



Designation: D5848 – 20

Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings¹

This standard is issued under the fixed designation D5848; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This test method covers the measurement of mass per unit area of machine-made woven, knitted, and tufted pile yarn floor covering both before and after an adhesive-back coating application.

1.2 This test method encompasses three techniques for determination of mass per unit area as applicable:

1.2.1 Section 7, for determining total mass per unit area, applies to both coated and uncoated (unfinished) pile floor coverings.

1.2.2 Section 8, for determining component mass per unit area, applies only to uncoated (unfinished) pile yarn floor coverings.

1.2.3 Section 9, for determining pile yarn mass per unit area, applies only to back-coated, or finished, pile yarn floor coverings.

1.3 Determination of mass per unit area of pile yarn floor coverings was previously contained within Test Methods D418. For user convenience, Subcommittee D13.21 subdivided Test Methods D418 into separate standards, of which this test method is one.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only (except where shown in 1.4.1) and are not considered standard.

1.4.1 The following sections are measured in SI units: Table 1, sections 9.8.4.2, 9.8.6.3 to 9.8.6.10, A2.1, A2.2, and A2.3.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use. Specific precautionary statements are given in 9.5.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*²

D123 Terminology Relating to Textiles

D418 Test Method for Testing Pile Yarn Floor Covering Construction (Withdrawn 1998)³

D1193 Specification for Reagent Water

D1776 Practice for Conditioning and Testing Textiles

D1909 Standard Tables of Commercial Moisture Regains and Commercial Allowances for Textile Fibers

D5684 Terminology Relating to Pile Floor Coverings

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

D2904 Practice for Interlaboratory Testing of a Textile Test Method that Produces Normally Distributed Data (Withdrawn 2008)³

D2906 Practice for Statements on Precision and Bias for Textiles (Withdrawn 2008)³

3. Terminology

3.1 For definitions of terms relating to Pile Floor Coverings, D13.21, refer to Terminology D5684.

3.1.1 The following terms are relevant to this standard: back coating, backing, backing fabric, binding sites, buried pile yarn, carpet, components, extractable matter, finished, finished pile yarn floor covering, floor covering, multilevel pile, pile, pile yarn floor covering, pile yarn mass, pitch, primary backing, secondary backing, stubble, textile floor covering, total mass, tufted fabric.

3.2 For all other terminology related to textiles, refer to Terminology D123.

¹ This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.21 on Pile Floor Coverings.

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² 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.

³ The last approved version of this historical standard is referenced on www.astm.org.

4. Significance and Use

4.1 The determination of the mass per unit area of pile yarn floor covering is useful in quality and cost control during the manufacture of pile floor covering. Both appearance and performance may be affected by changes in mass per unit area.

4.2 In case of a dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and supplier should conduct comparison testing to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum the two parties should take a group of test specimens that are as homogeneous as possible and that are from a lot of material of the type in question. The test specimens should then be randomly assigned to each laboratory for testing. The average results from the two laboratories should be compared using Student's *t*-test for unpaired data and an acceptable probability level chosen by the two parties prior to testing. If a bias is found, either its cause must be found and corrected or the purchaser and supplier must agree to interpret future test results with consideration to the known bias.

5. Test Specimen

5.1 Sampling Units:

5.1.1 *Uncoated Floor Covering*—The basic sampling unit of uncoated floor covering is a production roll.

5.1.2 *Coated Floor Covering*—The basic sampling unit of coated floor covering is a shipping roll. The number of shipping rolls obtained from each production roll ranges from one to over ten.

5.2 *Lot Sample*—Take a lot sample as directed in Practice E122 when statistical knowledge of the product variability and test method precision is available, and a decision has been made on the maximum deviation that can be tolerated between the estimate to be made from the sample and the result that would be obtained by measuring every sampling unit of the lot. Otherwise the number of sampling units in a lot sample and the use of the test results obtained from the individual test samples shall be in accordance with the manufacturer's quality control program or with the specification agreed upon between the purchaser and the supplier.

5.3 *Laboratory Sampling Unit*—A laboratory sampling unit shall consist of a full width section of floor covering cut from one end of each roll in the lot sample and shall be at least 4 in. (100 mm) longer than the specimens required for the tests being conducted. Do not cut a laboratory sampling unit of coated floor covering from a seam end of a production roll.

5.4 Test Specimens:

5.4.1 A test specimen is a designated area of a test sample cut from the test sample. For test samples 120 in. (3000 mm) wide or wider, three test specimens are required for a test method, one at each edge no nearer to the edge than 5 % of the total floor covering width and one in the middle portion of the test sample. For test samples at least 60 in. (1500 mm) wide but less than 120 in. (3000 mm), take two test specimens, one at each edge no nearer to the edge than 5 % of the total floor

covering width. For test samples less than 60 in. (1500 mm) wide, take one specimen from the middle.

5.4.2 Where it is known that systematic variations in a floor covering characteristic may occur in bands 18 in. (460 mm) or more in width, as with a modular pattern device having separate controls or adjustments for each module, take test specimens from the middle of each band.

5.4.3 When a full-width test sample is not available, take specimens as directed in 5.4, and state in the report the width available and the number of test specimens taken.

5.5 A test result is the average of the measurements made on a set of test specimens as described in 5.4. In these methods, directions are given only for obtaining a test result from one test sample. The value representative of the lot being sampled will be the average of the test results for all the test samples in the lot sample.

6. Conditioning

6.1 Condition the specimen or the test sample in the standard atmosphere for testing textiles in accordance with Practice D1776.

6.2 If the fiber in any layer of the backing has a commercial regain of over 5 %, the specimen shall be conditioned before measuring. Commercial moisture regains for textile fibers are listed in Table 1 in D1909.

7. Total Mass Per Unit Area

7.1 *Scope*—This test method applies to both uncoated and coated floor covering.

7.2 *Summary of Test Method*—Test specimens are cut from a conditioned test sample and then measured, or are cut from an unconditioned test sample and then conditioned before measuring, so that the area of each test specimen is measured after conditioning. Each conditioned test specimen is weighed and the mass per unit area is calculated.

7.3 Apparatus:

7.3.1 *Balance*, having a capacity and sensitivity to weigh to the nearest 0.1 % of the test specimen mass or to the nearest 0.01 g, whichever is larger.

NOTE 1—Weighing to the nearest 0.1 % means weighing to the nearest 0.01 g for test specimens weighing 10 to 100 g, to the nearest 0.1 g for 100 to 1000 g, and to the nearest 1 g for more than 1000 g. A 100-g, 10.0 × 10.0-in. (254 × 254-mm) test specimen has a mass per unit area of 457 oz/yd² (1550 g/m²) while a 1000-g, 18.0 × 18.0-in. (457 × 457-mm) test specimen has a mass per unit area of 141.1 oz/yd² (4784 g/m²).

7.3.2 *Device for Cutting and Measuring Test Specimens*, as directed for the procedure selected in Annex A1.

7.4 *Conditioning*—Condition the test specimens as directed in 6.1 before measuring and weighing. For Annex A1 Procedures 2 and 3, condition the test sample before cutting the test specimens.

7.5 *Sample and Test Specimens*—Take the test sample and the test specimens as directed in Annex A1.

7.5.1 For level pile floor covering, the test specimens shall be at least 10.0 × 10.0 ± 0.2 in. (250 × 250 ± 5 mm).

7.5.2 For multilevel pile floor covering the test specimens shall comprise a full pattern repeat or a whole number multiple

of a full pattern repeat in each direction, but no less than as directed in 7.5.1. If the pattern repeat is not known and cannot be determined readily, use 18.0 × 18.0 ± 0.2 in. (460 × 460 ± 5 mm) for the test specimen dimensions.

7.6 Procedure:

7.6.1 *Preparation of Specimens*—Follow the selected procedure of Annex A1.

7.6.2 *Test Specimen Mass*—Weigh each test specimen to the nearest 0.1 % (or less) of the test specimen mass, *M* (Note 1).

7.7 Calculation:

7.7.1 *Test Specimen Total Mass Per Unit Area*—Calculate the total mass per unit area for each test specimen to the nearest 0.01 oz/yd² (0.3 g/m²) using Eq 1.

$$W = M \times K / (B \times L) \tag{1}$$

where:

- W* = total mass per unit area of the test specimen, oz/yd² (g/m²),
- M* = mass of the test specimen, oz(g),
- K* = appropriate conversion factor in Table 1,
- B* = average width of the test specimen to the nearest 0.01 in. (0.3 mm), and
- L* = average length of the test specimen to the nearest 0.01 in. (0.3 mm).

NOTE 2—When the template or clicking die procedure of Annex A1 is used, a standard area value for *B* × *L* may be used in place of values of *B* and *L* determined by direct measurement of the specimens. Round this standard area value to the nearest 0.1 in.² (65 mm²).

7.7.2 Calculate the average total mass per unit area for all test specimens of the test sample to the nearest 0.1 oz/yd² (1 g/m²).

7.8 Report:

7.8.1 State the test sample was tested as directed in Test Method D5848 for determining total mass per unit area. Describe the material or product sampled and the method of sampling used.

7.8.2 Report the average total mass per unit area for each test sample.

7.9 Precision and Bias:

7.9.1 *Precision*—The precision of the procedure in Test Method D5848 for determining total mass per unit area is being established.

7.9.2 *Bias*—The procedure in Test Method D5848 for determining total mass per unit area has no known bias and may be used as a referee method.

8. Component Masses Per Unit Area

8.1 *Scope*—This test method applies only to uncoated floor covering.

TABLE 1 Conversion Factors for Mass Per Unit Area

From	To	
	g/m ²	oz/yd ²
oz/in. ²	43 940	1296.0
oz/mm ²	28.350 × 10 ⁶	836 100
g/in. ²	1550.0	45.72
g/mm ²	10 ⁶	29 494

8.2 *Summary of Test Method*—The test specimens used for determining the total mass per unit area as directed in 1.3 are dissected into the component parts, separating the pile yarn from the backing fabric, and, if required, separating the yarns composing the backing fabric one from the other. Each component is weighed separately and the component mass per unit area calculated.

8.3 *Apparatus*—Balance, see 7.3.1.

8.4 Condition the test specimens as directed in 1.2.3 before measuring.

8.5 *Test Specimens*—Use the test specimens prepared for determining total mass per unit area as directed in 1.3 or prepare test specimens as directed in 7.5 and 7.6.

8.6 Procedure:

8.6.1 Manually separate the pile yarn from the backing fabric in each test specimen.

8.6.2 In the case of woven and knitted floor covering also separate the backing yarns, if required.

8.6.3 Weigh each component to the nearest 0.1 % of the component mass, *M*.

8.7 Calculation:

8.7.1 For each component calculate the component mass per unit area for each test specimen to the nearest 0.01 oz/yd² (0.1 g/m²), using Eq 2.

$$C = (M / (B \times L)) \times K \tag{2}$$

where:

- C* = component mass per unit area for the test specimen, oz/yd² (g/m²),
- M* = mass of the component removed from the test specimen, oz (g),
- K* = appropriate conversion factor in Table 1,
- B* = average width of the test specimen, in. (mm), and
- L* = average length of the test specimen, in. (mm).

8.7.2 Calculate the average component mass per unit area for each component to the nearest 0.1 oz/yd² (1 g/m²) for all test specimens in the test sample.

8.8 Report:

8.8.1 State the test sample was tested as directed in Test Method D5848 for determining component masses per unit area. Describe the material or product sampled and the method of sampling used:

8.8.2 Report the average component mass per unit area for each component for the test sample, using component names in common usage.

8.9 Precision and Bias:

8.9.1 *Precision*—The precision of the procedure in Test Method D5848 for determining component masses per unit area is being established.

8.9.2 *Bias*—The procedure in Test Method D5848 for determining component masses per unit area has no known bias and may be used as a referee method.

9. Pile Yarn Mass Per Unit Area

9.1 *Scope*—This test method applies only to coated pile yarn floor coverings.