



## Standard Test Method for McNett Wet Classification of Dual Asbestos Fiber<sup>1</sup>

This standard is issued under the fixed designation D 2589; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers the determination of the length distribution and fines content of milled asbestos fiber by wet classification employing the McNett fiber classifier.

1.2 The values stated in SI units are the standard. The inch-pound units shown in parentheses are provided for information only.

1.3 *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:

D 2590 Test Method for Sampling Chrysotile Asbestos<sup>2</sup>

D 2946 Terminology for Asbestos and Asbestos-Cement Products<sup>2</sup>

D 3639 Test Method for Classification of Asbestos Fibers by Quebec Standard Test<sup>2</sup>

D 3879 Test Method for Sampling Amphibole Asbestos<sup>2</sup>

E 11 Specification for Wire-Cloth Sieves for Testing Purposes<sup>3</sup>

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods<sup>3</sup>

### 3. Terminology

3.1 *Definitions*—Terms relating to asbestos are defined in Terminology D 2946.

### 4. Significance and Use

4.1 Normally, results obtained by this test method are reproducible under comparable laboratory conditions. However, it must not be expected that results obtained by different operators at various laboratories and times will be in exact agreement due to some seemingly minor procedural change. Moreover, results for longer fiber grades are influenced to a

greater extent by differences in fiber length distribution and characteristics than those of shorter grades.

### 5. Apparatus

5.1 *McNett Fiber Classifier (such as 203-A or 203-CA)*,<sup>4</sup> preferably equipped with vacuum suction cups for drainage, similar in design to that shown in Fig. 1, or on page 7 of the Service Manual 203-CA (see service manuals for identification of classifiers' parts).

NOTE 1—Drainage through muslin filter cloths or 200-mesh sieve (325-mesh for float products) is acceptable.

#### 5.2 Accessories:

5.2.1 *Filter paper*, to fit suction cups on classifier. This shall be thin, rapid filtering, ashless paper hardened to provide adequate wet strength and resistance to washing. Alternatively, 325-mesh screen cloths mounted in suitable metal rings may replace filter papers (see Note 5 in 11.5.4).

5.2.2 *T-Shaped Soft Rubber Scraper*, for cleaning screens, made from a 10-cm (4-in.) length of automobile windshield wiper, or equivalent, held in a suitable handle, similar to a hoe.

5.2.3 *Rubber Hose*, 6-mm (¼-in.) bore with control valve nozzle for rinsing classifier screens and tanks with filtered water.

5.2.4 *Drying Oven*, (convection type, or mechanical draft), or infrared drying unit.

5.2.5 *Automatic Overflow Alarm*, as shown in Appendix X1.

5.2.6 *Optional Accessory*, Automatic clearing device on the fourth tank, as shown in Appendix X1 (see Note 3 in 11.5.4).

5.3 *Water Supply*—Provide a suitable filtering device on the water supply to ensure a constant flow of clean water to the classifier and rinsing hose.

### 6. Sampling

6.1 Select samples in accordance with Test Method D 2590 for chrysotile or Test Method D 3879 for amphibole fibers as defined in Terminology D 2946. Duplicate specimens shall be tested. (**Warning**—When handling asbestos fibers, use reasonable precautions to avoid creating dust. Prolonged or frequent breathing of significant concentration of airborne asbestos dust may cause serious bodily harm.)

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C17 on Fiber-Reinforced Cement Products and is the direct responsibility of Subcommittee C17.03 on Asbestos-Cement Sheet Products and Accessories.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.05.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.02.

<sup>4</sup> Currently supplied classifier Model 203-CA and service manuals for the installation, operation and maintenance of Models 203-A and 203-CA are available from the Bauer Bros. Co. Ltd., Brantford, ON, Canada, or Springfield, OH.

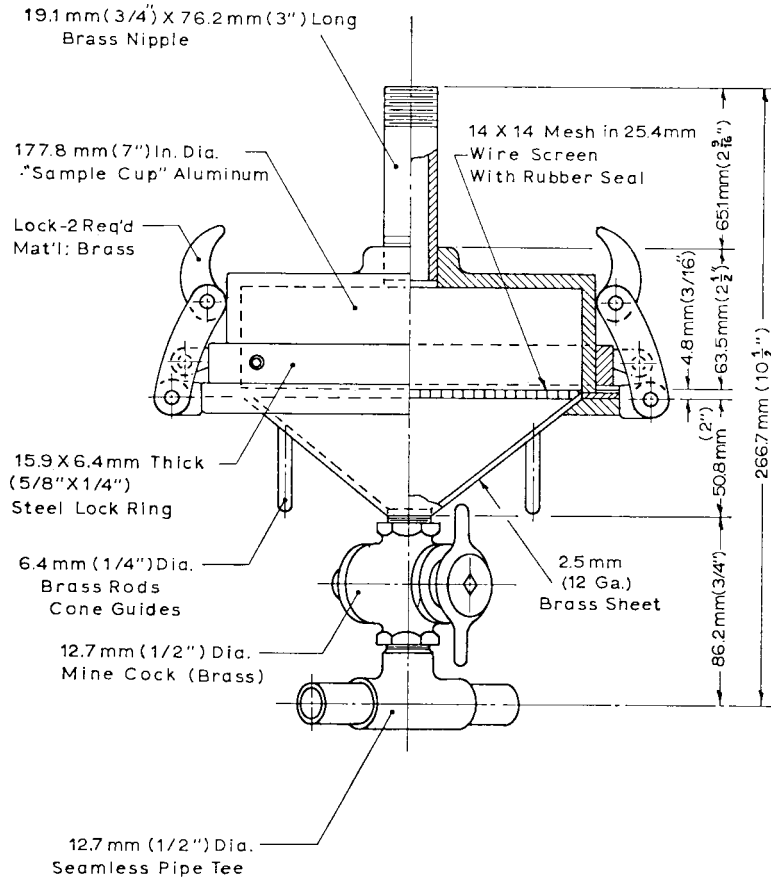


FIG. 1 Suction Cup

**7. Test Specimen, Screen Sizes, and Test Duration**

7.1 Relationships between the type of specimen, screen sizes, masses, and duration of test may be found in Table 1.

7.2 For reference, Tyler, U.S. Standard and British Standard equivalent sieves are listed in Table 2.

7.3 Screen cloth must be double-lock, double-crimp style, with the warp in the horizontal direction, and it must conform to Specification E 11.

**8. Procedure**

8.1 Select screens specified for the fiber grade being tested and set in place, making certain that the baffle plates are in their slots behind the screens. If the fiber grade is unknown, refer to Test Method D 3639.

8.2 Insert the rubber stoppers, and fill the tanks with water.

8.3 Start the agitators to rotate at  $540 \pm 40$  r/min and adjust the water valve to give a flow slightly in excess of 0.19 L/s (3.0

U.S. gal/min). This rate of flow is achieved when the overflow from the constant head tank is pencil-size.

8.4 Add the test specimen to 800 cm<sup>3</sup> of water in a 1000-mL beaker and stir until the asbestos is thoroughly dispersed.

8.5 Pour the slurry into the first tank (tank with coarsest screen mesh) and wash out any fiber residue in the beaker with clean, filtered water. Set the timer for 20 or 30 min, depending upon the sample under test, as given in Table 1.

8.6 During the operation, center the filter papers, previously weighed to the nearest 0.01 g at equilibrium with room conditions, in suction cups on the supporting screen. Mark the weight of the filter paper, sample designation, classifier screen mesh, and other pertinent data around the outside edge of each filter paper with a soft black pencil before inserting into the suction cup, placing the writing against the supporting screen. Wet the filter paper and clamp into position.

**TABLE 1 Screen Size, Test Specimen and Duration Relationships**

Test Specimen, QAMA <sup>A</sup> Fiber Group	Screen Sizes, SI openings (Tyler mesh/in.)	Specimen Mass, g	Duration of Test, min
3, 4, 5, 6 and 7D	476, 119, 420 μm, 74 μm (4, 14, 35, 200)	10 ± 0.05	20
Other Group 7 fibers	119, 420 μm, 199 μm, 74 μm (14, 35, 100, 200)	20 ± 0.05	20
"Floats"	177 μm, 44 μm (80, 325)	20 ± 0.05	30

<sup>A</sup> Quebec Asbestos Mining Association (QAMA) standard designation of chrysotile asbestos grades.

**TABLE 2 Sieve Equivalents**

ISO Opening SI	Tyler Series			U.S. Standard			British Standard		
	Mesh	Opening		Mesh	Opening		Mesh	Opening	
	(in.)	mm	(in.)	(in. <sup>-1</sup> )	mm	(in.)	(in. <sup>-1</sup> )	mm	(in.)
4.76	4	4.699	(0.185)	4	4.76	(0.187)	...	...	...
1.19	14	1.168	(0.046)	16	1.19	(0.0469)	14	1.20	(0.0474)
420 μm	35	0.417	(0.0164)	40	0.42	(0.0165)	36	0.42	(0.0166)
177 μm	80	0.175	(0.0069)	80	0.177	(0.0070)	85	0.177	(0.0070)
149 μm	100	0.147	(0.0058)	100	0.149	(0.0059)	100	0.152	(0.0060)
74 μm	200	0.074	(0.0029)	200	0.074	(0.0029)	200	0.076	(0.0030)
44 μm	325	0.043	(0.0017)	325	0.044	(0.0017)	...	...	...

8.7 Close the main vacuum valve and open each suction cup valve.

NOTE 2—It is advantageous to perform the above two steps during the time in which the classifier tanks are initially being filled.

8.8 Watch screens carefully during the test, and if any tank appears to overflow, clean the screen surface with a soft rubber scraper.

8.9 At the end of the test period, stop the impellers, shut off the water, and open the main vacuum valve until a vacuum of approximately 1 kPa (4 in. of water) gage is attained. Remove the drain plugs from each tank, and progressively increase the vacuum to the maximum desired. Failure to perform this operation slowly, or to remove all the drain plugs before any one tank is completely drained, may cause rupture of the filter papers.

8.10 During draining, remove the screens and place them in their respective tanks. Immediately after a tank has been completely drained, carefully wash the screen and tank using the rinsing hose to ensure that all remaining fiber, including entrapped fiber and particles deposited behind the screen, are washed into the suction cup.

8.11 When all the fiber in a tank is deposited into the suction cup, and the cup itself has drained, close the cup valve. Failure to close the cup valve after washing down and emptying the tank causes atmospheric air to enter the vacuum system and substantially lowers the vacuum of the system.

8.12 After closing the cup valve, open the cup and remove the filter paper with its classified specimen fraction, and dry to constant mass at 105 to 110°C (220 to 230°F) under an infrared unit, or in a drying oven.

8.13 After all the fractions are dried and allowed to return to equilibrium with room conditions, weigh each paper and fraction together. Obtain the net weight of the specimen fraction by subtracting the initial mass of the filter paper and record as a percentage. The amount of minus 200 mesh or minus 325 mesh in the original specimen is calculated by subtracting the cumulative weight of the fractions retained on the filter papers from the original mass of the specimen (see Note 6 concerning crudy fibers).

## 9. Interpretation of Results

9.1 A typical example of a Group 5 fiber wet classification test (10-g specimen, 20-min test duration) with calculations follows:

Screen SI opening (Tyler mesh)	4.76 mm (4)	1.19 mm (14)	420 μm (35)	74 μm (200)	-74 μm (-200)
Mass retained, g	0.5	1.3	1.9	1.4	= 4.9 g
-14 μm (-200 mesh/ in.)	10.0 -	(0.5	+ 1.3	+ 1.9	+ 1.4)
Results, %	5.0	13.0	19.0	14.0	49.0

## 10. Report

10.1 Report the percentage of fiber retained on each screen and the percentage passing through the last screen. Fully identify the origin and description of the sample.

## 11. Precision and Bias

### 11.1 Repeatability:

11.1.1 The intralaboratory single-operator, single apparatus repeatability is  $\pm 0.9$  g (0.03 oz) (2S) obtained on any fraction, with Grade 4 fibers, as defined in Practice E 177.

11.1.2 The equivalent repeatability for Grade 7D fibers is  $\pm 0.6$  g ( $\pm 0.02$  oz).

11.2 *Reproducibility*—Reproducibility has not yet been established in accordance with the requirements of ASTM.

### 11.3 Bias:

11.3.1 Bias cannot be established on asbestos fibers for lack of a referee method. Bias associated with each of the sieves used may be determined as described in the appendixes to Specification E 11.

11.3.2 It has been observed that the retention of fibers on each sieve may be a function of the degree to which the screen cloth is worn.

11.4 If the corresponding individual percentages obtained for each screen fraction of the duplicate specimens differ by more than five units of percentage, make a third test. Average the results of two acceptable tests and report the average.

11.5 To obtain the desired accuracy, the following general precautions should be observed:

11.5.1 It is important that all material be washed from the tanks into the suction cups; and that the filter papers are handled with care.

11.5.2 For better accuracy and reproducibility a water temperature of  $21 \pm 10^\circ\text{C}$  ( $70 \pm 20^\circ\text{F}$ ) is recommended.

11.5.3 New screens should be run in at least 8 h to condition them before they are put into regular use. When the classifier is not in use, the tanks should be kept full of water to prevent deposits from forming on screens.

11.5.4 To obtain prescribed accuracy, screens should not be cleaned during a classification, unless the tanks tend to overflow. Test results may not be reproducible when screens are cleaned frequently and at irregular intervals during the test.

NOTE 3—At many laboratory locations, the use of an automatic clearing device on the fourth tank, similar to that shown in the appendix with the motor connected in series with the micro switch of the overflow alarm or on a separate switch, has been found to eliminate the necessity for cleaning the screen.

NOTE 4—At some laboratory locations, the use of stainless steel screen cloth has been found to give reproducible results over a longer period of time.

NOTE 5—When classifying very fine products, use filter papers for better accuracy.

NOTE 6—In the case of crudy fibers, the classified fractions may be retained for examination and the percentage of crudy bundles and rock particles determined by an approved method.

11.6 The following precautions apply to Model 203-A classifiers only:

11.6.1 Screens should be checked regularly (at least once every operating shift) for damage, holes, warped frames, etc. Likewise, the rubber gaskets should be examined and replaced if defective as this is frequently the cause of abnormal minus

200 mesh results. The clamping screws should be turned tight enough to hold the screen plates firmly against the tank; but if turned too tight, or not uniformly, the screen frames may be permanently warped out of shape causing leakage past the gaskets.

11.6.2 The normal agitator speed ( $540 \pm 40$  r/min) should be checked daily, and the belts should be inspected to prevent slippage. The use of positive traction belts and sprockets is recommended.

11.6.3 The equipment must be lubricated and maintained as described in Service Manual 203-A.

11.7 The following precautions apply to Model 203-CA classifiers only:

11.7.1 Screens should be checked regularly (at least once per operating shift) for damage, holes, warped frames, etc.

11.7.2 The equipment must be lubricated and maintained as described in Service Manual 203-CA.

## 12. Keywords

12.1 asbestos; classification; fiber; fiber length distribution; McNett; wet; wet classification

## APPENDIX

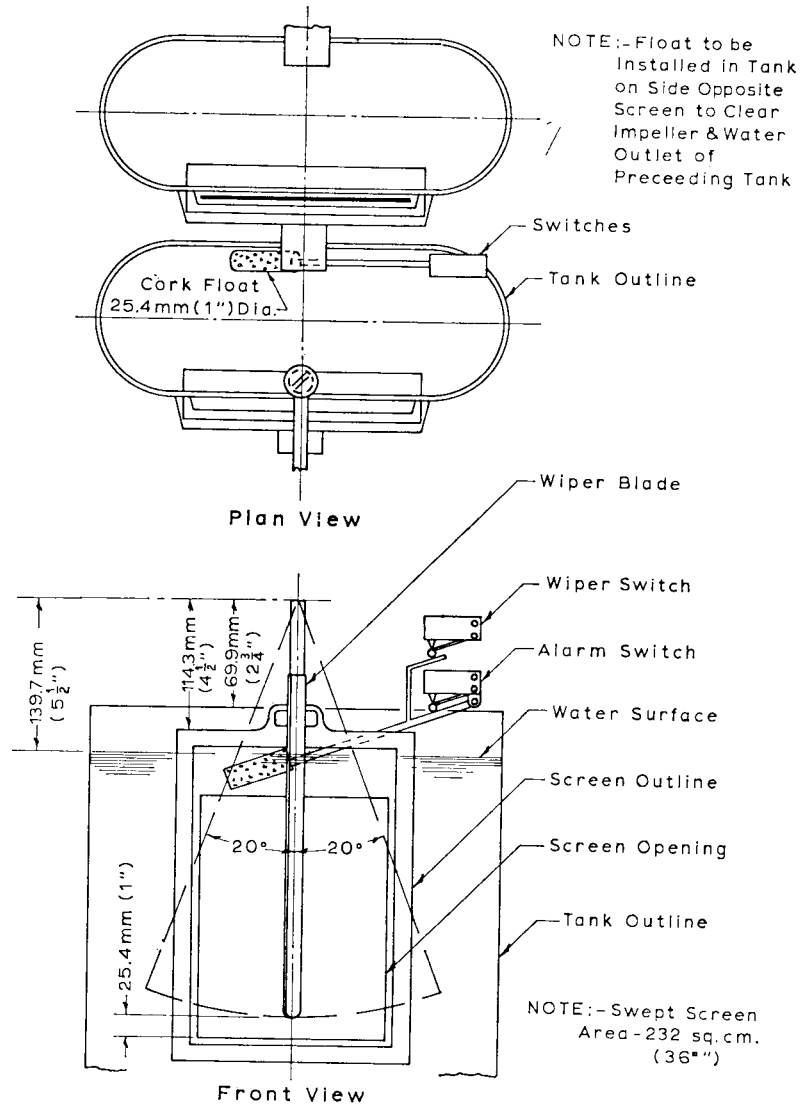
### (Nonmandatory Information)

#### X1. AUTOMATIC OVERFLOW ALARM AND CLEARING DEVICE FOR SCREENS

X1.1 Fig. X1.1 illustrates a suitable method of mounting float switches to activate an automatic overflow alarm, and a clearing device for installation on the fourth tank of the

classifier.<sup>5</sup> The support must be fabricated to fit individual classifiers due to slight differences in pertinent dimensions. Fig. X1.1 also gives appropriate dimensions for locating the axis of the clearing device with respect to the classifier tank.

<sup>5</sup> Detail drawings for a suitable screen-clearing device are available from ASTM Headquarters, 100 Barr Harbor Drive, W. Conshohocken, PA 19428, at a nominal price. Request Adjunct ADJD2589.



**FIG. X1.1 Overflow Alarm and Screen-Clearing Device**

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