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( पहला पुनरीक्षण )

*Indian Standard*

**METHODS OF TEST FOR SOILS**

**PART 19 DETERMINATION OF CENTRIFUGE MOISTURE EQUIVALENT**

*( First Revision )*

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**BUREAU OF INDIAN STANDARDS**  
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Price Group 1

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Soils and Soil Engineering Sectional Committee had been approved by the Civil Engineering Division Council.

With a view to establish uniform procedures for determination of different characteristics of soils and also for facilitating comparative studies of the results, an Indian Standard Methods of Tests for Soils, IS 2720 has been published in 41 parts. This part deals with the method of test for determination of centrifuge moisture equivalent of soils. The value of the centrifuge moisture equivalent is useful in assessing the relative permeability of soils.

This standard was first published in 1964. In this first revision apart from the general updation, the amendment issued has been incorporated and all the quantities/dimensions have been given in SI units.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# Indian Standard

## METHODS OF TEST FOR SOILS

### PART 19 DETERMINATION OF CENTRIFUGE MOISTURE EQUIVALENT

#### ( First Revision )

#### 1 SCOPE

This standard ( Part 19 ) lays down the method for determining the centrifuge moisture equivalent of soils.

#### 2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:

IS No.	Title
1433 : 1965	Specification for beam scales
2720	Methods of test for soils :
( Part 1 ) : 1983	Part 1 Determination of dry soils samples for various tests ( second revision )

#### 3 TERMINOLOGY

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

##### 3.1 Centrifuge Moisture Equivalent ( CME )

The centrifuge moisture equivalent of a soil is the amount of moisture, expressed as a percentage of the mass of the oven-dried soil, retained by the soil which has been first saturated with water and then subjected to a force equal to 1 000 times the force of gravity for one hour.

#### 4 APPARATUS

- a) Gooch Crucible — porcelain, with perforated bottom. The crucible shall be about 40 mm in height and the diameter shall be about 25 mm at the top and about 20 mm at the bottom.
- b) Filler Paper — circular piece, just large enough to cover the inside bottom of the Gooch crucible. A Whatman filter paper No. 42 or equivalent is found suitable.
- c) Trunnion Cup — a Babcock trunnion cup fitted with a brass cap and with a suitable device for supporting the Gooch crucible 12 mm above the bottom of the cup in such a manner that the water ejected during the centrifuging operation shall not come in contact with the cruci-

ble and contents and furthermore, the air may circulate freely about the crucible within the cup. Suitable fittings for the cup are shown in Fig. 1.

- d) Centrifuge — one of such size and so driven that a force equal to 1 000 times the force of gravity may be exerted at the centre of gravity of the soil sample.
- e) Balance — sensitive to 0.001 g ( see IS 1433 : 1965 ).
- f) Oven — thermostatically controlled with interior of non-corroding material to maintain the temperature between 105°C and 110°C.

#### 5 SOIL SPECIMEN

A 5 g soil specimen shall be taken from the thoroughly mixed portion of the material passing the 425-micron IS Sieve obtained in accordance with IS 2720 ( Part 1 ) : 1983.

#### 6 PROCEDURE

Weigh the Gooch crucible empty and with a piece of dry filter paper which just covers the bottom of the crucible. Then place the soil specimen in the crucible. Place the crucible with the soil specimen in a pan of distilled water and allow specimen to take up moisture until completely saturated, as indicated by the presence of free water on the surface of the specimen. Then place the crucible in a humidifier for at least 12 hours to ensure uniform distribution of moisture throughout the soil mass. Pour off all free water remaining on the surface of the sample and place the crucible in a Babcock trunnion cup fitted as described in 4 (c).

Centrifuge the soil specimen for a period of one hour at a speed which, for the diameter of head used, will exert a centrifugal force 1 000 times the force of gravity at the centre of gravity of the soil specimen. Immediately after centrifuging, weigh the crucible and contents and record the mass. Then oven-dry the specimen to constant mass at a temperature of 105°C to 110°C. Weigh the crucible and contents and record the mass.

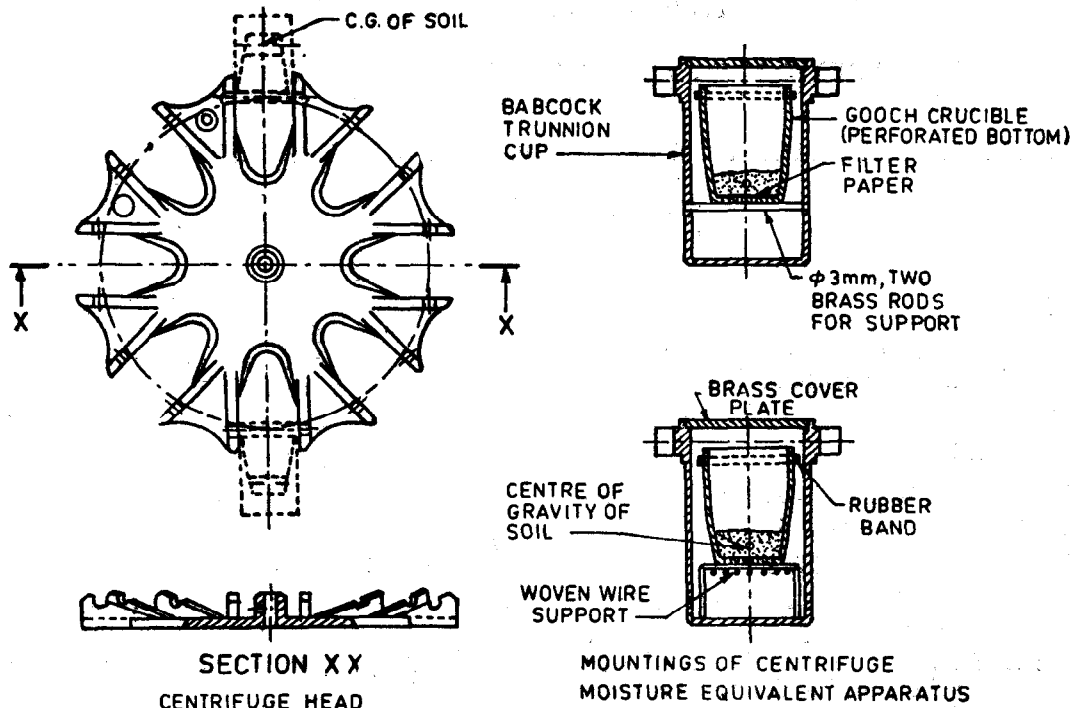


FIG. 1 CENTRIFUGE APPARATUS

If the soil is waterlogged, that is, when free water is observed on the top of the specimen after the centrifuging operation, do not remove the free water but weigh it with the specimen.

The test should be conducted at a temperature of  $(27 \pm 2)^\circ\text{C}$ .

An allowance of 0.02 g shall be made for the moisture remaining in the filter paper after centrifuging.

**7 CALCULATION**

The centrifuge moisture equivalent of the soil shall be calculated by the following formula:

$$\text{CME} = \frac{(M_2 - M_1 - 0.02) - (M_3 - M_1)}{(M_3 - M_1)} \times 100$$

where

CME = centrifuge moisture equivalent;

$M_2$  = mass of crucible and contents after centrifuging, in g;

$M_1$  = mass of crucible with dry filter paper in g; and

$M_3$  = Mass of crucible and contents after oven drying, in g.

**8 REPRODUCIBILITY OF RESULTS**

The tests shall be made in duplicate. The

variation between the two values obtained in the duplicate tests should not exceed one percent for values of CME up to 15 and 2 percent for values above 15. If the results disagree by more than the limits specified, the tests shall be repeated.

**9 REPORT**

9.1 The average of the two results obtained (see 8) shall be reported as the Centrifuge Moisture Equivalent.

9.1.1 The results of the tests may be reported in the form given below:

1. Determination No.	1	2
2. Mass of crucible with dry filter paper ( $M_1$ ), in g		
3. Mass of crucible and contents after centrifuging ( $M_2$ ), in g		
4. Mass of crucible and content after oven drying ( $M_3$ ), in g		
5. Centrifuge moisture equivalent		
Average		
Remarks:		

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