sufficient results show consistently different behaviour. Once parameters are established a start can be made in preparing the

4. *design* when the outline proposals are sketched out. Engineering action and judgement have been used so far and only now does the engineer need

5. *calculations* to show that the design is adequate or if not to suggest modification that are checked by further calculation. Particularly in geotechnical engineering calculations follow the creative design of the scheme and have a value only when measured against a 'level of acceptance' where, for instance, calculated strains need to be compared with the consequences of movements. The levels of acceptance should be checked by

6. *observation* either directly from obvious indications of behaviour such as cracking of non-structural elements in buildings or by special instrumentation. What movements are critical and show the approach of collapse? The level of acceptance should be kept under review by observing behaviour. Mining engineers in particular are dealing with transient short term conditions where strains can be large but are not important once mining is complete. Micro-acoustic emissions are a sensitive indicator of distress in rock that may also prove useful for saprolites.

If the behaviour is less than adequate some or all of the design processes should be revised for the next schier. Unquestioning acceptance of techniques and rules inhib... development.

Professor de Mello believed that in saprolites a 'cohesion' existed and in fact could increase in time. In the Amazon basin newly cut slopes were alternately wetted and allowed to dry in order to induce moisture migration to the face with recrystallisation of chemicals to form a cemented rain resistant surface. The Mohr envelope for shallow material was often flatter than at depth but with a higher cohesion intercept. However the true strength increased with depth. The 'parametric cohesion' derived by straight line extrapolation to zero stress should be used with caution especially when the ground was being unloaded.

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GEOTECHNICAL GROUP
Address by Prof. de Mello

The Geotechnical Group Committee is now engaged in formulating the policies and planning the activities of the Group. The official start of the Group's programme is planned for April 1980, to coincide with the 1980-81 session.

One of the activities being planned by the Committee is to invite distinguished overseas geotechnical engineers who are visiting Hong Kong to give a lecture or talk to members of the Group. Such an opportunity arose last month when Professor Victor F.B. de Mello was in Hong Kong. Professor de Mello is well known internationally for his work in soil mechanics and, notwithstanding the very short notice, he agreed to give a talk on residual soils.

Mr. S. Rodin chaired the meeting which was held on October 2 at the Hong Kong Polytechnic, with about 163 people attending.

Professor de Mello very entertainingly 'exchanged doubts' over a wide range of aspects of geotechnical design and general soil behaviour but concentrated on residual soils or saprolites (as he preferred). He stressed that we 'could search in vain for the 'ultimate truth' in geotechnical engineering. 'Engineering science' was an aid to 'engineer, action', or design judgement, based on boundary condition.

The tropical weathering profiles in Hong Kong and his own Brazil were similar and could be broadly subdivided into:-

Mature soils - no relict structure, conventional soil mechanics techniques appropriate.

Saprolites - heterogeneous with relict structure.

Weathered rock - weak but conventional rock mechanic techniques appropriate.

Particular care and thought were needed in dealing with saprolites which are neither soil nor rock and are heterogeneous in almost all engineering behaviour. For any one problem the pertinent properties must be established for the 'significant volume' that behaved in the same way as the whole soil mass. In settlement calculations the compressibility of the loaded volume was required with variations in properties being average, whereas in other problems lower or upper boundary conditions could govern. Professor de Mello drew comfort from the 'silent majority' of designs that behaved perfectly well and did not need publication. In some fields the numerous published case histories should be synthesised as the present proliferation of information was confusing.

The process of evolution of a scheme could be considered in a number of stages starting with an assessment of the ground based on crude but simple guides such as:

1. *index tests*. Conventional index tests should be applied with caution to residual soils. The particle size distribution derived in the laboratory can depend on the type of flocculant used but this phenomenon may also be a significant property of the material. Possibly other indices should be devised for saprolites to indicate the most appropriate.

2. *fundamental tests* such as compressibility, strength and permeability. The stress condition within saprolites are changed radically by very small strains. Therefore, in-situ stress measurements are difficult and none has been made successfully. Movements of a few millimetres have been found to be sufficient to form slickensides. Especially at

Members are reminded to send in their entry forms for the President's Cup golf competition as soon as possible. Held at Sheko Country Club on November 30, this will be an 18 hole Stableford on handicap. Details in the October issue of the Hong Kong Engineer.