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(Reaffirmed 1995)

Indian Standard

METHODS OF PHYSICAL TESTS FOR HYDRAULIC CEMENT

PART 13 MEASUREMENT OF WATER RETENTIVITY OF MASONRY CEMENT

(First Revision)

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0. FOREWORD

0.1 This Indian Standard (Part 13) (First Revision) was adopted by the Bureau of Indian Standards on 22 April 1988, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Standard methods of testing cement are essential adjunct to the cement specifications This standard in different parts lays down the procedure for the tests to evaluate the physical properties of different types of hydraulic cements. The procedure for conducting chemical tests of hydraulic cement is covered in IS : 4032-1985*.

0.3 Originally all the tests to evaluate the physical properties of hydraulic cements were covered in one standard ; but for facilitating the use of this standard and future revisions, it has been decided to print the different tests as different parts of the standard and, accordingly, this revised standard has been brought out in thirteen parts. This will also facilitate updating the individual tests. Further since publication of the original standard in 1968, a number of standards covering the requirements of different equipment used for testing of cement, a brief description of which was also covered in the standard, had been published. In this revision, therefore, reference is given to different instrument specifications deleting the description of the instruments, as it has been recognized that reproducible and repeatable test results can be obtained only with standard testing equipment capable of giving desired level of accuracy. This part (Part 13) covers measurement of water retentivity of masonry cement.

0.4 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Method of chemical analysis of hydraulic cement (*first revision*).

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

1. SCOPE

1.1 This standard (Part 13) covers the procedure for measuring water retentivity of masonry cement.

2. SAMPLING AND SELECTION OF TEST SPECIMENS

2.1 The samples of the cement shall be taken in accordance with the requirements of IS : 3535-1986* and the relevant standard specification for the type of cement being tested. The representative sample of the cement selected as above shall be thoroughly mixed before testing.

*Methods of sampling hydraulic cement (*first revision*).

3. TEMPERATURE AND HUMIDITY

3.1 The temperature of moulding room, dry materials and water shall be maintained at 27 ± 2°C. The relative humidity of the laboratory shall be 65 ± 5 percent.

4. GENERAL

4.1 Standard Sand — The standard sand to be used in the preparation of mortar shall conform to IS : 650-1966*.

5. APPARATUS

5.1 The apparatus assembly for the water

*Specification for standard sand for testing of cement (*first revision*).

retention test shall conform to IS : 10850-1984*.

5.2 Balance — The balance used in weighing materials shall conform to the following requirements :

On balance in use, the permissible variation at a load of 2 000 g shall be ± 2·0 g. The permissible variation on new balance shall be one-half of this value. The sensibility reciprocal shall be not greater than twice the permissible variation.

NOTE 1 — The sensibility reciprocal is generally defined as the change in load required to change the position of rest of the indicating element or the elements of a non-automatic indicating scale a definite amount at any load.

NOTE 2 — Self-indicating balance with equivalent accuracy may also be used.

5.3 Standard Weights

5.4 Planetary Mixer — Planetary mixer conforming to IS : 10890-1984†.

5.5 Flow Table and Accessories — Flow table and accessories conforming to IS : 5512-1983‡.

5.6 Tamping Rod — Tamping rod conforming to 6.1 (c) of IS : 10086-1982§.

6. PROCEDURE

6.1 Adjust the mercury relief column so as to maintain a vacuum of 50 mm as measured on the manometer. Seat the perforated dish on the greased gasket of the funnel. Place a wetted filter paper in the bottom of the dish. Turn the stopcock to apply the vacuum to the funnel and check the apparatus for leaks and to determine that the required suction is obtained. Then turn the stopcock to shut off the vacuum from the funnel.

6.2 Mix the mortar consisting of one part of masonry cement and 3 parts of standard sand using the quantity of materials and the procedure given in 7 of IS : 4031 (Part 7) - 1988 ‖ to a consistency to give a flow of 110 ± 5 percent. Immediately after making the flow test, return the mortar on the flow table to the mixing bowl, and remix the entire batch for 15 s at medium speed. Immediately after remixing of the mortar, fill the perforated dish with the mortar to slightly above the rim. Tamp the mortar 15 times with the tamper. Ten of the tamping strokes shall be applied at approximately uniform spacing adjacent to the rim of the dish and with the long axis of the tamping face held at right angles to the radius of the dish. The remaining five tamping strokes shall be applied at random points distributed over the central area of the dish. The tamping pressure shall be just sufficient to ensure filling of the dish. On completion of the tamping, the top of the mortar should extend slightly above the rim of the dish. Smooth off the mortar by drawing the flat side of the straight edge (with the leading edge slightly raised) across the top of the dish. Then cut off the mortar to a plane surface flush with the rim of the dish by drawing the straight edge with a sawing motion across the top of the dish in two cutting strokes, starting each cut from near the centre of the dish. If the mortar is pulled away from the side of the dish during the process of drawing the straight edge across the dish, gently press the mortar back into contact with the side of the dish using the tamper.

6.3 Turn the stopcock to apply the vacuum to the funnel. The time elapsed from the start of mixing the cement and water to the time of applying the vacuum shall not exceed 8 minutes. After suction for 60 s, quickly turn the stopcock to expose the funnel to atmospheric pressure. Immediately slide the perforated dish off from the funnel, touch it momentarily on a damp cloth to remove droplets of water and set the dish on the table. Then, using the bowl scraper, plow and mix the mortar in the dish for 15 s. Upon completion of mixing, place the mortar in the flow mould and determine the flow. The entire operation shall be carried out without interruption and as quickly as possible, and shall be completed within an elapsed time of 11 min after the start of mixing the cement and water for the first flow determination.

7. CALCULATION

7.1 Calculate the water retention value for the mortar as follows :

$$\text{Water retention value} = \frac{A}{B} \times 100$$

where

A = flow after suction, and

B = flow immediately after mixing.

*Specification for apparatus for measurement of water retentivity of masonry cement.

†Specification for planetary mixer used in tests of cement and pozzolana.

‡Specification for flow table for use in tests of hydraulic cements and pozzolanic materials (*first revision*).

§ Specification for moulds for use in tests of cement and concrete.

‖ Methods of physical tests for hydraulic cement : Part 7 Determination of compressive strength of masonry cement (*first revision*).

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