Standard Specification for
Asbestos Lap[1]

1. Scope

1.1 This specification covers asbestos lap, a felted asbestos product, having a minimum of 75 mass % of asbestos fiber.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 The following safety hazards caveat pertains only to the test methods, Section 12, described in this specification: *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 123 Terminology Relating to Textiles[2]
D 1118 Test Method for Magnetic Rating of Asbestos Fiber and Asbestos Textiles[3]
D 1918 Test Method for Asbestos Content of Asbestos Textiles[3]
D 2946 Terminology Relating to Asbestos[3]

3. Terminology

3.1 For definitions of other textile terms used in this specification refer to Terminology D 123. For asbestos terms refer to Terminology D 2946.

3.2 *Definitions:*

3.2.1 *asbestos*—a group of impure silicate minerals occurring in fibrous form.

3.2.2 *asbestos fiber*—the hydrous magnesium silicate serpentine mineral designated as chrysotile and having the empirical formula $Mg_3Si_2O_5(OH)_4$.

3.2.3 *atmosphere for testing textiles— for asbestos*, air maintained at a relative humidity of 50 ± 2 % at $21 \pm 1°C$.

3.2.4 *lap, n—for asbestos*, a flat compressed form of carded or otherwise felted asbestos fiber, with or without carrier fibers.

3.2.5 *magnetic rating (MR)*—an empirical value that reflects the effect of magnetic particles, such as magnetic iron compounds, in asbestos material as measured by a magnetic analyzer.

NOTE 1—Magnetic rating is not a quantitative measure of the number or mass of magnetic particles in the material.

4. Classifications

4.1 *Styles*—The style of asbestos lap refers to the physical construction. Two styles are available:

4.1.1 *Style 1*—A single compressed flat formation of carded or otherwise felted asbestos fibers, and

4.1.2 *Style 2*—A flat parallel assemblage of compressed carded asbestos slivers.

4.2 *Grades*—The grades of asbestos lap are based on the mass percentage of asbestos content as stated in Table 1.

4.3 *Mass per Unit Length*—Asbestos lap is normally furnished in the following nominal linear densities:

g/m	(lb/100 yd)
20	(4)
50	(10)
70	(14)
100	(20)
150	(30)

Other linear densities may be furnished as agreed upon between the purchaser and the seller.

4.4 *Types*:

4.4.1 Asbestos lap as made for the electrical industry is furnished in three types, classified on the basis of magnetic rating determinations (Test Method D 1118) as follows:

4.4.2 *Type II (Magnetic Rating 0.75 Maximum)* is intended only for special applications where the asbestos is of primary importance as electrical insulation used on magnet wire and when used primarily as a dielectric.

4.4.3 *Type IV (Magnetic Rating 2.00 Maximum)* is intended for use where the asbestos is of secondary importance as electrical insulation and where it is applied in combination with other materials of comparably higher dielectric strength, as in the construction of heat and flame resistant electrical insulating walls over unit conductors of electric cables.

4.4.4 *Type VI (Magnetic Rating 4.00 Maximum)* is intended for use where the asbestos is of minor importance as a dielectric, as in the construction of filler or heat and flame resistant walls of electric cables or when used as a lining for control enclosures subject to exposure to electric arcs (arc chutes).

TABLE 1 Grades of Asbestos Lap

Grade	Asbestos Content, mass, %
Commercial	75 up to but excluding 80
Underwriters'	80 up to but excluding 85
A	85 up to but excluding 90
AA	90 up to but excluding 95
AAA	95 up to but excluding 99
AAAA	99 to 100 inclusive

5. Ordering Information

5.1 State the style, grade, mass per unit length (weight), and quantity required.

5.2 If required for electrical insulation, state this requirement and the type needed.

5.3 Dimensions of the finished lap and the packaging are as agreed upon between the purchaser and the seller. See 14.1.

6. Materials and Manufacture

6.1 Asbestos lap shall be made from a uniformly carded or otherwise felted blend of fibers.

7. Chemical Composition

7.1 *Asbestos Content*— The asbestos content of the particular grade shall be within the limits stated in Table 1.

7.2 *Carrier Fibers*— The chemical composition of carrier fibers shall be as agreed upon between the purchaser and the seller.

8. Physical Properties

8.1 *Electromagnetic Properties*—The magnetic rating of the particular type of lap shall be within the limits in 4.4 to 4.4.4.

8.2 *Carrier Fibers*— The physical properties of the carrier fibers shall be as agreed upon between the purchaser and the seller.

9. Dimensions, Mass, and Permissible Variations

9.1 *Mass per Unit Length*—The linear density in grams per metres (or pounds per 100 yards) shall conform to the limits stated in Table 2.

9.2 *Width*—The width of the lap shall be within 6 mm (0.25 in.) of the width agreed upon by the purchaser and the seller.

10. Sampling

10.1 Take five sample rolls at random from each lot of 700 to 900 kg (1500 to 2000 lb) or fraction thereof.

11. Specimen Preparation

11.1 *Conditioning*— Condition all specimens in the atmo-

TABLE 2 Limits in Mass per Unit Length for Asbestos Lap

Nominal Mass per Unit Length		Permissible Range for 1-m (or 1-yd) Specimens			
		Average of Five Specimens		Individual Specimens	
g/m	(lb/100 yd)	g/m	(lb/100 yd)	g/m	(lb/100 yd)
20	(4)	17.0 to 18.4	(3.43 to 3.71)	16.0 to 19.5	(3.21 to 3.93)
50	(10)	50.3 to 56.0	(10.14 to 11.29)	47.9 to 58.5	(9.64 to 11.79)
70	(14)	67.4 to 74.4	(13.57 to 15.00)	63.8 to 78.0	(12.86 to 15.71)
100	(20)	101.0 to 111.7	(20.36 to 22.50)	95.7 to 117.0	(19.29 to 23.57)
150	(30)	134.7 to 148.9	(27.14 to 30.00)	127.6 to 156.0	(25.71 to 31.43)

sphere for testing asbestos textiles (without preconditioning) for a minimum of 4 h, or until the specimen shows no progressive change in mass of more than 0.1 % after an exposure of 0.5 h.

11.2 *Number of Specimens*:

11.2.1 Unless otherwise agreed upon, as when specified in an applicable material specification, take a number of specimens such that the user may expect at the 95 % probability level that the test result is more than 15.0 grains per linear yard (1.13 g/m) above or below the true average (for the lot). Determine the number of specimens as follows:

11.2.2 *Reliable Estimate of Standard Deviation*—When there is a reliable estimate of standard deviation(s) based upon extensive past records for similar materials tested in the user's laboratory as directed in the method, calculate the number of specimens using Eq 1:

$$n = (t^2 \times s^2)/E^2 = 0.0170 \times s^2 \qquad (1)$$

where:

n = number of specimens (rounded upward to a whole number),

s = reliable estimate of the standard deviation of individual observations on similar materials in the user's laboratory under conditions of single-operator precision,

t = 1.960, the value of Student's t for infinite degrees of freedom, for two-sided limits, and a 95 % probability level ($t^2 = 3.842$),

E = 1.13 g/m (21.4 lb/100 yd), the value of the allowable variation, and

0.0170 = value calculated from t^2/E^2.

11.3 *No Reliable Estimate of Standard Deviation*—When there is no reliable estimate of standard deviation(s) for the user's laboratory, Eq 1 should not be used directly. Instead, specify the fixed number of ten specimens. This number of specimens is calculated using $s = 1.64$ g/m (0.33 lb/100 yd), which is a somewhat larger value of s than is usually found in practice. When a reliable estimate of s for the user's laboratory becomes available, Eq 1 will usually require fewer than ten specimens.

12. Test Methods

12.1 *Mass per Unit Length*:

12.1.1 *Scope*—This test method covers the determination of length per unit mass (weight) of asbestos lap.

12.1.2 *Significance and Use*—The length per unit mass (weight) is the most significant dimension of asbestos lap. This determines its suitability with regard to bulk for specific applications.

12.1.3 *Hazards*—When cutting or handling asbestos lap, avoid creating dust or wear a respiratory protector. Frequent prolonged respiration of excessive concentrations of airborne asbestos may cause serious bodily harm.

12.1.4 *Procedure*—From each of the five rolls selected as directed in Section 11, take a 1 ± 0.01 m (1 ± 0.01-yd) test specimen. Take care that each specimen is not scuffed or torn. Weigh each of the five conditioned specimens to the nearest 0.5 g (0.001 lb) and calculate the average mass per unit length of the five specimens.

TABLE 3 Precision and Reproducibility

Number of Observations in Each Average	Critical Differences[A] for the Conditions Described			
	Single-Operator Precision (Repeatability)		Interlaboratory (Reproducibility)	
	g/m	(lb/100 yd)	g/m	(lb/100 yd)
1	3.25	(0.653)	3.25	(0.653)
2	2.30	(0.461)	2.30	(0.461)
5	1.45	(0.293)	1.45	(0.293)
10	1.03	(0.207)	1.03	(0.207)

[A] The critical differences were calculated using $\tau = 1.96$, which is based on infinite degrees of freedom.

12.1.5 *Precision and Bias*:

12.1.5.1 *Summary*—In comparing two averages of five observations, the differences should not exceed in 95 out of 100 cases where all observations are taken by the same well-trained operator using the same equipment and specimens randomly drawn from the sample of material. Larger differences are likely to occur under all other circumstances.

12.1.5.2 *Interlaboratory Test Data*[4]—An interlaboratory test was run in 1973 in which randomly drawn samples of one material were tested in each of five laboratories. Each laboratory used one operator who tested five specimens. The components of variance for linear density results were calculated to be as follows:

Single-operator component	1.17 g/m (0.236 lb/100 yd)
Between-laboratory component	0.00 g/m (0.000 lb/100 yd)

12.1.5.3 *Precision*—For the components of variance reported in 12.1.5.2, two averages of observed values should be considered significantly different at the 95 % probability level if the difference equals or exceeds the critical differences listed in Table 3.

NOTE 2—The tabulated values of the critical differences in Table 3 should be considered to be a general statement, particularly with respect to between-laboratory precision. Before a meaningful statement can be made about two specific laboratories, the amount of statistical bias, if any, between them must be established; with each comparison being based on recent data obtained on randomized specimens from one sample of the materials to be tested.

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[4] ASTM Research Report RR:D-13-1063. A copy is available on loan from ASTM Headquarters, 1916 Race St., Philadelphia, PA 19103.

12.1.5.4 *Bias*—No justifiable statement on the accuracy of this procedure can be made since the true value of the property cannot be established by an accepted referee method.

12.2 *Electromagnetic Properties*—Determine the magnetic rating on one or more specimens from each lot or unit taken for test, as directed in Test Method D 1118.

12.3 *Asbestos Content*— Determine the asbestos content as directed in Test Method D 1918.

13. Rejection and Rehearing

13.1 The purchaser and the seller may agree on a procedure to establish conformance, including control charts furnished by the seller, a sequential sampling plan, or the double-sampling plan outlined in 13.2.

13.2 In the absence of a control-chart or sequential-sampling plan, proceed as directed in 13.2.1 through 13.2.3.

13.2.1 If the test results for the lot conform to the tolerances for all characteristics specified in Section 4 to 9, consider the lot a valid delivery.

13.2.2 If the test results for one or more characteristics do not conform to the tolerances, take a new laboratory sample from either the original lot sample or a new lot sample. Test the new sample for the characteristic(s) that did not conform to the tolerances in the first test, and average the results of the first and second samples as if all results were from one test of double the original number of specimens. If the new average(s) conform(s) to the specified tolerances, consider the lot a valid delivery.

13.2.3 If the test results obtained as directed in 13.2.2 do not conform to the specified tolerances, consider the lot a nonvalid delivery.

14. Packaging

14.1 Asbestos lap, wound on paper tubes, is packaged in rolls that vary in size in accordance with the number of slivers in the assemblage.

15. Keywords

15.1 asbestos; asbestos lap; classification; lap; testing