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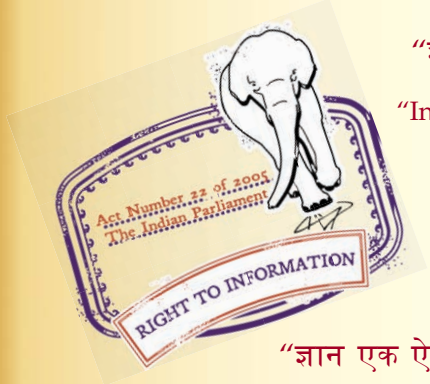

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METHODS OF TEST FOR SOILS

PART III DETERMINATION OF SPECIFIC GRAVITY

Section 2 Fine, Medium and Coarse Grained Soils

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Indian Standard

METHODS OF TEST FOR SOILS

PART III DETERMINATION OF SPECIFIC GRAVITY

Section 2 Fine, Medium and Coarse Grained Soils

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part III/Sec 2) (First Revision) was adopted by the Indian Standards Institution on 10 November 1980, after the draft finalized by the Soil Engineering and Rock Mechanics Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 With a view to establishing uniform procedures for the determination of different characteristics of soils and also for facilitating a comparative study of the results, the Indian Standards Institution is bringing out a series of standards on methods of test for soils (IS : 2720). This part deals with the method of test for determination of specific gravity of the soils which is used in finding out the degree of saturation and unit weight of moist soils. The unit weights are needed in pressure, settlement and stability problems in soil engineering. This standard was published in the year 1964. In view of the further work done in this field in this country and overseas, the revision has been prepared so as to give the latest method of test. The revision is being prepared in two sections: Section 1, dealing with fine grained soil which is basically a laboratory method; and Section 2 dealing with the method for fine, medium and coarse-grained soils which is basically a field method.

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

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1. SCOPE

1.1 This standard (Part III/Sec 2) lays down the method of test for the determination of the specific gravity of soil particle of fine, medium and

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

coarse-grained soils. It is not suitable for soils containing more than 10 percent of stones retained on a 40-mm IS sieve and such stones should be broken down to less than this size.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition shall apply.

2.1 Specific Gravity (G) — The ratio of the weight in air of a given volume of soil solids at a stated temperature to the weight in air of an equal volume of distilled water at that temperature.

3. APPARATUS

3.1 The following apparatus is required:

a) A gas jar of 1 litre capacity, fitted with a rubber bung (*see* Note 1) (*see* Fig. 1);

b) A ground-glass plate or a plastic slip cover for closing the gas jar (*see* Fig. 1);

c) A mechanical shaking apparatus capable of rotating the gas jar, end-over-end, at about 50 rev/min (*see* Note 2);

d) A balance readable and accurate to 0·2 g; and

e) A thermometer to cover the temperature range 0°C to 50°C, readable and accurate to 1°C.

4. PROCEDURE

4.1 A sample weighing 200 g in the case of fine-grained soil and 400 g in the case of medium and coarse-grained soils, shall be obtained in accordance with the procedure for the preparation of disturbed soil samples for testing. This sample shall have been oven dried (*see* Note 3) and then stored in an airtight container until required.

4.2 The gas jar and ground glass plate/plastic slip cover shall be dried and weighed to the nearest 0·2 g (m_1).

4.3 Approximately 200 g of fine-grained soil or 400 g of medium or coarse-grained soil shall be introduced into the gas jar directly from the container in which it has been cooled. The gas jar, ground-glass plate/ plastic slip cover and contents shall be weighed to the nearest 0·2 g (m_2).

4.4 Approximately 500 ml of water at a temperature within $\pm$ 2°C of the average room temperature during the test (*see* Note 4) shall be added to the soil. The rubber stopper shall then be inserted into the gas jar and in the case of medium and coarse-gained soils the gas jar and contents shall be set aside for at least 4 hours. At the end of this

period, or immediately after the addition of water in the case of fine-grained soils, the gas jar shall be shaken by hand until the particles are in suspension and then placed in the shaking apparatus and shaken for a period of 20 to 30 minutes.

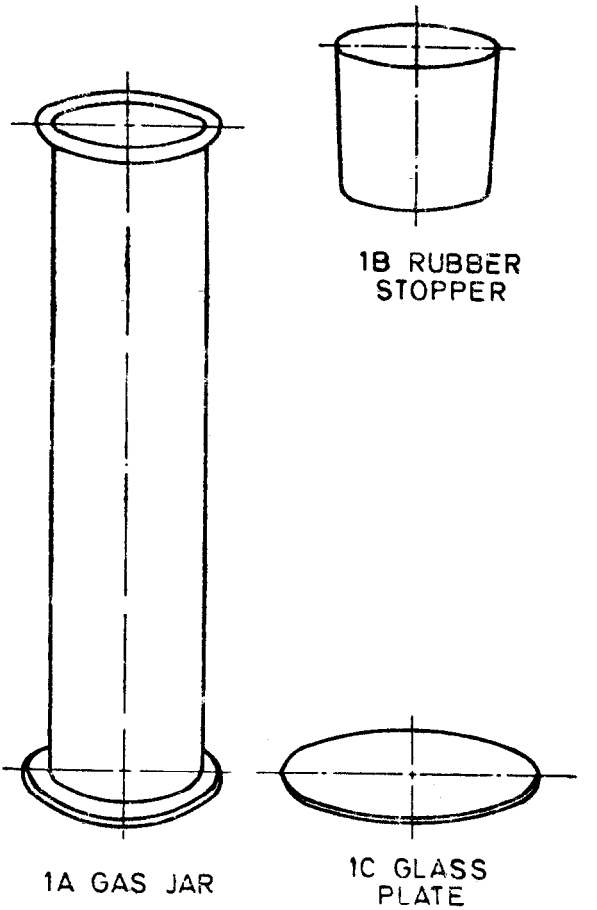

FIG. 1 GAS JAR, PLATE AND STOPPER FOR THE DETERMINATION OF SPECIFIC GRAVITY OF SOIL PARTICALES

4.4.1 The stopper shall then be removed carefully and any soil adhering to the stopper or the top of the gas jar shall be washed carefully into the jar; any froth that has formed shall be dispersed with a fine spray of water. Water shall then be added to the gas jar to within 2 mm of the top. The soil shall be allowed to settle for a few minutes and the gas jar then filled to the brim with more water. The ground-glass plate plastic slip cover shall then be placed on the top of the jar taking care not to trap any air undert the plate. The gas jar and plate shall then be carefully dried on the outside and the whole weighed to the nearest 0·2 g (m_3).

4.5 The gas jar shall be emptied, washed out thoroughly, and filled completely to the brim with water. The glass plate shall be placed in position taking care not to trap any air under the plate. The gas jar and plate shall then be dried carefully on the outside and the whole weighed to the nearest 0·2 g (m_4).

4.6 The procedure outlined in **4.1** to **4.4** shall be repeated on a second sample of the same soil so that two values for specific gravity are obtained.

5. CALCULATIONS

5.1 The specific gravity, G, of the soil particles shall be calculated from the equation:

$$G = \frac{m_2 - m_1}{(m_4 - m_1) - (m_3 - m_2)}$$

where

m_1 = the mass of gas jar and ground glass plate;
m_2 = the mass of gas jar, plate and soil;
m_3 = the mass of gas jar, plate, soil and water;
m_4 = the mass of gas jar, plate and water.

5.2 The specific gravity shall be calculated at 27°C. If the room temperature is different then 27°C, the following corrections shall be done:

$$G' = KG$$

where

G' = corrected specific gravity at 27°C, and

$$K = \frac{\text{Relative density of water at room temperature}}{\text{Relative density of water at 27°C}}$$

6. REPORTING OF RESULTS

6.1 The specific gravity of the soil particles shall be reported to the nearest 0·01.

6.2 Three determinations of the specific gravity of the same soil sample shall be made. The average of the values obtained shall be taken as the specific gravity of the soil particles and shall be reported to the nearest 0·01. If the results differ by more than 0·03 from the average value, the tests shall be repeated.

NOTE 1 — A gas jar has been found to make a very effective pycnometer but any container of similar capacity can be used provided that it can be shaken in a mechanical shaking apparatus, and provided that the mouth can be sealed in such a way that its volume is constant.

NOTE 2 — An end-over-end shaker has been specified but shaking machines giving a vibrating motion would also be suitable. The choice of shaking machine depends on the type of pycnometer uaed.

NOTE 3 — Oven drying of the soil has been specified for convenience. If there is any reason to believe that this will change the specific gravity due to loss of water of hydration, the soil should be dried at not more than 80°C. This fact should be reported.

NOTE 4 — If there is a large difference the air temperature sufficient water should be drawn for the required number of tests and allowed to stand in the room in which the tests are being done until the temperature is within the given range.

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