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METHOD OF TEST FOR DETERMINATION OF OPENNESS OR FIBERIZATION OF CHRYSOTILE ASBESTOS FIBRE BY AIR PERMEABILITY METHOD USING RAPID SURFACE AREA APPARATUS

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METHOD OF TEST FOR DETERMINATION OF OPENNESS OR FIBERIZATION OF CHRYSOTILE ASBESTOS FIBRE BY AIR PERMEABILITY METHOD USING RAPID SURFACE AREA APPARATUS

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Indian Standard

METHOD OF TEST FOR DETERMINATION OF OPENNESS OR FIBERIZATION OF CHRYSOTILE ASBESTOS FIBRE BY AIR PERMEABILITY METHOD USING RAPID SURFACE AREA APPARATUS

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 degree of fiberization or subdivisions of the asbestos fibre bundles in a specimen is related to its resistance to air flow. The number and size of the pores in the specimen are a function of the size of the fibre bundles and determine the resistance to air flow through the plug. In this method of test, the resistance to air flow of a compressed specimen of fixed mass and volume to a fixed hydraulic pressure head is determined.

0.4 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.

0.5 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.

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

1. SCOPE

1.1 This standard covers the procedure for measuring the relative degree of openness or fiberization of milled chrysotile asbestos fibre by air permeability using rapid surface area apparatus.

1.2 This method is limited to fibres with an effective surface area in the range from 1 000 to 25 000 cm^2/g. Samples containing excessive quantities of non-fibrous particles or contaminants will not give reliable or meaningful results.

2. SAMPLING

2.1 The sampling shall be carried out in accordance with IS : 4844-1968*.

3. PREPARATION OF TEST SAMPLE

3.1 The sample shall be spread on a smooth working surface in layers to form a flat pile of uniform thickness of approximately 13 mm and quartered.

3.2 Opposite quarters shall then be set aside and procedure as in **3.1** shall be repeated with the remaining quarters. Two 50 ± 0·1 g mass test specimens shall be selected by taking pinches from each quarter of the pile.

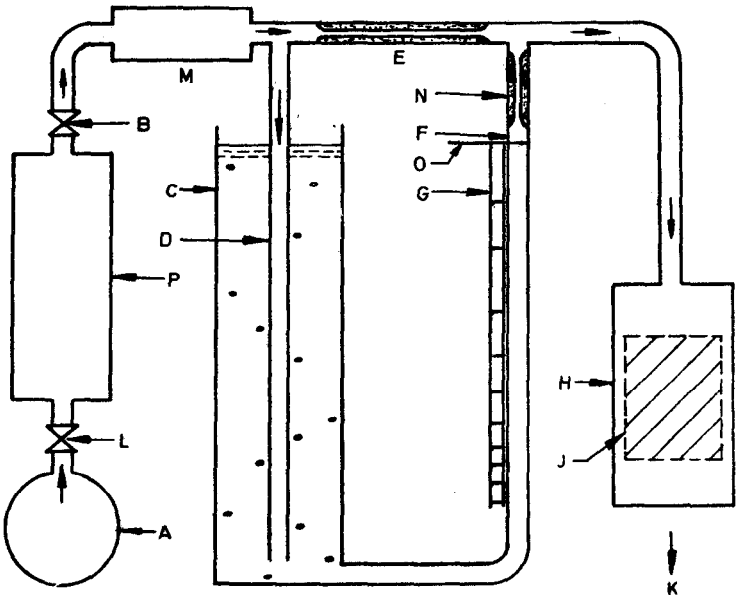
3.3 When pinches are taken, care shall be taken to include the total cross-section of the pile from top to bottom at the point where it is taken, including any grit or fines that may have segregated to the bottom. Any lumps or knots of matted fibre still remaining in the specimen should be disentangled before cell loading is begun.

4. APPARATUS

4.1 The apparatus consists of a rapid surface area tester including 50 g brass sample cell complete with perforated plate, end cap, retaining ring and base. A schematic diagram of the apparatus is shown in Fig. 1.

NOTE — The sample cell is made of brass such that the effective length occupied by the specimen is 58·903 ± 0·050 mm and the diameter is 38·964 ± 0·050 mm. It is advisable to check these dimensions periodically.

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



LEGEND

A — Supply of clean compressed air
B — Control valve
C — Water reservoir
D — Bubbler tube
E — Capillary resistance
F — Manometer leg
G — Manometer scale (Exponential)
H — Permeability cell
J — Test specimen
K — Air outlet
L — Shut-off valve
M — Dust filter (Fibre glass)
N — Capillary snubber
O — Zero mark on manometer
P — Air dryer or desiccator (Dryerite)

NOTE — Items *A*, *L*, & *P* are not supplied with the apparatus.

FIG. 1 SCHEMATIC DIAGRAM OF RAPID SURFACE AREA TESTER

4.2 Accessories — The accessories shall be the following:

a) source of clean air at approximately 14 kPa,
b) calibrating standards as described in **4.3**,
c) handle for inserting and extracting capillary tube holders in the permeability cell,
d) tamping rod, and
e) filling funnel.

4.3 Calibrating Standards — The calibrating standards (low and high) consist of capillary glass tubing mounted in a holder which suitably fills the specimen cavity in the permeability cell and shall have the following requirements:

a) *Low Standard*

Surface area range	4 500 to 5 500 cm^2/g
Glass capillary tube bore	0·311 ± 0·012 mm
Length	13 mm, approximately

b) *High Standard*

Surface area range	20 000 to 23 000 cm^2/g
Glass capillary tube bore	0·178 ± 0·013 mm
Length	39·5 mm, approximately

NOTE 1 — For accurate results, calibrating standards shall be kept in airtight containers or in a desiccator when not in use.

NOTE 2 — Capillary tubes shall be cleaned with dry, compressed air, free from contaminants, at 138 kPa, if permanently mounted or 34·5 kPa, if temporarily mounted prior to calibration by allowing the air to flow 60 seconds.

5. PREPARATION OF APPARATUS

5.1 The apparatus shall be checked daily before using and adjustments made, if necessary, in accordance with **5.1.1** to **5.1.5.**

5.1.1 Verify the zero reading of the tester as given in **7.4** and **7.5** but with the cell empty.

5.1.2 In case the manometer does not read zero, check to determine if the manometer is out of plumb.

5.1.3 If the water level is below zero, adjust by adding distilled water through the hole in the reservoir cap.

5.1.4 If the water level is above zero, correct it by inserting a wick through the hole to remove excess water. The apparatus should not be tilted.

5.1.5 Ensure that the perforated disc is perfectly seated at the bottom of the sample cell.

6. INSTRUMENT CALIBRATION

6.1 Prepare the apparatus as described in **5.**

6.2 Insert a calibrating standard mounted in its capillary tube holder into the cell using the handle. Insert the end cap of the cell, and screw down the retaining ring using the key and base provided, until there is a positive resistance indicating that the O-ring seal is fully compressed and that metal-to-metal contact has been established between the cell face and the end cap.

6.3 Proceed as in **7.4** and **7.5**. If the results differ from the nominal value of the standard by more than ± 3·0 percent, it may be concluded that the equipment is defective and the defect must be rectified before proceeding further.

7. PROCEDURE

7.1 Place the filling funnel over the open end of the cell and empty one 50 g specimen into it in stages, using the tamping rod at intervals to coax all the specimen past the neck of the funnel Trapping of any fibre between the rod and the funnel shall be avoided. In a single motion, press the specimen into the cell until the transverse bar touches the upper edge of the filling funnel.

7.2 Do not compress the fibre in the cell without the filling funnel in place.

7.3 Withdraw the rod slowly, rotating it slightly to ensure that the compressed fibre is not disturbed. Insert the end cap of the cell, and screw down the retaining ring using the key and base provided, until there is a positive resistance indicating that the O-ring seal is fully compressed and the metal-to-metal contact has been established between the cell face and the end cap.

7.4 Connect the cell to the rubber discharge tube of the tester and turn on the air supply. Open the control valve on the apparatus until the water level in the front manometer tube begins to fall. When air bubbles begin to escape from the escape holes at the bottom end of the brass tube in the transparent vertical cylinder at the rear of the tester, adjust the control valve until bubbles escape at a rate of about three per second.

7.5 When the water level in the manometer tube appears to be stationary, note the scale reading opposite this level. Wait 10 seconds and read the level again to ensure that it is constant; if not, take another reading after a further 10 seconds. Estimate the scale reading to half a division, and note down this reading as the effective surface area in square contimetres per gram.

7.6 When the reading has been noted, close the shut-off valve, and disconnect the cell from the apparatus. The setting of the control valve shall not be changed, unless required.

7.7 Repeat the procedure described in **7.1** to **7.6** for the second test specimen.

8. REPORTING OF RESULTS

8.1 Fully identify the sample stating the origin and the designation. Calculate the average of the two readings.

8.2 If the difference between any individual readings and the average is more than 3 percent, the test shall be repeated.

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