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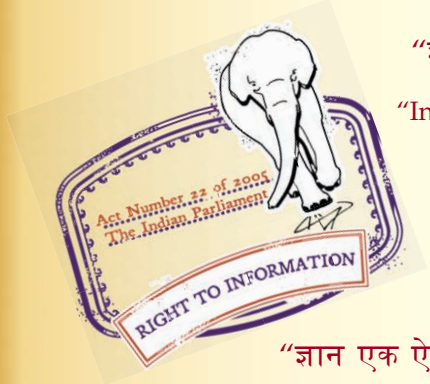
IS 11267 (1985): Method of test for length distribution (wet classification of fibre length) of chrysotile asbestos fibre using Turner and Newall classifier [CED 53: Cement Matrix Products]



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"Knowledge is such a treasure which cannot be stolen"

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IS : 11267 - 1985
(Reaffirmed 2005)

Indian Standard

METHOD OF TEST FOR LENGTH DISTRIBUTION (WET CLASSIFICATION OF FIBRE LENGTH) OF CHRYSOTILE ASBESTOS FIBRE USING TURNER AND NEWALL CLASSIFIER

UDC 677·511 : 531·717·14

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

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November 1985

Indian Standard

METHOD OF TEST FOR LENGTH DISTRIBUTION (WET CLASSIFICATION OF FIBRE LENGTH) OF CHRYSOTILE ASBESTOS FIBRE USING TURNER AND NEWALL CLASSIFIER

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(*Continued on page* 10)

Indian Standard

METHOD OF TEST FOR LENGTH DISTRIBUTION (WET CLASSIFICATION OF FIBRE LENGTH) OF CHRYSOTILE ASBESTOS FIBRE USING TURNER AND NEWALL CLASSIFIER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 12 April 1985, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A series of standards on testing procedures of asbestos fibre is being formulated so as to provide standard methods for obtaining physical and chemical properties of asbestos fibre which is used for manufacturing various asbestos cement products like asbestos cement sheets, asbestos cement pipes, etc. These testing procedures will be useful for both mine owners and the manufacturers of asbestos cement products.

0.3 The test for length distribution of chrysotile asbestos fibre by wet classification can be performed by either Bauer-McNett classifier or Turner and Newall (T & N) classifier. This standard covers the method of test by Turner and Newall classifier and the method of test by Bauer-McNett classifier is covered in IS : 9691-1980*.

0.4 This test provides a simple method for obtaining information on the fibre length distribution of milled chrysotile asbestos fibre. This test method also requires the use of a relatively low cost apparatus, small test specimens and a short test period. This is suitable for quality verification and manufacturing control.

0.5 In the formulation of this standard, due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by basing the standard on 'Chrysotile Asbestos Test Manual' 1974 (*revised* 1978) of Asbestos Textile Institute and Quebec Asbestos Mining Association.

*Method of test for length distribution (wet classification of fibre length) of chrysotile asbestos fibre using Bauer-McNett classifier.

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, 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 specifies the method of test for the determination of fibre length distribution and fines content of milled chrysotile asbestos fibre by wet classification using Turner and Newall (T & N) classifier.

1.2 For the purpose of estimating fibre length distribution, this test method is limited to samples free from excessive quantities of non-fibrous particles or contaminants.

1.3 For comparison between different fibre grades, only those specimens which have approximately the same degree of fiberization will give completely meaningful results.

1.4 This standard is not applicable to ultrafine grades of asbestos powder which contains little or no fibres retained on 75 μm IS Sieve. This standard is restricted to fibre grades 4A to 7D inclusive.

NOTE — The fibre grade classification is based on Quebec Standard (Q.S) designation of chrysotile asbestos grades.

2. APPARATUS

2.1 Turner and Newall Classifier — This apparatus (Fig. 1) consists of four 127 mm diameter rotating plastic circular vessels, the bottom of which are fitted with 98 mm diameter screens, arranged vertically and concentrically in order of diminishing screen sizes. It is also fitted with stirrers in order to prevent screen blinding, and with spouts for conducting the drainage from each vessel to the following vessel. The lowest vessel discharges into a 75 μm IS Sieve 203·2 mm in diameter, in the base of the apparatus.

2.1.1 Sieve discs fitted with screen cloth having IS Sieve designation 2·36 mm, 1·18 mm, 600 μm, 300 μm and 75 μm are required.

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

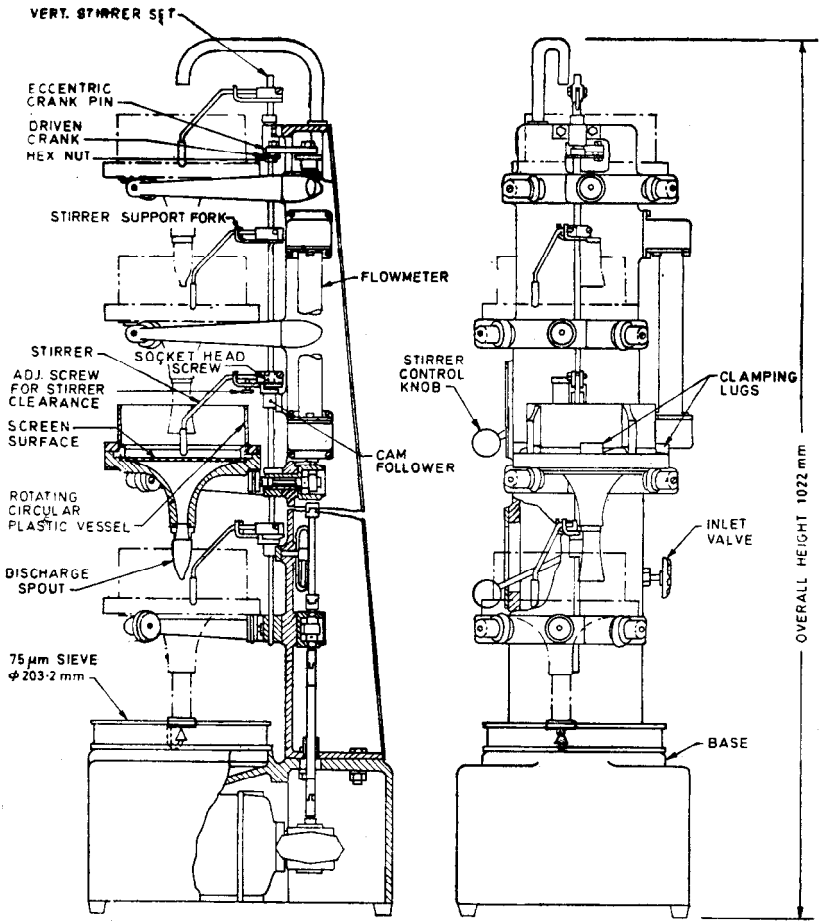

FIG. 1 TURNER AND NEWALL CLASSIFIER

2.2 Accessories — The following accessories shall be provided:

a) one 63 μm IS Sieve disc for drying 75 μm fractions;

b) fraction collector or optional suction arrangement, such as Buchner funnel;

c) drying oven (convection type, or mechanical draught) or infra-red drying unit; and

d) balance (sensitivity 0·001 g).

2.3 Water Supply Provisions — A suitable pressure regulator and filter, if necessary, shall be provided to ensure a constant flow of clean water to the classifier.

3. SAMPLING

3.1 Sampling shall be done in accordance with IS : 4844-1968*.

4. PREPARATION OF TEST SAMPLE

4.1 From the sampling done in accordance with **3.1**, two specimens having mass approximately 15 g shall be drawn. Afterwards, reduce each specimen by coning and quatering to 2 $\pm$ 0·005 g.

5. PREPARATION OF APPARATUS

5.1 Measurement of Stirrer Stroke — Stirrer stroke may be measured by attaching a pencil to the side of the stirrer and measuring the chordal length of the arc swept on a piece of card held horizontally under it. Care shall be taken to mount the pencil in such a position that its point describes an arc having the same radius as that swept by the tip of the stirrer.

5.2 Adjustment of Stirrer Stroke

5.2.1 Stirrer stroke shall be 60·0 to 64·0 mm. If it is outside this range, it may be adjusted as described in **5.2.2**.

5.2.2 Loosen the hexagonal nut of the driven crank mounted on the vertical stirrer shaft. Rotate the eccentric crank pin so that the pin moves inwards if the stroke was too small, or outwards if the stroke was too large. Tighten the locking nut and recheck the stroke. Repeat the procedure until the correct stroke is obtained.

5.2.3 The arc swept by each of the four stirrers shall stop 3 mm from the inner edge of the lower bevelled part of the plastic vessel.

5.3 Stirrer Clearance

5.3.1 The clearance between the tip of each stirrer and the screen over which it is mounted shall be 1·5 to 2·4 mm. If the clearance falls outside these limits, it may be adjusted as described in **5.3.2** and **5.3.3**.

5.3.2 For the upper two stirrers, adjust the clearance by means of the small screw which is located on the stirrer support fork upon which the horizontal part of the stirrer arm rests.

*Method of sampling and preparation of asbestos fibre for laboratory test purposes.

5.3.3 For the two lower stirrers, the adjustment shall be made by losening the socket screw which secures the stirrer fork to the stirrer drive shaft, and adjusting the height of the stirrer fork as necessary. Lowering the stirrer fork raises the stirrer tip and *vice versa*. The adjustment is made easier if feeler gauges are inserted between the underside of the stirrer fork and the upper surface of the cam follower. The horizontal angular position of the stirrer fork shall be maintained during these adjustments, to ensure that the stirrer tip does not strike the side of the plastic vessel at the extremity of its stroke. Limits imposed in **5.2.3** shall be maintained.

5.4 Open the water control valve, start the drive motor, adjusting the flow of water through the classifier to 80 ml/s or the 64 graduation on the flowmeter tube when reading the top of the float, and ensure that there are no leaks caused by inadequate clamping of the sieve discs. Any such leak shall be rectified by unclamping the plastic vessel, readjusting the sieve disc and reclamping the plastic vessel. It is to be ensured that the side of the water jet impinges on the top of the screen about 3 mm from the inner edge of the lower bevelled part of the plastic vessel. The water spout shall be adjusted, if necessary, for this purpose.

NOTE — The operating water level in the top three vessels shall be checked daily before use. The level shall be to the top surface of the clamping lugs within ± 3·2 mm. In case the water level is high or low in any vessel, adjust the copper outlet tube of that vessel to obtain the desired level. Generally, very slight adjustments are necessary.

6. PROCEDURE

6.1 Disperse one test specimen in 400 ml of water in a 500-ml beaker and allow it to soak for four minutes. Then, stir intermittently by hand for a further period of one minute. Stir gently and diametrically across the beaker to disperse the asbestos without excessive fiberizing action.

6.2 While the test specimen is soaking, thoroughly wet all the discs of the sieve series and fit to the classifier. Take a clean 75 micron, 203·2 mm diameter test sieve and thoroughly wet its screen cloth and place it in the recess in the top of the classifier base, and centre the small plastic disc supplied with the apparatus atop the screen surface beneath the fourth vessel outlet.

NOTE — Tare mass of each sieve disc shall be verified daily before use.

6.3 Slowly pour the water dispersion containing the test specimen from the beaker into the first (top) vessel, ensuring that overflowing does not occur. This operation shall be completed within 20 to 25 seconds. Start the timing period at this point. Any residue from the beaker shall be washed out with a small volume of clean water into the first vessel.

NOTE — A plastic wash bottle is suitable for this purpose.

6.4 During the test, manually rotate the 75 μm sieve slightly at 30 seconds intervals, recentering the plastic disc on each occasion, for improved operation and to prevent blinding. If the water level in either of the two lowest rotating sieve units rises continuously, as may happen with short or talcy grades, lower the stirrer on the appropriate sieve by pressing down the control knob on the left-hand side of the classifier body. Clear immediately any fibre which lodges in the orifices of any of the sieving units, by means of a wire hook. A clue to this malfunction is given if the water level in any of the units rises unduly.

6.5 At the end of 300 seconds test period, stop the flow of water and when each unit has drained, wash down any fibre remaining on the walls of the vessel, using a plastic wash-bottle and directing the water jet in a direction opposite to the motion of the vessel. Afterwards, stop the motor.

6.6 Unclamp the plastic vessels and remove each sieve disc in turn from its sieving unit, after ensuring that any fibre remaining in the conical depression in the sieve holder above has been washed down.

6.7 Carefully wash the fibre retained on the 203·2 mm diameter 75 μm sieve on to a 63 μm sieve held in the fraction collector (or Buchner funnel) and apply a vacuum to enhance the filtration. A venturi type water-jet suction pump may be used for this purpose. The suction tube shall be connected to the outlet of the fraction collector.

6.8 Dry the fibre fractions retained on their respective sieve discs to constant mass at 105 to 110°C in a drying oven.

6.9 When all the fractions are dried, cool the sieve discs along with the contents for a minimum period of 15 minutes in a partly closed container and weigh immediately.

7. REPORTING OF RESULTS

7.1 Obtain the net mass of the different fibre fraction by subtracting the tare mass of each sieve disc, previously determined, from the gross mass of the corresponding fibre fraction and sieve disc. The quantity passing 75 μm in the original specimen is calculated by subtracting the cumulative mass of the fractions retained on the sieve discs from the original mass of the specimen. Report the percentage of fibre retained on each sieve disc and the percentage passing through the last screen. Fully identify the origin and the grade designation of the sample.

NOTE — For a typical calculation, Appendix A may be referred to.

7.2 If the corresponding individual percentage obtained for each sieve fraction of the duplicate specimens differ by more than three units of percentage, make a third test. Average the results of two acceptable tests and report average stating the series of sieves used.

8. PRECAUTIONS

8.1 To obtain desired accuracy, the general precautions given in **8.2** to **8.6** should be observed.

8.2 It is important that all the retained material be washed from the walls of the vessels into the corresponding sieve discs and after removal of a sieve disc, any material in the cone beneath it be washed into the vessel below.

8.3 For better accuracy and reproducibility, a water temperature of 27 ± 2°C is recommended.

8.4 New sieve discs should be run-in by making at least ten dummy tests before they are put into regular use.

8.5 Stirrer clearance of 1·5 to 2·4 mm and stirrer stroke of 60 to 64 mm shall be maintained.

8.6 Sieve discs should be checked regularly for holes, slack and other damage.

APPENDIX A

(Note under Clause 7.1)

CALCULATIONS

A-1. TEST RESULTS

Sample: Group 4 (Q.S. classification)

Mass of sample: 2 g

Results:

IS Sieve size	2·36 mm	1·18 mm	600 μm	300 μm	75 μm
Mass retained, g	0·080	0·460	0·500	0·180	0·270

A-2. CALCULATION

Mass of fraction passing 75 μm sieve.

= 2·0 — (0·080 + 0·460 + 0·500 + 0·180 + 0·270) = 0·510 g

	IS Sieve designation of Sieve discs				
	2·36 mm	1·18 mm	600 μm	300 μm	75 μm
Percentage retained	4·0	23·0	25·0	9·0	13·5
Percentage passing 75 μm	—	—	—	—	25·5

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2