भारतीय मानक **IS 11389 : 2023**

Indian Standard

निमज्जन प्रकार के कंक्रीट कम्पित्र की निष्पादन परीक्षण पद्धति

(पहला पुनरीक्षण)

Method for Testing Performance of Immersion Type Concrete Vibrators

(First Revision)

ICS 91.220

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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 Mechanical Engineering Division Council.

The vibration characteristics for immersion type concrete vibrators are indicated in IS 2505 which also recommends the method for measuring these characteristics. While specifying these vibration characteristics, the committee had appreciated that even the requirements in regard to amplitude, frequency and acceleration could considerably vary from case to case and, therefore, the attempt in the specification had been to lay down only the limiting values of the vibration characteristics and the physical dimensions of the vibrators on the basis of available technical literature, experience and the manufacturing practices in the country. A mere measurement of amplitude, frequency and acceleration of vibration may not yield a firm basis for judging the efficiency of an immersion type concrete vibrator and therefore, a direct measurement of the range of action of vibrating needle and leakage as well as endurance test would give a more convincing and fairer appreciation of its quality.

In this standard, an attempt has been made to arrive at a method of test for measurement of limiting values of the characteristics, such as amplitude, frequency, acceleration, range of action, leakage and endurance tests.

This Indian Standard was first published in 1985. This standard is being revised again to keep pace with the latest technological developments and international practices. In this revision, the standard has been brought into the latest style and format of Indian Standards, and references of Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act,* 2016. Also **6.1**, **6.6**, and **6.7** have been modified with this revision.

The composition of the committee responsible for the formulation of this standard is listed in 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 or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. 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

METHOD FOR TESTING PERFORMANCE OF IMMERSION TYPE CONCRETE VIBRATORS

(First Revision)

1 SCOPE

1.1 This Indian Standard covers the method of testing the performance of immersion type concrete vibrators in terms of limiting values of operational characteristics, like amplitude, frequency, acceleration, range of action, leakage and endurance tests.

1.2 The requirements of this standard apply mostly to flexible shafts driven immersion vibrators powered by different types of motors, as well as electrically driven motor-in-head type vibrators up to 90 mm size. Pneumatic motor-in-head type immersion vibrators and flexible shaft driven or motor-in-head type vibrators of size larger than 90 mm are not covered by this standard although some of the provisions of this standard may also apply to these types of vibrators.

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 the agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

IS No.	*Title*
IS 456 : 2000	Plain and reinforced concrete — Code of practice (*fourth revision*)
IS 2505 : 1992	Concrete vibrators — Immersion type — General requirements (*third revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2505 shall apply.

4 MATERIAL FOR TEST

For conducting range of action test, the concrete shall be prepared in accordance with the requirements of IS 456.

5 SIZE

The size of vibrator shall be denoted by nominal outside diameter of the vibrating needle expressed in millimetres and shall be in accordance with IS 2505.

6 METHOD OF TEST

6.1 Measurement of Frequency and Amplitude of Vibration

6.1.1 The frequency and amplitude shall be determined under no load condition (operation in air) by operating the vibrating needle kept horizontally on a piece of sponge rubber or substance of similar softness more than 25 mm thick. The flexible shaft shall also be kept horizontal during the operation.

6.1.2 The measurement of frequency shall be carried out with the help of an electromagnetic vibration pick up or read vibrator or stroboscope or tachometer or any other equally suitable instrument. However, tachometer shall not be used with vibrator whose rotation per minute and frequency are not the same.

6.1.3 Average value of the frequency of vibration measured shall conform to **7.1.1** of IS 2505.

6.2 The amplitude shall be measured by a combined set of oscilloscope, amplitude measuring apparatus and electromagnetic pickup, or any other equally suitable instrument.

6.3 At least three measurements, top, middle, and bottom, over the length of needle should be taken. The minimum value of amplitude for the vibrator under test shall conform to **7.1.2** of IS 2505.

6.4 Measurement of Vibration Acceleration

The acceleration shall be either measured with the help of a piezo-electric accelerometer or by a combined set of oscilloscope, amplitude measuring apparatus and electromagnetic pickup, or any other suitable apparatus or calculated from the following formula:

$$A = (11.18\ a\ n^2\ 10^{-7})\ g$$

where

A = vibration acceleration;

a = amplitude of vibration in mm;

n = measured frequency of vibration in cycles per minute; and

g = acceleration due to gravity expressed in m/sec^2.

6.4.1 In practice and in absence of acceleration measuring instruments it is easier to compute vibration acceleration by substituting the values of amplitude of vibration and frequency of the vibrator under test.

6.5 Measurement of Range of Action

The concrete shall be shovelled into a strong right circular cylindrical container of cross-sectional area at least 50 percent greater than the expected area of action of the vibrator and of depth at least 25 percent greater than the length of the vibrating needle. The vibrator shall then be started and when it has attained its full speed, it shall be inserted into the middle of the container filled with concrete, so that the working part of the needle is immersed. The area of action shall be observed by operating the needle continuously in this position for not less than two minutes.

6.5.1 The area of action shall be determined by any of the following methods, given under (c) shall be used only if agreed to between the purchaser and the supplier:

a) By determining the radius of the region beyond which the static pressure is equal to the hydrostatic pressure, the measurement of pressure being done with the help of a piezo-electric accelerometer;

b) By determining the radius of the plane surface of settlement in the vicinity of the vibrating needle by observing the contour lines of the concrete surface with the help of photographs; and

c) By determining the radius of the area in which the concrete surface is glossy as indicated by visual observation of a sharply defined plane surface in the immediate neighbourhood of the vibrating needle.

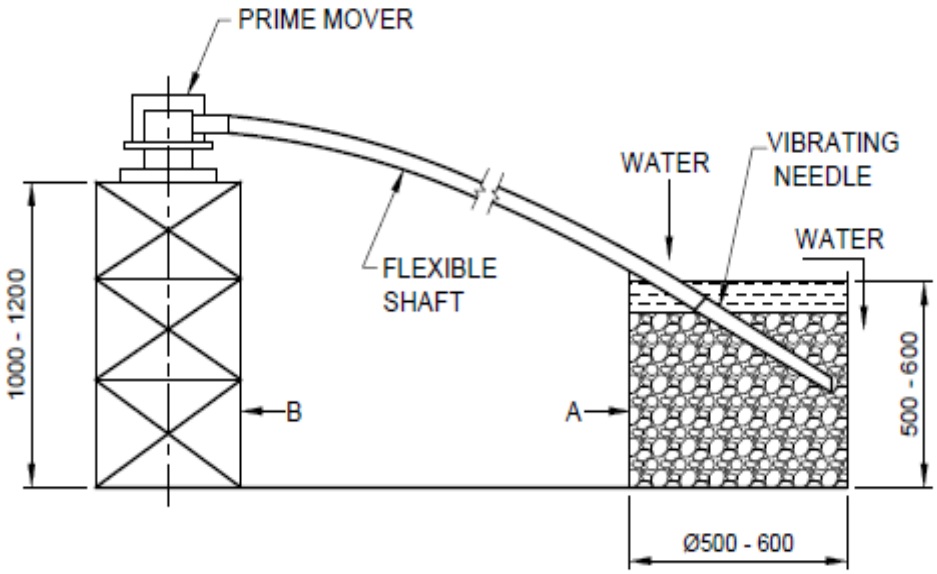
6.5.2 The area of the range of action of the vibrating needle measured in accordance with **6.5**, in concrete with maximum nominal size of aggregate not more than 20 mm and of workability 0.74 to 0.82, compacting factor shall be not less than 100 times the cross-sectional area of the needle. The cross-sectional area of the needle shall be calculated from its nominal diameter (*see* IS 2505).

6.6 Leakage Test

The vibrator shall be operated for one hour in 75 mm slump concrete to determine its ability to operate with the needle submerged and to determine if the needle is completely sealed against the entrance of concrete and water. After one hour of operation, the vibrator needle shall be dis-assembled and examined for presence of concrete or water inside the vibrator head. The presence of either concrete or water on the inside mechanism shall be the cause for rejection. It shall be a type test.

6.7 Endurance Test

The vibrator shall be operated continuously for 20 hours (with not more than two stoppages of 15 minutes required for change of prime mover) in a barrel of crushed stone aggregates, sand and water simulating a concrete mix. The minimum size of the barrel shall be such that the cross-sectional area is at least equal to the range of action, the depth being at least twice the length. The vibrator shall be able to complete this test without any breakdown (*see* Fig. 1). It shall be a type test.



All dimensions in millimetres.

A — barrel containing sand and 15 mm and down rounded aggregate in 1:2 ratio in flood water.

B — raised platform for placing the prime mover.

FIG.1 TYPICAL ARRANGEMENT FOR ENDURANCE TEST

ANNEX A
(*Foreword*)

COMMITTEE COMPOSITION

Construction Plant and Machinery Sectional Committee, MED 18

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