into the virgin soil and the '*N*' value is obtained for 30 cm penetration. In the authors' device, the penetrometer is made of conical point and if the penetrometer is given same specification as SPT, the cone resistance will be very large owing to the sinking of the penetrometer beyond 15 cm penetrations. The authors should analyse this point of information before the tool is adopted for standardization. In contrast the writer feels, the penetrometer could be used as a continuous penetration apparatus rather than using at specified depths.

AUTHORS' REPLY

The authors appreciate the comments of Shri V. Raman. The clarification for some of the points are as follows :

1. The detailed procedure regarding placement and compaction of sand has been described in the text of the paper. The assessment of uniformity of compaction was made qualitatively by an improvised penetrometer, the details of which are also given in the paper.

2. The paper constitutes a sort of progress report on a continuing research project for the development of a light weight dynamic penetrometer. Only two types of locally available sand and as are generally encountered in many parts of Rajasthan were selected for laboratory study. The work has to be confined to limited ranges of density and moisture content and other variables.

3. The work has been extended to include comparison with the standard penetration test and a reference is invited to the authors another paper entitled 'Some Experiments with a Light Dynamic Penetrometer with a View to Assess its Suitability for Exploring Subgrades and Foundations' published in the journal of the Indian Road Congress, Vol. 35-I, April 1973.

The work on this research project is in progress and will be reported in times to come.

* * *

Zones of Compressibility in the Modified Plasticity Chart*

by

S.K. Chakraborty

V. DAKSHANAMURTHY AND V. RAMAN**

The writers congratulate the author for the paper on 'Zones of Compressibility in the Modified Plasticity Chart', with emphasis laid on the compressibility characteristics of soils based on the degree of liquid limit values. The IS : 1498 : 1959 classifies the fine grained soil into 3 subdivisions, viz.

(1) Silts and clays of low-compressibility having LL<35.

* Published in the Indian Geotechnical Journal, Vol. 3, No. 1, January 1973 issue, pp. 38-42.

**Department of Civil Engineering, Soil Engineering Laboratory, Indian Institute of Technology, Madras-600036.

(2) Silts and clays of medium-compressibility having LL > 35 and <50.

(3) Silts and clays of high-compressibility having LL>50.

In the authors' analysis of plasticity chart, there are four divisions in general, viz., soils of low, medium, high and very high compressibility whose liquid limit values varying from 0-50, 50-75, 75-100 and 100-750 respectively. The writers are of the opinion that the degree of compressibility can only be correlated to the compression index of the soil, since the compressibility property of the soil is itself dependant upon the clay minerals, pore water pressure, stress history of the soil, etc., and merely correlating the compressibility property to the liquid limit values will not be a meaningful one. To substantiate the above statement, the writers note that compression index of clays are generally obtained from consolidation test in natural state, whereas the liquid limit test is done on remoulded state which will have very much influence on classification of the soil based on compressibility. The writers feel that if liquid limit is done on natural state, an empirical relationship as suggested by Skempton will be a useful index of compressibility value based on liquid limit values.

The classification of expansive soils based merely on its compressibility characteristics as suggested by the author needs additional information, viz., the shrinkage index and free swell value. Hence the writers feel that the above classification requires some more detailed study. However, the writers (1973) have presented a simple method on identification of expansive soils, based on liquid limit and shrinkage index and it has been proved that even organic soils do come under expansive group whether it falls under M or C groups.

References

1. I.S. : 1498-1959 "Classification and Identification of Soil for General Engineering Purposes".

2. DAKSHANAMURTHY, V. and RAMAN, V. (1973) : "A Simple Method of Identifying an Expansive Soil—Soils and Foundations". Vol. 13, No. 1, March 1973, Japan.

AUTHOR'S REPLY

The author thanks writers for showing some interest in discussing the paper. Degree of compressibility can be co-related not only to the compression index but to the liquid limit. This has already been supported by the writers while referring to the IS Code 1498 : 1959. Relative to the liquid limit, the degree of compressibility such as low, medium and high are also mentioned by the writers in their discussions. The author only showed a slightly different trend in his analysis than the one developed by Casagrande (1936) who had only results of limited number of soils. Therefore, his divisions of degree of compressibility had some limitations. But the author had collected results of more than 2000 soils and could replot the whole plasticity chart in an entirely different fashion indicating four major relations. Moreover, Skempton (1944) conducted consolidation tests on a number of clays from different parts of the world and gave the following equation of compression index for a remoulded sample :

$$C_c = 0{\cdot}007\,(W_L - 10\ \%)\ .$$

For an ordinary clay of medium to low sensitivity, the value of C_e' corresponding to field consolidation is roughly equal to 1·3 times the value of $C_e = 0{\cdot}009\,(W_L - 10\ \%)$. Hence, the compression index is a function of liquid limit in both natural and remoulded state. The degree of compressibility can now be co-related either with liquid limit or with compression index. The author also agrees that organic soils do come under expansive group. Detailed informations regarding expansive soils were not mentioned in the author's chart, only their general behaviour with regard to plasticity index versus liquid limit were indicated, though the writers' reference on expansive soils is noted.