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Indian Standard

METHOD FOR TESTING PERFORMANCE OF CONCRETE VIBRATORS, IMMERSION TYPE

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Indian Standard

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0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 September 1985, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 The vibration characteristics for concrete vibrators, immersion type are indicated in IS : 2505-1980* which also recommend the methods 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 a 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.

0.3 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 and acceleration, range of action, leakage and endurance tests.

04. For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, oberved or calculated, expressing the result of a test 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.

*General requirements for concrete vibrators, immersion type (*second revision*).
†Rules for rounding off numerical values (*revised*).

1. SCOPE

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

1.2 The requirements of this standard apply mostly to flexible shafts driven and immersion vibrators powered by different types of motors, as well as electrically driver 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. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2505-1980* shall apply.

3. MATERIAL FOR TEST

3.1 For conducting range of action test, the concrete shall be prepared in accordance with the requirements of IS : 456 - 1978†.

4. SIZE

4.1 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 : 2505-1980*.

5. METHOD OF TEST

5.1 Measurement of Frequency and Amplitude of Vibration

5.1.1 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.

5.1.2 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.

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*General requirements for concrete vibrators, immersion type (*second revision*).
†Code of practice for plain and reinforced concrete (*third revision*).

5.1.3 Average value of the frequency of vibration measured shall conform to **6.1.1** of IS : 2505-1980*.

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

5.3 At least three measurement, top, middle and bottom, over the length of needle should be taken. The minimum value of amplitude for vibrator under test shall conform to **6.1.2** of IS : 2505 - 1980*.

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

$$A = (11{\cdot}18\ a\ n^2\ 10^{-7})\ g$$

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.

5.4.1 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.

5.5 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.

5.5.1 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:

*General requirements for concrete vibrators, immersion type (*second revision*).

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

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

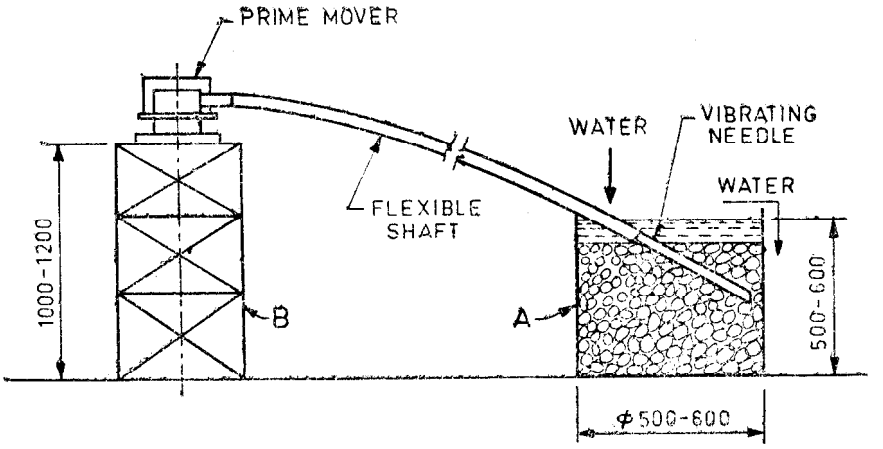
c) By determining the radius of area in which the concrete surface is glossy as indicated by visual observation of a sharply defined plane surface in the immediate neighbourhood of the vibrating needle.

5.5.2 The area of the range of action of the vibrating needle measured in accordance with **5.5**, 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 : 2505-1980*).

5.6 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.

5.7 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).

*General requirements for concrete vibrators, immersion type (*second revision*).



All dimensions in millimetres.

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

B — raised platform for placing the prime mover.

FIG. 1 TYPICAL ARRANGEMENT FOR ENDURANCE TEST

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Panel for Concrete Vibrators, BDC 28 : P2

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