Designation: D2752/D2752M – 88 (Reapproved 2011)ε1

Standard Test Methods for Air Permeability of Asbestos Fibers[1]

This standard is issued under the fixed designation D2752/D2752M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—Units information was editorially corrected in February 2012.

1. Scope

1.1 These test methods cover the measurement of the relative degree of openness or degree of fiberization of milled asbestos fiber by air permeability instruments.

1.2 Method A is the recommended procedure and describes a determination by means of the Rapid Surface Area apparatus. This test method is limited to fibers with an effective surface area in the range from 10 to 250 dm^2/g [490 to 12 000 ft^2 /lb].

1.3 Method B is an alternative procedure and covers the use of the Dyckerhoff apparatus. This test method is limited to fibers within the range from 10 to 600 Dyckerhoff seconds.

1.4 Only those asbestos specimens which are of similar specific gravities will bear strict comparison by these air permeability methods since differences in density result in specimens being tested under different conditions of porosity.

1.5 Samples containing excessive quantities of nonfibrous particles or contaminants will not give reliable or meaningful results.

1.6 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.7 **Warning—**Breathing of asbestos dust is hazardous. Asbestos and asbestos products present demonstrated health risks for users and for those with whom they come into contact. In addition to other precautions, when working with asbestos-cement products, minimize the dust that results. For information on the safe use of chrysotile asbestos, refer to "Safe Use of Chrysotile: A Manual on Preventive and Control Measures."[2]

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D2590 Test Method for Sampling Chrysotile Asbestos

D3879 Test Method for Sampling Amphibole Asbestos (Withdrawn 2009)[4]

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

2.2 *Other Standard:*[5]

NNN-P-1475B Federal Specification for Paper, Filter, Analytical

3. Summary of Test Methods

3.1 In both test methods the resistance to air flow of a compressed specimen of fixed weight and volume is determined.

3.2 *Test Method A:*

3.2.1 The apparatus is arranged so that the total resistance to air flow remains equal to a fixed hydraulic pressure head. Total resistance includes the resistance of the specimen and the pressure drop across a calibrated capillary tube of known resistance. The contribution of the specimen to total resistance is measured on a manometer calibrated in specific surface area units.

3.2.2 Optional calibration of the manometer in equivalent Dyckerhoff seconds, which are the units of Test Method B, permits comparison of results by both test methods on the same basis.

[1] These test methods are under the jurisdiction of ASTM Committee C17 on Fiber-Reinforced Cement Products and are the direct responsibility of Subcommittee C17.03 on Asbestos - Cement Sheet Products and Accessories.

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[2] Available from The Asbestos Institute, http://www.chrysotile.com/en/sr_use/manual.htm.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] The last approved version of this historical standard is referenced on www.astm.org.

[5] Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

3.3 *Test Method B:*

3.3.1 The time required to draw a given volume of air through the specimen under specified conditions of varying hydraulic head is determined. This time is taken as a measure of the air permeability of the specimen.

4. Significance and Use

4.1 The degree of fiberization or subdivision of the asbestos fiber 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 fiber bundles and determine the resistance to air flow through the plug. Test specimens that have undergone a higher degree of fiberization will yield higher results provided the specimens compared are of similar specific gravities and other properties are not markedly different.

4.2 These test methods are suitable for specification acceptance, manufacturing control, development, and applied research.

4.3 It must not be assumed that all test specimens with equal test results have undergone equivalent degrees of fiberization. Some types of asbestos fiberize more readily than others. Particle size distribution and harshness can also influence permeability.

5. Sampling

5.1 Take a sample in accordance with the sampling procedure in Test Method D2590 for chrysotile fibers and Test Method D3879 for amphibole fibers. (**Warning—**See 1.7.)

6. Test Specimen

6.1 Spread the sample on a smooth working surface in layers to form a flat pile of uniform thickness 13 mm [0.5 in.] thick, and quarter the pile.

6.2 Set aside opposite quarters and repeat 6.1 with the remaining quarters.

6.3 Select two 50 ± 0.01-g [0.1102 ± 0.00002-lb] specimens (Note 1) by taking pinches from each quarter of the pile until a quantity is obtained that will require minimum adjustment to the desired weight.

NOTE 1—The metric system of units shall be used for referee testing.

6.4 When pinches are taken be careful 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 which may have segregated at the bottom.

6.5 Any lumps or knots of matted fiber still remaining in the specimen should be disentangled before cell loading is begun.

7. Calibration and Standardization

7.1 *Calibrating Standards*[6]:

7.1.1 The calibrating standards for both test methods consist of capillary glass tubing mounted in a holder which suitably fills the specimen cavity in the permeability cell.

7.1.2 The low standards have an equivalent surface area range from 45 to 55 dm^2/g [2200 to 2700 ft^2/lb]. This corresponds to a Dyckerhoff time of efflux in the range from 20 to 30 s. They are made from glass tubing with a bore of 0.311 ± 0.012 mm [0.01225± 0.0005 in.] and about 13 mm [0.5 in.] long.

7.1.3 The high standards have an equivalent surface area range from 200 to 230 dm^2/g [9770 to 11 200 ft^2 /lb]. The Dyckerhoff time of efflux is fixed in the range from 350 to 450 s. They are made from glass tubing with a bore of 0.178 ± 0.013 mm [0.0070± 0.0005 in.] and about 39.5 mm [1.55 in.] long.

7.1.4 A Dyckerhoff capillary tube holder is shown in Fig. 1. Holders for Rapid Surface Area standards are of similar design but are 38 ± 0.2 mm [1.496 ± 0.007 in.] in external diameter.

7.1.5 For accurate results keep calibrating standards in airtight containers or in a desiccator when not in use.

7.1.6 Clean capillary tubes with dry, compressed air, free from contaminants, at 1.4 kgf/cm^2[20 psig], if permanently mounted, or 0.35 kgf/cm^2 [5 psig] if temporarily mounted, prior to calibration. Allow the air to flow 1 min.

7.2 *Instrument Calibration for Rapid Surface Area Tester:*

7.2.1 Verify the apparatus as described in Section 9.

7.2.2 Insert a calibrating standard mounted in its capillary tube holder into the cell using the handle shown in Fig. 2(*a*). 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.

7.2.3 Proceed as directed in 10.4 and 10.5. If results differ from the nominal value of the standard by more than ±3.0 %, it may be concluded that the equipment is defective. The defect must be rectified before proceeding.

7.3 *Instrument Calibration for the Dyckerhoff Tester:*

7.3.1 *Fixed Electrode Apparatus:*

7.3.1.1 Verify the apparatus as described in Section 13.

7.3.1.2 Insert a calibrating standard mounted in its capillary tube holder into the cell using the handle shown in Fig. 2(*a*)

[6] Calibrating standards mounted in approved capillary tube holders are obtainable from Centre Spécialisé en Technologie Minérale, CEGEP, 671 South Smith Boulevard, Thetford Mines, QC, Canada, G6G 6X9. Standards may be permanently or temporarily mounted; however, permanent mountings are recommended. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

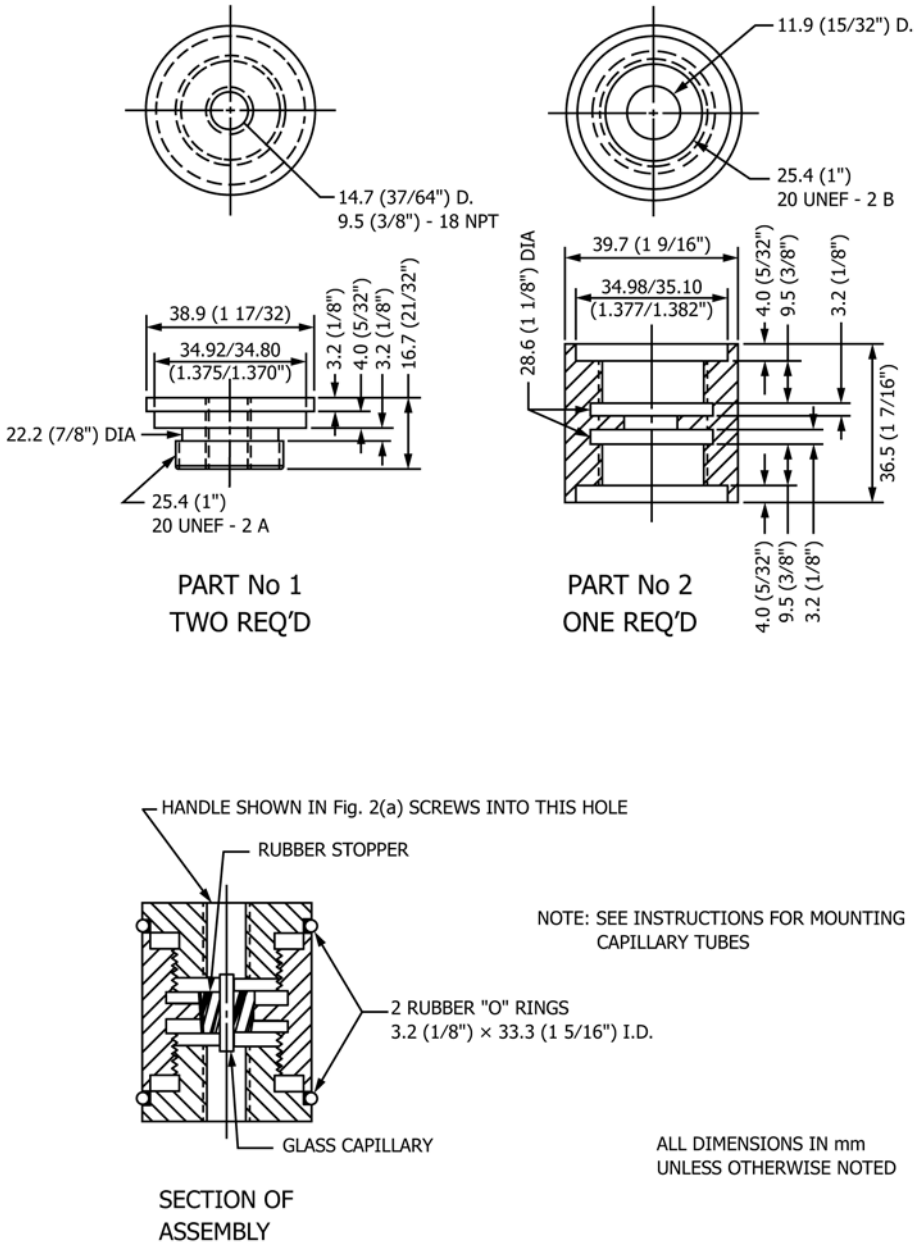

FIG. 1 Capillary Tube Holder

and clamp the cell in position on the apparatus. Omit the spacer from the assembly so that the plunger may seat perfectly.

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

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

7.3.1.5 Reset 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.

7.3.1.6 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.

7.3.1.7 Obtain readings on the calibrating standard as directed in 14.5 to 15.1.

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

7.3.1.9 If the value obtained with the calibrating standard is within 3 % of the cumulative average, that value is accepted and the apparatus may be considered free from defects.

7.3.1.10 If the deviations exceed 3 %, examine the apparatus for defects and rectify as described in the instructions supplied with the standards. Then recheck the calibrating standards.