IS 2386-6 (1963): Methods of test for aggregates for concrete, Part 6: Measuring mortar making properties of fine aggregates [CED 2: Cement and Concrete]

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Indian Standard

METHODS OF TEST FOR AGGREGATES FOR CONCI

PART VI MEASURING MORTAR MAKING PROPERTIES OF FINE AGGREGATE

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(Including Amendment No.1 and 2)

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

METHODS OF TEST FOR AGGREGATES FOR CONCRETE

PART VI MEASURING MORTAR MAKING PROPERTIES OF FINE AGGREGATE

(*Continued on page 2*)

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NEW DELHI 110002

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AMENDMENT NO. 1 FEBRUARY 1982

TO

IS:2386(Part VI)-1963 METHODS OF TEST FOR AGGREGATES FOR CONCRETE

Part VI MEASURING MORTAR MAKING PROPERTIES OF FINE AGGREGATE

Alteration

[*Page 6, clauses 7 and 7.1 (renumbered as 8 and 8.1)*] - Substitute the following for the existing clauses:

'8. REPORTING OF RESULT

8.1 Calculate the average crushing strength of not less than three specimens containing untreated sand. Similarly calculate the average crushing strength of the corresponding number of specimens containing treated sand. Report the average crushing strength of specimens containing untreated sand as a percentage of the average crushing strength of the specimens containing treated sand.'

Addendum

(*Page 4, clause 1.1*) - Add the following new clauses after 1.1 and renumber the clauses '2 to 7' as '3 to 8':

"2. BASIS FOR COMPARISON

2.1 The fine aggregate shall be compared in mortar, as described in this method, with a sample of the same aggregate that has been washed in a 3 percent solution of sodium hydroxide followed by thorough rinsing in water. The treatment shall be repeated till the washed material produces a colour lighter than that of

the standard solution described in 6.2.2 of IS:2386(Part II)-1963 'Methods of test for aggregates for concrete : Part II Estimation of deleterious materials and organic impurities'. However, it shall be ensured that no fines are lost while washing with sodium hydroxide. The washed and rinsed aggregate shall be checked with a suitable indicator such as phenolphthalein or litmus to assure that all traces of sodium hydroxide are removed from the aggregate before being used for making control mortar."

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IS 2386 (Part 6) : 1963 METHODS OF TEST FOR AGGREGATES FOR CONCRETE

PART 6 MEASURING MORTAR MAKING PROPERTIES OF FINE AGGREGATE

(*Page* 4, *clause* **2.2**) — Substitute the following for the existing clause :

'**2.2 Tamping Bar** — The tamping bar shall be made of nor-absorbent, abrasion resistant, non-brittle material such as a rubber compound having a Shore A durometer hardness of 80 ± 10 or seasoned teak wood rendered non-absorbent by immersion for 15 minutes in paraffin at approximately 200°C and shall have a cross-section of 12.5 × 25 mm and a convenient length of 125 to 150 mm. The tamping face shall be flat and at right angles to the length of the bar.'

(*Page* 4, *clause* **2.4**) — Substitute the following for the existing clause :

"**2.4 Moulds** — These shall be 50 mm cube moulds and shall conform to the requirements laid down in IS 10036 : 1982 'Specification for moulds for use in tests of cement and concrete'."

(*Page* 5, *clause* **3.1**, *Note*) — Delete.

(*Page* 5, *clause* **5.1**, *line* 2) — Substitute '50 mm' *for* '7.06 cm'.

(CED 2)

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Indian Standard

METHODS OF TEST FOR AGGREGATES FOR CONCRETE

PART VI MEASURING MORTAR MAKING PROPERTIES OF FINE AGGREGATE

0. FOREWORD

0.1 This Indian Standard (Part VI) was adopted by the Indian Standards Institution on 13 September 1963, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Building Division Council.

0.2 One of the major contributing factors to the quality of concrete is the quality of aggregates used therein. The test methods given in this standard are intended to assist in assessing the quality of aggregates. In a given situation, for a particular aggregate, it may not be necessary to assess all the qualities and therefore it is necessary to determine beforehand the purpose for which a concrete is being used and the qualities of the aggregate which require to be assessed. Accordingly, the relevant test methods may be chosen from amongst the various tests covered in this standard. For the convenience of the users, the test methods are grouped into the following eight parts of Indian Standard Methods of Test for Aggregates for Concrete (IS : 2386 - 1963):

Part I	Particle Size and Shape
Part II	Estimation of Deleterious Materials and Organic Impurities
Part III	Specific Gravity, Density, Voids, Absorption and Bulking
Part IV	Mechanical Properties
Part V	Soundness
Part VI	Measuring Mortar Making Properties of Fine Aggregate
Part VII	Alkali Aggregate Reactivity
Part VIII	Petrographic Examination

0.3 The Sectional Committee responsible for the preparation of this standard has taken into consideration the views of the concrete specialists, testing authorities, consumers and technologists and has related the standard to the practices followed in this country. Further, the need for international co-ordination among standards prevailing in different countries of the world has also been recognized. These considerations led the Sectional

Committee to derive assistance from C 87 — 62T Tentative Method of Test for Measuring Mortar Making Properties of Fine Aggregate issued by American Society for Testing and Materials.

0.4 Wherever a reference to any Indian Standard appears in this method, it shall be taken as a reference to its latest version.

0.5 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.

0.6 This standard is intended chiefly to cover the technical provisions relating to testing of aggregates for concrete, and it does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This standard (Part VI) covers the test procedure for measuring the mortar-making properties of fine aggregate for concrete by means of a compression test on specimens made from a mortar of a plastic consistency and gauged to a definite water-cement ratio.

2. APPARATUS

2.1 Flow Table and Flow Mould — These shall conform to the requirements specified in **12** of *IS: 1727 - 1960 Methods of Test for Pozzolanic Materials.

2.2 Tamper — It shall be made of a non-absorptive, non-abrasive material, such as medium-hard rubber or seasoned oak wood rendered non-absorptive by immersion for 15 minutes in paraffin at approximately 200°C and shall have a cross-section of 12·5 × 25 mm and a convenient length from 125 to 150 mm. The tamping face of the tamper shall be flat and at right angles to the length of the tamper.

2.3 Trowel — It shall have a steel blade 100 to 150 mm in length, with straight edges.

2.4 Moulds — These shall be 7·06 cm cube moulds.

2.5 Tamping Rod — It shall be approximately 10 mm in diameter and 100 mm long, with one end rounded to a hemispherical tip 10 mm dia × approx 300 mm long.

2.6 Testing Machine — A compression testing machine of suitable capacity shall be used.

*Since revised.

3. MORTAR

3.1 Place cement and water in quantities that will give a water-cement ratio of 0·6 by weight in an appropriate vessel and permit the cement to absorb water for one minute. Mix the materials into a smooth paste with a spoon. Beat into the mixture a known weight of the sample of sand under test that has been brought to a saturated surface-dry condition. Mix until the material appears to be of the desired consistency (flow 100 $\pm$ 5). Continue the mixing for 30 seconds and make a determination of the flow in accordance with **4**.

NOTE — For six 7·06 cm cubes 1 650 g of cement and 990 g of water will usually give sufficient mortar. The quantity of sand used with this amount of cement may vary from 3 300 g for fine sand to 5 500 g or more for coarse sand.

4. PROCEDURE

4.1 Carefully wipe the flow-table top clean and dry, and place the flow mould at the centre. Immediately after completing the mixing operation, place a layer of mortar about 25 mm in thickness in the mould and tamp 20 times with the tamper. The tamping pressure shall be just sufficient to insure uniform filling of the mould. Fill the mould with mortar and tamp as specified for the first layer. Cut off the mortar to a plane surface, flush with the top of the mould, by drawing the straight edge of a trowel (held nearly perpendicular to the mould) with a sawing motion across the top of the mould. Wipe the table top clean and dry, being especially careful to remove any water from around the edge of the flow mould. Lift the mould away from the mortar one minute after completing the mixing operation. Immediately, drop the table through a height of 12·5 mm ten times in 6 seconds. The flow is the resulting increase in average diameter of the mortar mass, measured on at least four diameters at approximately equal angles, expressed as a percentage of the original diameter. Should the flow be too great, return the mortar to the mixing vessel, add additional sand, and make another determination of the flow. If more than two trials need be made to obtain a flow of 100 $\pm$ 5, consider the mortar as a trial mortar, and prepare test specimens from a new batch. If the mortar is too dry, discard the batch. Determine the quantity of sand used by subtracting the weight of the portion remaining after mixing from the weight of the initial sample.

5. MOULDING TEST SPECIMENS

5.1 Immediately following completion of the flow test, place the mortar in 7·06 cm cube moulds in two layers. Rod each layer in place with 25 strokes of the tamping rod. After the rodding has been completed, fill the moulds to overflowing. Place the specimens in a moist closet for curing. Three to four hours after moulding, strike off the specimens to a smooth surface. Remove the specimens from the moulds 20 to 24 hours after moulding and store in water until tested.

5.2 The temperature of the mixing water, moist closet, and storage tank shall be maintained at 27 $\pm$ 2°C.

6. TESTING OF SPECIMENS

6.1 Test the specimens for compressive strength as given in **6.1.1** to **6.1.3**.

6.1.1 Test the specimens immediately after their removal from the moist closet in the case of 24-hour specimens, and from storage water in the case of all other specimens. If more than one specimen at a time is removed from the moist closet for the 24-hour tests, keep these specimens covered with a damp cloth until time of testing. If more than one specimen at a time is removed from the storage water for testing, keep these specimens in water at a temperature of 27 $\pm$ 2°C and of sufficient depth to immerse completely each specimen until time of testing.

6.1.2 Surface-dry each specimen, and remove any loose sand grains or incrustations from the faces that will be in contact with the bearing blocks of the testing machine. Check these faces by applying a straight edge (*see* Note). If there is appreciable curvature, grind the face or faces to plane surfaces or discard the specimen.

NOTE — Results much lower than the true strength will be obtained by loading faces of the specimen that are not truly plane surfaces. Therefore, it is essential that specimen moulds be kept scrupulously clean, as otherwise large irregularities in the surfaces will occur. Instruments for cleaning of moulds should always be softer than the metal in the moulds to prevent wear. In case grinding of specimen faces is necessary, it can be accomplished best by rubbing the specimen on a sheet of fine emery paper or cloth glued to a plane surface, using only a moderate pressure. Such grinding is tedious for more than a few hundredths of a millimetre; where more than this is found necessary, it is recommended that the specimen be discarded.

6.1.3 Apply the load to specimen faces that were in contact with the true plane surfaces of the mould. Carefully place the specimen in the testing machine below the centre of the upper bearing block. Use no cushioning or bedding materials. An initial loading up to one-half of the expected maximum load for specimens having expected maximum loads of more than 2 500 kg may be applied at any convenient rate. Adjust the rate of load application so that the remainder of the load (or the entire load in the case of expected maximum loads of less than 2 500 kg) is applied, without interruption, to failure at such a rate that the maximum load will be reached in not less than 20 nor more than 80 seconds. Make no adjustment in the controls of the testing machine while a specimen is yielding rapidly immediately before failure.

7. REPORTING OF RESULT

7.1 Report the average crushing strength of not less than three specimens and also the age of test.

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