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Indian Standard

METHODS OF PHYSICAL TESTS FOR HYDRAULIC CEMENT

PART 4 DETERMINATION OF CONSISTENCY OF STANDARD CEMENT PASTE

(First Revision)

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0. FOREWORD

0.1 This Indian Standard (Part 4) (First Revision) was adopted by the Bureau of Indian Standards on 24 February 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 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 cement were covered in one standard but for facilitating the use of this standard and future revisions, it has been decided to print 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 of individual tests. Further, since the 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 covers the procedure for determining the quantity of water required to produce a cement paste of standard consistency.

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 4) covers the procedure for determining the quantity of water required to produce a cement paste of standard consistency.

2. SAMPLING AND SELECTION OF TEST SPECIMEN

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.

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. APPARATUS

4.1 Vicat Apparatus —Vicat apparatus conforming to IS : 5513-1976*.

4.2 Balance — The balance shall conform to the following requirements.

4.2.1 On balance in use, the permissible variation at a load of 1 000 g shall be plus or minus 1·0 g. The permissible variation on new balance shall be one-half of this value. The sensibility reciprocal shall not be 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 elements of a non-automatic indicating scale a definite amount at any load.

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

*Specification for Vicat apparatus (*first revision*).

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

4.3 Standard Weights — The permissible variation on weights in use in weighing the cement shall be as prescribed in Table 1.

TABLE 1 PERMISSIBLE VARIATION ON WEIGHTS

WEIGHT	PERMISSIBLE VARIATION ON WEIGHTS IN USE, PLUS OR MINUS
g	g
500	0·35
300	0·30
250	0·25
200	0·20
100	0·15
50	0·10
20	0·05
10	0·04
5	0·03
2	0·02
1	0·01

4.4 Gauging Trowel — Gauging trowel conforming to IS 10086 : 1982†.

5. PROCEDURE

5.1 The standard consistency of a cement paste is defined as that consistency which will permit the Vicat plunger *G* shown in IS : 5513-1976* to penetrate to a point 5 to 7 mm from the bottom of the Vicat mould when the cement paste is tested as described in **5.2** to **5.4**.

5.2 Prepare a paste of weighed quantity of cement with a weighed quantity of potable or distilled water, taking care that the time of gauging is not less than 3 minutes, nor more than 5 min, and the gauging shall be completed before any sign of setting occurs. The gauging time shall be counted from the time of adding water to the dry cement until commencing to fill the mould. Fill the Vicat mould *E* with this paste, the mould resting upon a non-porous plate. After completely filling the mould, smoothen the surface of the paste, making it level with the top of the mould. The mould may be slightly shaken to expel the air.

5.2.1 Clean appliances shall be used for gauging. In filling the mould, the operator's hands and the blade of the gauging trowel shall alone be used.

5.3 Place the test block in the mould, together with the non-porous resting plate, under the rod bearing the plunger; lower the plunger gently to touch the surface of the test block, and quickly release, allowing it to sink into the paste. This operation shall be carried out immediately after filling the mould.

5.4 Prepare trial pastes with varying percentages of water and test as described above until the amount of water necessary for making up the standard consistency as defined in **5.1** is found.

6. CALCULATION

6.1 Express the amount of water as a percentage by mass of the dry cement to the first place of decimal.

*Specification for Vicat apparatus (*first revision*).

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