



Standard Test Method for McNett Wet Classification of Dual Asbestos Fiber¹

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^{ε1} NOTE—Units information was editorially corrected in February 2012.

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 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.

1.3 **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

1.4 *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
- D2946 Terminology for Asbestos and Asbestos-Cement Products
- D3639 Test Method for Classification of Asbestos by Quebec Standard Test

¹ 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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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.

D3879 Test Method for Sampling Amphibole Asbestos (Withdrawn 2009)⁴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 ASTM Adjunct:

Screen Clearing Device Drawings⁵

3. Terminology

3.1 **Definitions**—Terms relating to asbestos are defined in Terminology D2946.

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)*,⁶ 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

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

⁵ Available from ASTM International Headquarters. Order Adjunct No. ADJD2589. Original adjunct produced in 1967.

⁶ 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.

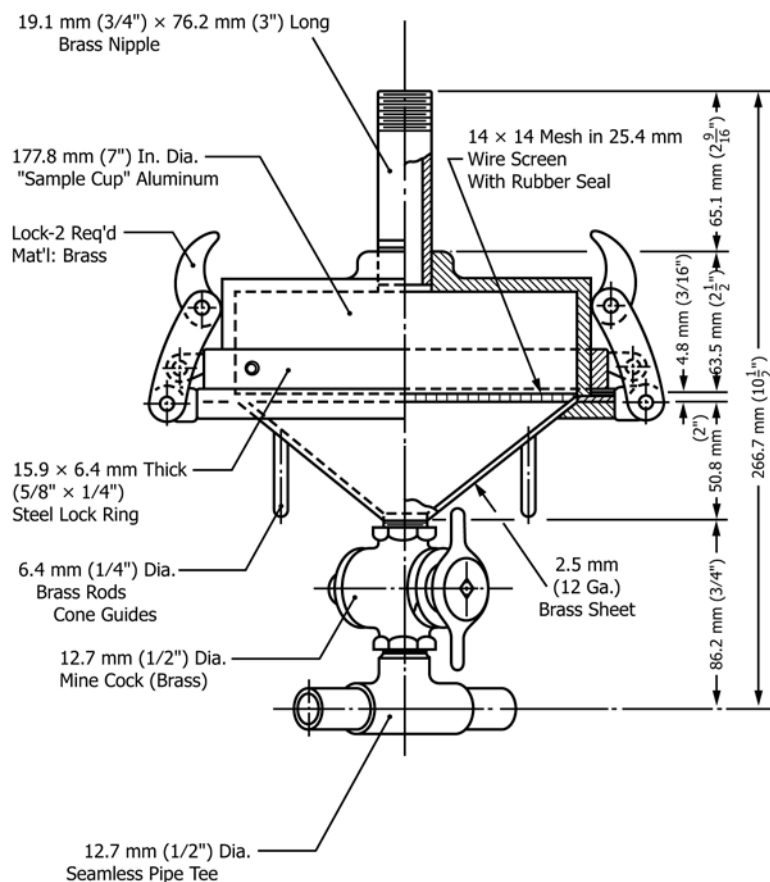


FIG. 1 Suction Cup

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 [1/4-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 **D2590** for chrysotile or Test Method **D3879** for amphibole fibers as defined in Terminology **D2946**. Duplicate specimens shall be tested. (**Warning**—See **1.3.**)

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**.

TABLE 1 Screen Size, Test Specimen and Duration Relationships

Test Specimen, QAMA ^A 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

^A Quebec Asbestos Mining Association (QAMA) standard designation of chrysotile asbestos grades.

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 [E11](#).

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 [D3639](#).

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

8.3 Start the agitators to rotate at 540 ± 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 cm³ 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.

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	
–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.

TABLE 2 Sieve Equivalents

ISO Opening SI	Tyler Series				U.S. Standard			British Standard		
	Mesh		Opening		Mesh		Opening		Mesh	
	[in.]	mm	[in.]	[in. ^{–1}]	mm	[in.]	[in. ^{–1}]	mm	[in.]	[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]	

11. Precision and Bias

11.1 Repeatability:

11.1.1 The intralaboratory single-operator, single apparatus repeatability is ± 0.9 g [0.03 oz] (2S) obtained on any fraction, with Grade 4 fibers, as defined in Practice E177.

11.1.2 The equivalent repeatability for Grade 7D fibers is ± 0.6 g [± 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 E11.

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 ± 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.⁷ 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.

⁷ 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.

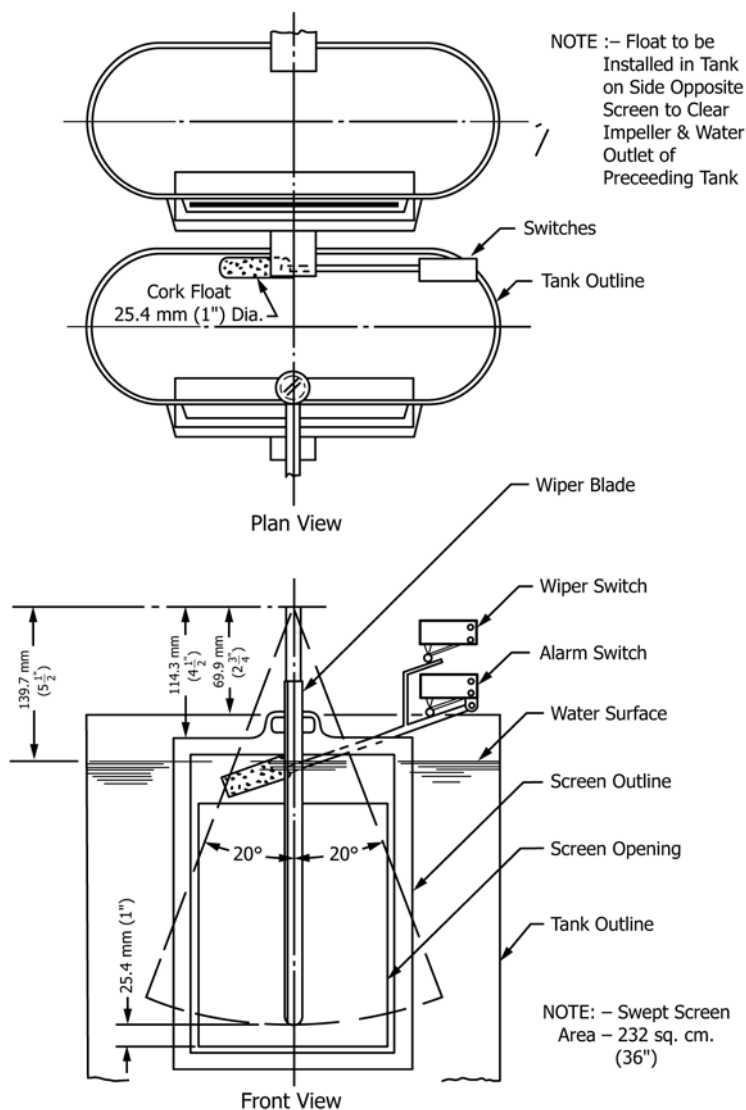


FIG. X1.1 Overflow Alarm and Screen-Clearing Device

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