भारतीय मानक

खेपनुमा कंकरीट मिश्रण यंत्र — कार्यकारिता की परीक्षण पद्धति

(पहला पुनरीक्षण)

Indian Standard

BATCH-TYPE CONCRETE MIXERS — METHOD OF TEST-PERFORMANCE

(First Revision)

UDC 666·97·031·3 : 620·16

© BIS 1991

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

December 1991

Price Group 2

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Heavy Mechanical Engineering Division Council.

The object of the concrete mixer is to thoroughly mix various constituents of concrete to a fairly uniform proportion everywhere in the mix. Any test for the performance of concrete mixers has, therefore, to be based on the determination of the uniformity of the concrete, particularly as regards the even distribution of the constituents throughout the batch mixed by the mixer.

This standard lays down a method for assessing the performance of batch-type concrete mixers.

The recommended method of test is based on the results of the tests conducted by the Central Building Research Institute, Roorkee under the aegis of the Construction Plant and Machinery Sectional Committee of Bureau of Indian Standards. While devising this test, the considerable amount of relevant work done in this respect in other countries has also been taken into consideration.

The performance test as explained subsequently in this standard is required to be performed on a particular type, model and capacity of concrete mixer and would serve as type test. Owing to the large quantity of materials, considerable time and the type of apparatus involved in the test, it is not considered suitable as a batch test or a routine site test.

This standard was first published in 1968. On the basis of experience gained in usage of the standard during course of these years, a number of changes have been made in this revision; the prominent among which are:

a) Volumetric measurement of dry aggregates for preparation of mix has been deleted,
b) Mixing time allowed for mixing the various constituent of concrete mix in the mixer drum has been specified, and
c) Limits for the percentage variation of cement, fine and coarse aggregates have been added.

In reporting the results of a test or analysis made in accordance with this standard, if the final value,observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

BATCH-TYPE CONCRETE MIXERS — METHOD OF TEST-PERFORMANCE

(First Revision)

1 SCOPE

1.1 This standard covers the method of test for assessing the performance of batch type concrete mixers sizes conforming to IS 1791 : 1985.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 CONCRETE MIXES AND MATERIALS

3.1 For the purpose of conducting performance test to ensure reproducability and comparison of test results, the concrete mixes and materials used for the test should be as recommended in **3.1.1** to **3.1.4**. Use of highly absorptive or porous aggregate should be avoided as this would lead to inconsistence test values.

3.1.1 *Mix*

The proportions of cement, coarse and fine aggregate and water shall be as indicated below and no admixture shall be used. In proportioning the materials for the mix, the aggregate shall be dry. All the materials to be mixed should be weighed and the weighing equipment used shall be accurate to within one half percent of their capacity.

Cement/aggregate ratio by weight	1·6
Water/cement ratio by weight	0·5
Maximum size of the aggregate	20 mm
Normal percentage by weight of combined aggregate passing 4·75 mm IS Sieve	35

[*see* IS 460 (Part 1) : 1985 and IS 460 (Part 2) : 1985]

3.1.2 The cement used for mix shall conform to IS 269 : 1989, IS 1489 : 1991, IS 8112 : 1989 or IS 455 : 1989.

3.1.3 *Coarse Aggregate*

Coarse aggregate shall generally conform to IS 383 : 1970. The grading of the coarse aggregate shall comply with the limits given in Table 2 of IS 383 : 1970 for graded aggregate of 20 mm to 4·75 mm size. The proportion passing 150 micron IS Sieve, tested in accordance with IS 2386 (Part 1) : 1963 shall not exceed 3 percent by weight of the coarse aggregate.

3.1.3.1 The flakiness index, determined by the method described in IS 2386 (Part 1) : 1963 shall not exceed 35 for 20 mm to 16 mm, 16 mm to 12·5 mm, 12·5 mm to 10 mm and 10 mm to 6·3 mm fractions of aggregate.

3.1.4 *Fine Aggregate*

The fine aggregate shall be siliceous sand complying with IS 383 : 1970.

3.1.4.1 *Grading*

The grading of the fine aggregate shall comply with either Zone II or Zone III of IS 383 : 1970 and in addition the proportion passing 75 micron IS Sieve shall not exceed 3 percent by weight.

4 APPARATUS

4.1 The apparatus for analysing the constituent of concrete shall conform to the requirements of IS 1199 : 1959 in respect of test for analysis of freshly mixed concrete by unit weight method.

4.2 The measurement of time for recording the mixing time allowed for the concrete mix in the mixing drum should be carried out with the help of a stop watch.

5 PRINCIPLES AND PROCEDURE

5.1 The mixer performance test is used to check the ability of a mixer to mix concrete that will be within the prescribed limits of uniformity. The uniformity of fresh concrete is evaluated by finding:

a) the percentage variation between the the quantity of cement, fine aggregate and coarse aggregate (as found by

weighing in water) in two individual halves of a batch and the average of the two halves of the batch, and

b) the percentage variation between the quantities of cement, fine aggregates and coarse aggregates (as found by weighing in water) in an individual batch and the average of the three batches.

5.2 PROCEDURE

5.2.1 Using the appropriate mix (*see* **3.1**). four batches of concrete (one priming batch and three test batches) shall be prepared. The total weight of concrete in each batch shall be the nominal batch capacity of the mixer multiplied by the weight per cubic metre of freshly mixed concrete for the mix. The weight per cubic metre of the concrete mix prepared according to **3.1.1** shall be determined in accordance with the appropriate requirements of IS 1199 : 1959, using a batch of concrete mix of suitable size prepared by mixing in a similar type of concrete mixer.

5.2.2 The mixer shall be set on a ground level. All arrangements shall be made to see that there is no movement and uplifting of mixer while the charging, discharging and mixing of material is being done.

5.2.3 The first batch of concrete shall be regarded as the priming batch and shall be prepared one after another for the purpose of sampling and testing.

5.2.4 The mixer drum shall not be washed or cleaned in any way after discharging the priming batch or between the three consecutive test batches. In case there is an interruption in completing the work of taking four batches as per **5.2.3** and the time of interruption is more than 15 minutes, the mixer drum in that case should be thoroughly cleaned and an additional priming batch should be taken. This should be followed by taking of remaining test batches.

5.2.5 Time interval between the discharging of one batch and the beginning of the mixing of the following batch shall be such that the stuck up material in the drum is not set. This is generally 15 minutes.

5.2.5.1 The actual mixing time allowed for mixing of various constituent of concrete mix in the mixer drum should be between 4 to 5 minutes. The mixing time is measured from the instant the dry materials first enters the mixer drum to the commencement of the discharge.

5.2.6 After the priming batch has been discarded each of the following three batches shall be sampled in the manner indicated below. The concrete batch shall be discharged in such a manner that the batch of concrete forms a window or strip, one end of which consists of the first material to leave the mixer and the other end the last materials to leave. This may be accomplished by:

a) moving the mixer bodily during discharge, or

b) by means of a swivelling chute discharging the batch in the form of an arc, or

c) by drawing a platfrom, through, or a long-wheel-base trolley past the discharge chute or by any other appropriate means.

When the batch has been discharged it shall be divided into two approximately equal parts leaving the transient portion that is the concrete which comes out of the mixer just in the beginning and at the fag end of the discharge. From each of these two halves two independent representative samples shall be taken by means of the scoop in an appropriate number of increments. Total number of samples thus collected for the three batches shall be 12, each weighing approximately 4 kg.

6 TESTING OF SAMPLES

6.1 Each of the twelve samples collected shall be weighed in water and washed on 4·75 mm and 150 micron IS Sieves (*see* IS 460 : 1985 for sieve designations). Coarse aggregates and the fine aggregates retained on the above sieves shall be weighed in water.

6.2 Weighing of the ingredients in water shall be carried out in accordance with the procedure given under analysis of fresh concrete in IS 1199 : 1959.

6.3 For each of the three ingredients (coarse aggregates, fine aggregates and cement), the average of the two representative samples from the each half shall be obtained.

7 ASSESSMENT OF PERFORMANCE

7.1 The performance of the mixer shall be assessed on the basis of uniformity of cement, fine aggregate and coarse aggregate in the concrete mixed by the mixer, that is, by finding the percentage variation of the three ingredients as in **7.2**.

7.2 Calculations

7.2.1 The percentage variation in the coarse aggregate shall be calculated as follows:

Let A_1, A_2 represent quantities of coarse aggregate found by weighing in water and expressed as percentage of the total weight of the sample in water, in two samples of first half of one batch, and A_3, A_4 represent the similar quantities in two samples of second half of the same batch:

$\frac{A_1 + A_2}{2} = A_5$, the average of two samples of first half

$\frac{A_3 + A_4}{2} = A_6$, the average of two samples of second half

$\frac{A_5 + A_6}{2} = A_7$, the average of both the halves (average for one batch)

percentage variation from the average of two halves for one batch

$$= \frac{A_7 - A_5}{A_7} \times 100$$

7.2.2 The percentage variation for fine aggregates and cement shall be calculated similarly.

7.3 Performance Criteria

The percentage variation of cement, fine and coarse aggregates, as calculated above shall not be more than the following limits:

Cement	8 percent
Fine aggregate	6 percent
Coarse aggregate	8 percent

8 REPORT

8.1 The report shall include the following minimum details:

a) Name of the manufacturer,
b) Type of mixer and manufacturer's designation,
c) Nominal batch capacity,
d) Method of loading used in the test,
e) Mixing time and drum speed in rev/min used in the test,
f) Details of the materials used in the test including grading of the aggregates,
g) Method of sampling, and
h) Percentage variation of coarse aggregates, fine aggregate and cement as described in **7.2.1.**

ANNEX A

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
IS 269 : 1989	Specification for 33 grade ordinary portland cement (*fourth revision*)
IS 383 : 1970	Specification for coarse and fine aggregates from natural sources for concrete (*second revision*)
IS 455 : 1989	Specification for portland slag cement (*fourth revision*)
IS 460 (Part 1) : 1985	Specification for test sieves : Part 1 Wire cloth test sieves (*third revision*)
IS 460 (Part 2) : 1985	Specification for test sieves: Part 2 Perforated plate test sieves (*third revision*)
IS 1199 : 1959	Method of sampling and analysis of concrete
IS 1489 : 1991	Specification for portland pozzolana cement (*second revision*)
IS 1791 : 1985	Specification for distributors for hot tar and bitumen (*first revision*)
IS 2386 (Part 1) : 1963	Method of test for aggregates for concrete : Part 1 Particle size and shape
IS 8112 : 1989	Specification for 43 grade ordinary portland cement (*first revision*)

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director Publications), BIS.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference:

Doc : No. HMD 18 (4320)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 331 01 31, 331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{311 01 31 {331 13 75
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola CALCUTTA 700054	37 86 62
Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036	53 38 43
Southern : C. I. T. Campus, IV Cross Road, MADRAS 600113	235 02 16
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093	6 32 92 95

Branches : AHMADABAD, BANGALORE, BHOPAL, BHUBANESHWAR, COIMBATORE, FARIDABAD, GHAZIABAD, GUWAHATI, HYDERABAD, JAIPUR, KANPUR, PATNA, THIRUVANANTHAPURAM.

Printed at Printwell Printers, Aligarh, India