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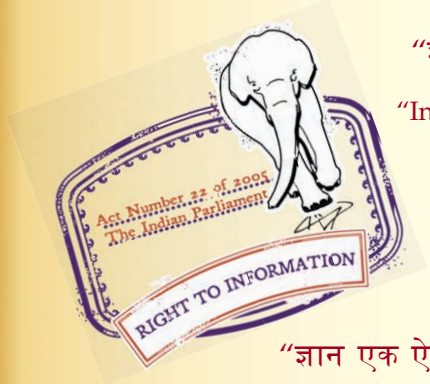
IS 9690 (1980): Method of test for determination of openness or fibrization of chrysotile asbestos fibre by air permeability method using Dyckerhoff apparatus [CED 53: Cement Matrix Products]



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IS : 9690 - 1980
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Indian Standard

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

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

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 December 1980, 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 roofing products, asbestos cement pipes, etc. These testing procedures will be useful for mine owners and manufacturers of asbestos cement products provided they have the facilities to make these tests with reasonable accuracy and the personnel with the required degree of laboratory experience. These standards which will define the properties of asbestos fibre fit for use in manufacturing asbestos cement products will also be helpful in utilizing indigenous asbestos fibre for various asbestos cement products.

0.3 In this method of test, the degree of fiberization is measured by determining the resistance to air flow of a compressed specimen of fixed weight and volume, which in turn is measured in terms of the time required to draw a given volume of air through the specimen under specified conditions of varying hydraulic head.

0.4 In the formulation of this standard due weightage has been given to international co-ordination 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). Asbestos Textile Institute, Inc. 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, 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 covers the procedure for measuring the relative degree of openness or fiberization of milled chrysotile asbestos fibre by air permeability.

1.2 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 (approximately 13 mm thick) and quartered.

3.2 Opposite quarters shall then be set aside and procedure as per **3.1** shall be repeated with the remaining quarters. Two $50 \pm 0{\cdot}1$ g mass test specimens shall be selected by taking pinches from each quarter of the pile.

3.3 When pinches are taken, care may 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 at 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 Dyckerhoff Air Permeability Apparatus — This apparatus (Fig. 1) is essentially a means of drawing a definite quantity of air through a prepared bed of asbestos fibre of fixed porosity. The tester shall be equipped with a manometer, fitted with electrodes, permeability cell with plunger, spacer (not supplied with the apparatus) which fits inside the cell, filter paper discs which are medium retentive, perforated disc which fits inside the cell, check valve holder connecting the cell to the manometer, suction pump and timer.

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

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

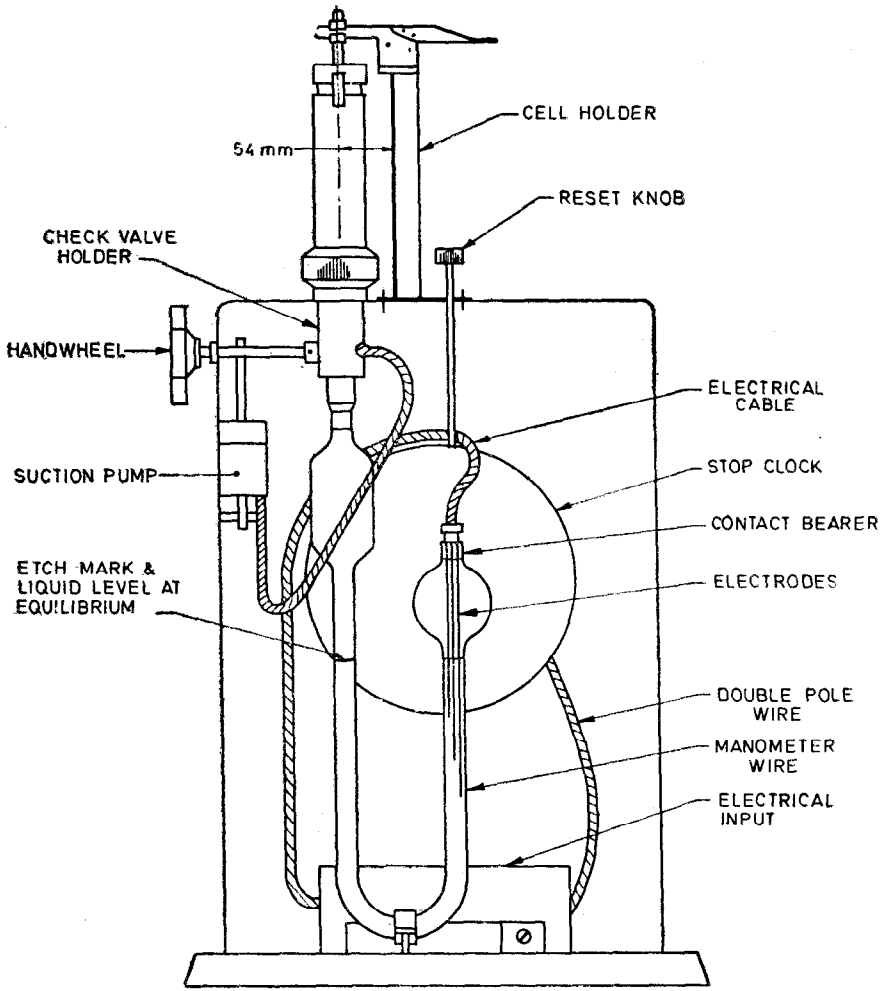

FIG. 1 DYCKERHOFF AIR PERMEABILITY APPARATUS

4.2 Accessories — The accessories shall be the following:

a) Tamper, supplied with the apparatus;

b) Porous cellulose filters for insertion at the top of check valve holder;

c) Funnel, wide mouth for loading the cell;

d) Calibrating standards mounted in cell holder, and as described in **4.3**; and

e) Handle for inserting and extracting capillary tube holders in the permeability cell.

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*	
Dyckerhoff time	20 to 30 s
Glass capillary tube bore	0·311 ± 0·012 mm
Length	13 mm, approximately.
b) *High Standard*	
Dyckerhoff time	350 to 450 s
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 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 s.

5. PREPARATION OF APPARATUS

5.1 Before using or calibrating the instrument, the system shall be checked for air leaks in accordance with **5.1.1** to **5.1.4**.

5.1.1 Seal off the top of the permeability cell by removing the plunger, coating the edge of the cell with petroleum jelly, and sliding a piece of thick, smooth flat glass over the opening. Clamp the cell firmly in position on the apparatus by using a suitable spacer (such as a rubber stopper) of the required thickness on top of the glass.

5.1.2 Apply vacuum to the manometer by means of the suction pump by rotating the hand wheel. The air interface should be drawn as little as possible below the longest electrode.

5.1.3 Wait 300 s until the oil drains from the walls of the manometer, then observe the level of the liquid. If the level remains stationary, there

are no leaks. If it moves, examine the tubing, check valve, and joints and correct any defects before proceeding further with the test.

5.1.4 Minute leaks might exist in a system, however, without having any significant effect upon the air-permeability value. Changes in the manometer level of less than 2·5 mm in 600 s may be neglected. Erratic readings can be caused by fines collecting in rubber check valve. This valve needs cleaning frequently.

6. INSTRUMENT CALIBRATION

6.1 Fixed Electrode Apparatus

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

6.1.2 Insert a calibrating standard mounted in its capillary tube holder into the cell using the handle and clamp the cell in position on the apparatus. Omit the spacer from the assembly so that the plunger may seat perfectly.

6.1.3 The liquid level in the manometer shall be at the indicated etch mark on the tube before the suction head is established.

6.1.4 Apply vacuum to the manometer until the lower liquid level in the manometer is just below the tip of the longest electrode.

6.1.5 Re-set the stop clock to zero, observe the reading on the dial after the level of the liquid has reached the shortest electrode, and the clock has stopped.

6.1.6 Take two readings. If the second reading differs appreciably from the cumulative average value of the standard, refer to the instructions supplied with the standards to locate and eliminate the source of variation.

6.1.7 Each time a working standard is used, and the valid readings are obtained, the average readings shall be recorded and the average of all previous readings, including the nominal value and the latest readings, shall be computed. This all time average value of the working standard is referred to as the cumulative average value.

6.1.8 If the value obtained with the calibrating standard is within 30 percent of the cumulative average that value is accepted and the apparatus may be considered free from defects.

6.1.9 If the deviations exceed 3 percent, examine the apparatus for defects and rectify as described in the instructions supplied with the standards.

6.1.10 The difference between the average reading (initial or re-check) and the cumulative average, which may be positive or negative, shall be applied as a correction to subsequent values obtained on unknown asbestos specimens.

6.1.11 When the correction exceeds 6 percent of the nominal value, the standards should be returned to the calibrating laboratory for the recalibration.

6.2 Variable Electrode Apparatus

6.2.1 Adjust the electrodes so that valid readings obtained on the calibrating standards will coincide with the nominal value within 3 percent.

6.2.2 Measure the position of the variable electrode relative to the apparatus housing whenever a new working standard is put into service, and record this vertical distance for later reference.

6.2.3 When electrode adjustments exceed 2·5 mm, the standard shall be recalibrated.

6.2.4 Obtain readings of unknown asbestos specimen directly without any correction.

7. PROCEDURE

7.1 Place the perforated disc at the bottom of the cell and cover it with a filter paper disc.

7.2 Divide the test specimen 50 g $\pm$ 0·1 g into four approximately equal parts. Pack the fibre into the cell, one part at a time, keeping the bed level uniform, and compress after each addition using the tamping tool supplied with the apparatus. Take care not to compress the fibre beyond final plug length or required porosity of 70 percent.

NOTE — Porosity of 70 percent is recommended assuming an average specific gravity of 2·55 for chrysotile asbestos. Other varieties with different specific gravities will result in different porosities, however, it is still possible to compare different samples of given species with equal specific gravities on the same basis.

7.3 When all the fibre has been added, compress, and place a filter paper disc on top of the fibre bed.

7.4 Place the spacer, screen side down, upon the filter paper disc, insert the plunger into the cell, and compress until the collar is seated flush with the top of the cell.

7.5 Fasten the hooks on the cell to the plunger to prevent fibre spring back and clamp the cell in position on the apparatus. Test the specimen under compression.

NOTE — Excessive holder pressure may allow contact between the perforated disc and the filter paper disc, and thus affect results.

7.6 Turn the suction hand wheel to the filling position to displace the liquid in the manometer. Then turn it to the measuring position and re-set the

clock to zero. This procedure starts the automatic process which will indicate on the clock the time required for the fixed volume of air to permeate through the specimen.

8. REPORTING OF RESULTS

8.1 Fully identify the sample stating the origin and the designation.

8.2 Record the time readings to the nearest estimated 0·1 s. Take four readings on each specimen and calculate the average.

8.3 The expected maximum difference between any individual reading and the average is ± 3·0 percent. When the maximum difference is exceeded (*see* Note), repeat the test by taking readings on a new test specimen.

NOTE — When the instrument has not been in use for some time the first reading may be erratic. In that case discard the first reading and replace it with an additional reading.

9. PRECISION AND ACCURACY

9.1 Reproducibility within ± 3·0 percent of the average can be obtained on homogeneous samples free from nonfibrous contaminants, with a given setting of the instrument.

9.2 The calibrating procedure however permits ± 3·0 percent deviation from the cumulative average value of the calibrating standard.

9.3 The formation of drops at the tips of the electrodes, which short-circuit the timer solenoid may give probable errors of 2 and 0·25 s respectively for high or low standards and the electrodes.

NOTE 1 — Apparatus shall be kept away from open boilers, high temperature surfaces, source of dusts and any other cause of atmospheric changes.

NOTE 2 — Duplication of the atmospheric conditions of barometric pressure, relative humidity and temperature used for calibration of the standards is recommended for more uniform results.

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3007 (Part II)-1965 Code of practice for laying of asbestos cement sheets: Part II Semi-corrugated sheets

3632-1969 Method of test for determination of wet volume of asbestos fibre

4844-1968 Method of sampling and preparation of asbestos fibre for laboratory test purposes

5328-1969 Method of test for determination of chemical composition of asbestos fibre

5748-1969 Method of test for tensile strength of asbestos fibre

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