

Indian Standard

GENERAL REQUIREMENTS FOR
CONCRETE VIBRATORS, SCREED BOARD TYPE
(*First Revision*)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

GENERAL REQUIREMENTS FOR CONCRETE VIBRATORS, SCREED BOARD TYPE

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Indian Standard

GENERAL REQUIREMENTS FOR CONCRETE VIBRATORS, SCREED BOARD TYPE

(First Revision)

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 compaction of concrete by vibrations has revolutionized the concept of concrete technology, making possible practical use of low slump, stiff mixes for production of high quality concrete with required degree of strength, density, durability and impermeability. Concrete vibrators of screed board type are essentially suited for compaction of concrete roads, runways, floors, pavements, thin slabs, etc, where the area to be compacted is large or the thickness is too small to allow the use of immersion vibrators. As is generally known, the strength of concrete of stipulated mix proportions depends largely on the degree of compaction imparted to it in plastic stage.

Insufficient compaction results in formation of voids in concrete which, in turn, reduces the strength. If the void content is 10 percent, the strength may be reduced by as much as 50 percent.

In such vibrators, as research results of Central Road Research Institute, New Delhi and work abroad have established, reasonably high amplitude of vibration corresponding to a matching frequency is of primary importance for efficient compaction.

This standard has been prepared with a view to providing guidance both in the manufacture and purchase of concrete vibrators of screed board type capable of giving satisfactory performance.

0.3 The prime mover to be used with the vibrator shall be of sufficient power to ensure required performance. The prime mover may be with internal combustion engine or electric motor conforming to relevant Indian Standard. It may be mounted on a suitable base. A suitable device for starting or stopping the vibrator without disconnecting the flexible shaft from the prime mover may also be provided.

0.3.1 The moving parts of the vibrator shall be suitably encased and appropriate safeguards against accident be provided. Suitable earthing and other safety arrangements shall also be provided for the electrical motors and components in accordance with the provisions laid down in relevant Indian Standard.

0.4 This Indian Standard was first published in 1964. While reviewing this standard in the light of the experience gained during these years, it has been decided to revise the standard with modifications in the performance characteristics of screed board vibrators and the title of the standard has been changed to general requirements.

0.5 A mere measurement of amplitude and frequency may not always yield a firm basis for judging the efficiency of a screed board vibrator. On the other hand, a direct measurement of the degree and uniformity of compaction of concrete achieved with such a vibrator would give a more convincing and fairer appreciation of its performance. However, in view of large number of variables involved, it has not been found feasible as yet to prescribe in this standard, a simple and practical method of test for direct measurement of compaction characteristics. Further, the Sectional Committee has also appreciated that even the requirements in regard to amplitude and frequency may considerably vary from case to case and, therefore, the attempt in this standard has been to lay down only the limiting ranges of the operational and performance characteristics besides the physical dimensions of the vibrators on the basis of available technical literature on the subject, experience and the current manufacturing practices in the country.

0.6 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this Standard.

1. SCOPE

1.1 This standard lays down the requirements for materials, sizes, construction, assembly and performance of screed board concrete vibrators, screed board vibrators operated by pneumatic power are not covered in this standard.

*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Amplitude of Vibration — Maximum displacement of a vibrating body from its mean position during vibration. It is usually expressed as half of its total displacement.

2.2 Eccentric Shaft (Rotor) — The rotating shaft of the vibrating unit designed to produce the required frequency and amplitude of vibration.

2.3 Anchor — The arrangement provided to give a support to the screed board when desired.

2.4 Frequency of Vibration — Number of complete cycles of vibrations per minute.

2.5 Screed Board (Tamping Beam or Vibrating Beam) — The beam to which the vibrating unit is affixed and which compacts the concrete due to its vibration.

2.6 Tube (Casing) — Fitting which encases the eccentric shaft.

2.7 Vibrating Units — The complete assembly of tube, the eccentric shaft and its bearings, affixed to the screed board to impart vibrations to it.

2.8 Vibration of Acceleration — The maximum acceleration per cycle of vibration. It is usually expressed as a multiple of g , the acceleration due to gravity.

3. MATERIALS

3.1 The eccentric shaft shall be made of carbon steel of Grade 35C8 of IS : 1570 (Part 2)-1979* and shall be tempered and polished.

3.2 The tube or casing of the vibrating unit and other parts shall conform to IS : 226 - 1975†.

3.3 The rivet bars shall conform to IS : 1148 - 1982‡ or IS : 226 - 1975†.

3.4 Spring shall be manufactured from suitable grade of wire conforming to IS : 4454 (Part 1)-1981§.

*Schedules for wrought steels: Part 2 Carbon steels (unalloyed steels) (*first revision*).

†Specification for structural steel standard quality (*fifth revision*).

‡Specification for hot rolled steel rivet bars (up to 40 mm diameter) for structural purposes (*third revision*).

§Specification for steel wires for cold formed springs: Part 1 Patented and cold drawn steel wire — unalloyed (*second revision*).

3.5 V-belt shall conform to IS : 2494 - 1974*.

3.6 All other materials to be used in construction of the screed board vibrator shall conform to the relevant Indian Standards.

4. SIZES

4.1 **Size Designation** — The size of the vibrator is designated by the overall length of the screed board expressed in metres. Common sizes of the vibrators are 3, 4 and 5 m.

5. CONSTRUCTION

5.1 The screed board vibrator shall consist of one or more vibrating units mounted on a screed board (see Fig. 1).

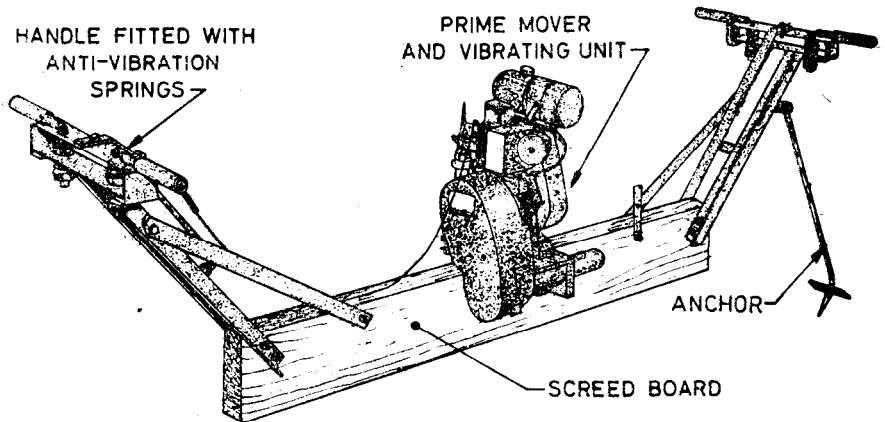


FIG. 1 TYPICAL SKETCH OF SCREED BOARD CONCRETE VIBRATOR

5.1.1 The vibrating unit or units shall be rigidly affixed to the screed board so that there is no relative movement between the vibrating beam and the vibrating unit, during operation. Suitable arrangements shall be provided to allow for easy fixing and removal of the vibrating unit from the screed board. Suitable arrangement shall also be provided for occasional tightening of the fixing joint between the vibrating unit and the screed board which may become necessary during operation.

Where the power unit is not directly connected with the eccentric rotor of the vibrating unit, the power unit shall be so mounted that the

*Specification for V-belts for industrial purposes (first revision).

vibrations of vibrating unit or the vibrating beam are not transferred to it thereby affecting its life and performance; and the efficiency of the drive shall be such that there is no significant slippage under full operating loads. In case of belt drives, multiple V-belt drives should preferably be used, tensioning device shall be provided to keep the transmitting medium adequately tensioned during operation.

5.1.2 The vibrating unit or units shall be suitably positioned, generally, symmetrically with respect to the centre of length of the screed board, to ensure that the amplitude and frequency of the screed board are as far as possible uniform all along its length.

The vibrating beam shall be rigid enough and vibrating units and the beam supports shall be so placed as to prevent excessive vibration (whipping) of the beam between the positions of vibrating units. The weight of the beam and the elasticity of the supports shall be so proportioned that the vibrations are not damped out by the supports.

5.2 Vibrating Unit — The vibrating unit shall be of totally enclosed construction and shall be filled with correct amount of lubricant and properly sealed to protect against the entry of dust and moisture.

5.2.1 The tube or casing of the vibrating unit shall be seamless in construction and shall be of material as specified in 3.2. The minimum finished wall thickness of the tube anywhere in its length including the thickness on the bearing seating shall not be less than 4 mm.

5.2.2 The bearings and the eccentric shaft shall be so assembled as to enable the easy removal of the shaft for repairs and replacements. Suitable arrangements shall be provided for adequate lubrication of bearings so as to prevent them from being heated excessively in actual operations. Such a provision also should take care of prevention of entry of moisture or cement slurry by providing a one way entry for the lubricant with the help of valve.

5.3 Screed Board — The screed board shall generally be of well-seasoned hard wood timber of cross-section not less than 75×150 mm or any other suitable material. The width of the screed board in any case shall not be less than 75 mm. If made of hard wood the screed board shall be shown with steel plate not less than 1.6 mm thick. The screed board should be checked periodically against bending of board so that the vibrated surface does not result in a curve.

5.4 Handles — The vibrator shall be provided with two handles, each suitably mounted on either end of the screed board. Each handle shall be provided with suitable anti-vibration packings or springs so as to protect it from direct vibrations of the screed board. The handles and

their braces shall be made of suitable steel section of adequate strength, and their design shall be such as to prevent injury or discomfort to the operator during operation.

5.5 Anchor — An anchor of suitable design shall be provided at one end of the screed board, preferably mounted on the handle so as to give support to the entire unit when required. The anchor shall be designed to dig into ordinary ground without much difficulty.

6. PERFORMANCE REQUIREMENTS

6.1 Operation Characteristics — The vibrators shall be so designed that when tested for operational characteristics shall comply with the provisions given in 6.1.1. The requirements given in 6.1.1 shall be checked on selected samples on the basis of suitable sampling scheme.

6.1.1 Frequency and Amplitude — Frequency and amplitude under no load (operation in air) shall be tested in accordance with IS : 6923-1973* and shall be as given below:

<i>Frequency of Vibration</i> Vibrations/minute	<i>Minimum Amplitude</i> mm
3 000 to 3 200 for thickness of concrete up to 15 cm	1'5
3 000 to 3 200 for thickness of concrete from 15 to 25 cm	2'0
3 500 to 3 700	1'5

NOTE — In no case frequency less than 3 000 shall be accepted.

6.2 Mechanical Efficiency — After continuous running of vibration for more than 4 hours, the rotor temperature shall not be more than 70°C and shall be tested in accordance with IS : 6923 - 1973*.

6.2.1 Endurance Test — The endurance test shall be in accordance with IS : 6923 - 1973*.

7. INSTRUCTION SHEET

7.1 An instruction sheet containing instructions relating to installation, maintenance and lubrication of the vibrator and the prime mover shall be given.

*Method of test for performance of screed board concrete vibrator.

8. MARKING

8.1 Each vibrator shall have firmly attached to it a mark plate bearing the following information:

- a) Manufacturer's name or trade-mark:
- b) Vibrator reference number;
- c) Type and rating of the power unit to be used;
- d) Year of manufacture; and
- e) Frequency and amplitude.

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Panel for Concrete Vibrators, BDC 28 : P2

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