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METHODS OF TEST FOR SOILS

PART XL DETERMINATION OF FREE SWELL INDEX OF SOILS

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METHODS OF TEST FOR SOILS

PART XL DETERMINATION OF FREE SWELL INDEX OF SOILS

0. FOREWORD

0.1 This Indian Standard (Part XL) was adopted by the Indian Standards Institution on 30 December 1977, after the draft finalized by the Soil Engineering Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 With a view to establish uniform procedures for the determination of different characteristics of soils and also for facilitating comparative studies of the results, the Indian Standards Institution has brought out this Indian Standard Methods of test for soils (IS : 2720) which is being published in parts. Forty-one parts of this standard have been published. This part [IS : 2720 (Part XL)-1977] deals with the method of test for the determination of free swell index of soils. Free swell is the increase in volume of a soil, without any external constraints, on submergence in water. The possibility of damage to structures due to swelling of expensive clays need be identified, at the outset, by an investigation of those soils likely to possess undesirable expansion characteristics. Inferential testing is resorted to reflect the potential of the system to swell under different simulated conditions. Actual magnitude of swelling pressures developed depends upon the dry density, initial water content, surcharge loading and several other environmental factors.

0.3 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.4 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard (Part XL) covers a test for the determination of free swell index of soil which helps to identify the potential of a soil to swell which might need further detailed investigation regarding swelling and swelling pressures under different field conditions.

2. APPARATUS

2.1 Sieve — 425-micron IS Sieve.

2.2 Glass Graduated Cylinders — Two, 100-ml capacity (*see* IS : 878-1956*).

3. PROCEDURE

3.1 Take two 10 g (*see* Note) soil specimens of oven dry soil passing through 425-micron IS Sieve.

NOTE — In the case of highly swelling soils, such as sodium bentonites, the sample size may be 5 g or alternatively a cylinder of 250 ml capacity may be used.

3.2 Each soil specimen shall be poured in each of the two glass graduated cylinders of 100 ml capacity. One cylinder shall then be filled with kerosene oil and the other with distilled water up to the 100 ml (*see* Note *under* **3.1**) mark. After removal of entrapped air (by gentle shaking or stirring with a glass rod), the soils in both the cylinders shall be allowed to settle. Sufficient time (not less than 24 h) shall be allowed for the soil sample to attain equilibrium state of volume without any further change in the volume of the soils. The final volume of soils in each of the cylinders shall be read out.

4. CALCULATION

4.1 The level of the soil in the kerosene graduated cylinder shall be read as the original volume of the soil samples, kerosene being a non-polar liquid does not cause swelling of the soil. The level of the soil in the distilled water cylinder shall be read as the free swell level. The free swell index of the soil shall be calculated as follows:

$$\text{Free swell index, percent} = \frac{V_d - V_k}{V_k} \times 100$$

where

V_d = the volume of soil specimen read from the graduated cylinder containing distilled water, and

V_k = the volume of soil specimen read from the graduated cylinder containing kerosene.

*Specification for graduated measuring cylinders.

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