भारतीय मानक

कंक्रीट व मोर्टार के परीक्षण के लिए प्रयुक्त मशीन — अपेक्षाएँ

Indian Standard

COMPRESSION TESTING MACHINE USED FOR TESTING OF CONCRETE AND MORTAR — REQUIREMENTS

ICS 19.060;91.100.30

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

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Price Group 3

FOREWORD

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

A series of Indian Standards on methods of testing of cement and concrete have already been brought out. It has been recognized that reproducible and repeatable test results can be obtained only with standard testing equipment capable of giving the desired level of accuracy; therefore, a series of specifications covering the requirements of equipments used for testing cement and concrete have also been brought out to encourage their development and manufacture in the country.

This standard has been formulated to cover requirements of the compression testing machine for testing concrete and mortar. The Indian Standard which details the methods of compressive strength test requiring use of this machine is IS 516 :1959 'Method of test for strength of concrete'.

In the formulation of the standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries. Assistance has also been derived from ASTM C 39-86 'Standard test methods for compressive strength of cylindrical concrete specimen'.

The composition of the technical committee responsible for the formulation of this standard is given at Annex A.

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 of 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

COMPRESSION TESTING MACHINE USED FOR TESTING OF CONCRETE AND MORTAR — REQUIREMENTS

1 SCOPE

This standard covers requirements of the machine used for testing of concrete and mortar test specimens in compression.

NOTE — The principle and equipment may also be applicable to the other materials for compression strength test.

2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
516 : 1959	Method of test for strength of concrete
1501 : 1984	Method for Vickers hardness test for metallic materials

3 CONSTRUCTION

3.1 General

Compression testing machine shall be robust, related to the size of the specimen and the expected load, and capable of providing the rates of loading prescribed in IS 516.

4 DESIGN

4.1 The design of the machine shall include the features given in **4.2** and **4.3**.

4.2 The machine shall be power operated and shall apply the load continuously rather than intermittently, and without shock.

4.3 The space provided for test specimens shall be large enough to accommodate, in the readable position, an elastic calibration device which is of sufficient capacity to cover the potential loading range of the testing machine.

5 LOADING

5.1 Load Control

The machine shall be capable of applying the load at the specified rate, uniformly, without shock, using manual or automatic control.

5.2 Load Pacers

5.2.1 If the machine is not equipped with an automatic load control, a load pacer shall be fitted to enable the operator to manipulate the machine controls to maintain the specified rate.

5.2.2 If the pacer has a scale, this scale shall be basically linear such that 1 mm represents not more than 100 N/s. Over the operating range of the scale the accuracy shall be within ± 5 percent.

5.2.3 If the pacer is fitted with a variable speed control or has preset speeds, then once the variable speed control has been set, or a preset speed has been chosen the pacer speed shall remain within ± 5 percent of the specified speed over the operating range.

5.3 Load Scale Indicators or Digital Displays

5.3.1 The machine shall be provided with the following:

a) Either easily read dials or scales or electrical load indicators, with a visual display.

NOTE — The visual display may be supplemented by recording devices, that are calibrated to the same accuracy as the display.

b) A resettable device which registers the maximum load sustained by the specimen.

c) The width of the needles shall be less than the width of the graduation.

5.4 Accuracy

The accuracy of the testing machine shall be such that the percentage of error for the loads within the proposed range of use of the testing machine shall not exceed ± 1.0 percent of the indicated load.

5.5 The indicated load of a testing machine shall not be corrected either by calculation or by the use of calibration diagram to obtain values within the required permissible variation.

5.6 Means of Applying the Load

The means of applying the load shall provide for the load to be applied either with the specimen in direct contact with the machine platens, or spacing blocks,

or with auxiliary platens interposed between each machine platen, or spacing block, and the specimen.

5.7 Rate of Loading

For testing machines of the screw type, the moving head shall travel at a rate of approximately 1.3 mm/min when the machine is running idle. For hydraulically operated machines, the load shall be applied at a rate of movement corresponding to a loading rate on the specimen within the range of 0.14 or 0.324 MPa/s.

6 MACHINE PLATENS

6.1 The testing machine shall be equipped with two steel bearing blocks with hardened faces (Vickers hardness not less than 550), one of which is a spherically seated block that will bear on the upper surface of the specimen, and the other a solid block on which the specimen shall rest. Bearing faces of the blocks shall have a minimum dimension at least 3 percent greater than the dimension of the specimen to be tested. Except for the marking described below, the bearing faces shall not depart from a plane by more than 0.025 mm in any 152 mm of blocks in diameter or larger, or by more than 0.022 5 mm in the diameter of any smaller block; and new blocks shall be manufactured within one half of this tolerance. When the dimensions of the bearing face of the spherically seated block exceeds the dimension of the specimen by more than 13 mm, markings not more than 0.8 mm deep and not more than 1.2 mm wide shall be inscribed to facilitate proper centering.

6.2 Bottom Bearing Blocks

6.2.1 Bearing block shall conform to the given in **6.2.2** to **6.2.4** requirements.

6.2.2 The bottom bearing block is specified for the purpose of providing a readily machinable surface for maintenance of the specified surface condition (*see* Note under **6.2.5**). The top and bottom surfaces shall be parallel to each other. The block may be fastened to the platen of the testing machine. Its least horizontal dimension shall be at least 3 percent greater than the dimension of the specimen to be tested.

6.2.3 The bottom bearing block shall be at least 25 mm thick when new, and at least 22.5 mm thick after any resurfacing operations.

6.2.4 The spherically seated bearing block shall conform to the requirements given in **6.2.4.1** to **6.2.4.4**.

6.2.4.1 The maximum diameter of the bearing face of the suspended spherically seated block shall not exceed the values given below:

Diameter of Test Specimen, mm	*Maximum Diameter of Bearing Face*, mm
51	105
76	127
102	165
152	254
203	279

NOTE — Square bearing faces are permitted provided the diameter of the largest possible inscribed circle does not exceed the diameter.

6.2.4.2 The centre of the sphere shall coincide with surface of the bearing face within a tolerance of $\pm$ 5 percent of the radius of the sphere. The diameter of the sphere shall be at least 75 percent of the diameter of the specimen to be tested.

6.2.4.3 The ball and the socket shall be so designed by the manufacturer that the steel in the contact area does not permanently deform under repeated use, with loads up to 82.7 MPa on the test specimen.

NOTE — The preferred contact area is in the form of a ring (described as preferred 'bearing' area) as shown in Fig. 1.

6.2.4.4 The movable portion of the bearing block shall be held closely in the spherical seat, but the design shall be such that the bearing face can be rotated freely and tilted at least 4.0 in any direction.

7 AUXILIARY PLATENS

7.1 The auxiliary platens shall be made of a material which, when tested in accordance with IS 1501, shall have a hardness value of at least 550. Also the material shall not deform irreversibly when the machine is used.

7.2 The distance between either pair of opposite edges of a square auxiliary platen, or the diameter of a circular platen, shall be the nominal size of the specimen (100 or 150 mm) $^{+\ 0.2}_{-\ 0.0}$ mm ; the distance between their contact faces of the platen shall be at least 23 mm.

7.3 The flatness tolerance for each contact face of the platens shall be 0.03 mm wide.

7.4 The squareness tolerance for each edge of the auxiliary platens with respect to the adjacent edge as datum shall be 0.06 mm wide.

7.5 The parallelism tolerance for one contact face of the auxiliary platen with respect to the other contact face as datum shall be 0.06 mm wide.

7.6 The R_a value for the surface texture of the contacet faces of the auxiliary platen shall be between 0.4μ and 3.2μ.

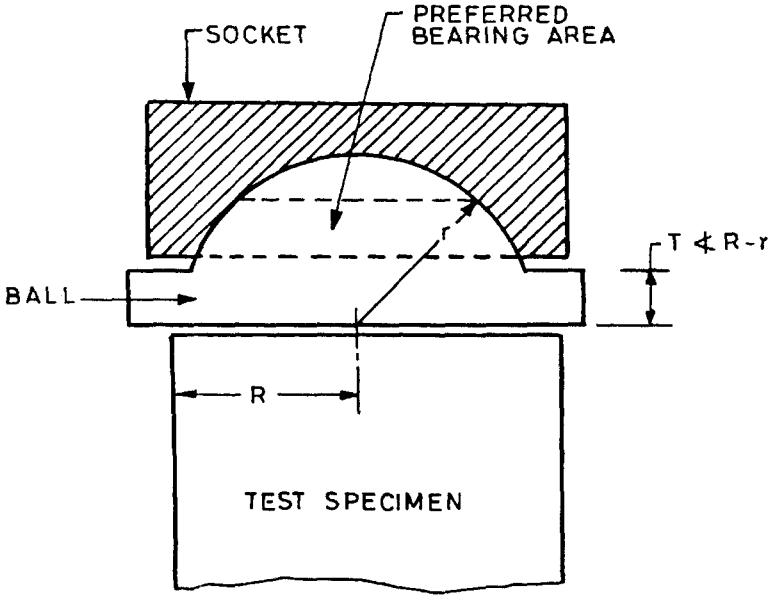

FIG. 1 TYPICAL SPHERICAL BEARING BLOCK

8 SPACING BLOCKS

8.1 If it is required to reduce the space between the machine platens, up to four spacing blocks shall be located either beneath or on the lower machine platen.

8.2 Spacing blocks used on the lower machine platen shall be made of a material, which when tested in accordance with IS 1501, shall have a hardness value of at least 550. Also the material shall not deform irreversibly when the machine is used.

8.3 All spacing blocks shall comply with the flatness and parallelism tolerances required for auxiliary platens.

9 MARKING

9.1 The following information shall be clearly and indelibly marked on the machine:

a) Indication of the source of manufacture,

b) Date of manufacture, and

c) Serial number.

9.2 BIS Certification Marking

Each machine may also be marked with the Standard Mark.

9.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act,* 1986 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

10 CALIBRATION

10.1 Verification of calibration of the test machines is required under the conditions given in **10.1.1** to **10.1.3**.

10.1.1 After an elapsed interval not exceeding 12 months from the previous verification.

10.1.2 On original installation or relocation or subjected to major repairs or adjustments.

10.1.3 Whenever there is reason to doubt the accuracy of the results, without regard to the time interval since the last verification.

10.2 The accuracy of the testing machine shall be verified by applying five test loads in four approximately equal increments in ascending order. The difference between any two successive loads shall not exceed one third of the difference between the maximum and minimum test loads.

The load as indicated by the testing machine and the applied load computed from the readings of the verification device shall be recorded at each test point. Calculate the error, E, and the percentage of error, E_p, for each point from these data as follows:

$$E = A - B$$

$$E_p = \frac{E}{B} \times 100$$

where

A = load in N indicated by the machine being verified, and

B = applied load in N as determined by the calibrating device.

10.3 The report on the verification of a testing machine shall state within what loading range it was found to conform to the specified requirements rather than reporting a blanket acceptance or rejection. In no case shall the loading range be stated as including loads below the value which is 100 times the smallest change of load that can be estimated on the load-indicating machanism, of the testing machine or loads within that portion of the range below 10 percent of the maximum range capacity.

In no case shall the loading range be stated as including loads outside the range of loads applied during the verification test.

11 RECORD OF MACHINE PERFORMANCE

A record of machine performance shall be kept giving the following details of the machine:

a) Machine identification;

b) Date of purchase;

c) Date/s of installation or re-installation;

d) Date of any maintenance; detailed notes should be kept of any maintenance that could affect the performance of the machine; and

e) Dates of verification of the performance of the machine.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

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