



Designation: D 5848 – 98

## Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings<sup>1</sup>

This standard is issued under the fixed designation D 5848; 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 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 1.3, for determining total mass per unit area, applies to both coated and uncoated (unfinished) pile floor coverings.

1.2.2 Section 1.4, for determining component mass per unit area, applies only to uncoated (unfinished) pile yarn floor coverings, and

1.2.3 Section 1.5, 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 D 418. For user convenience, Subcommittee D 13.21 subdivided Test Methods D 418 into separate standards, of which this test method is one.

1.4 The values stated in SI units are to be regarded as standard for all measurements. The inch-pound units given in parentheses are provided for information only.

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

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 123 Terminology Relating to Textile Materials<sup>2</sup>

D 418 Methods of Testing Pile Yarn Floor Covering Construction<sup>2</sup>

D 1193 Specification for Reagent Water<sup>3</sup>

D 1909 Table of Commercial Moisture Regains for Textile Fibers<sup>2</sup>

D 5684 Terminology Relating to Pile Floor Coverings<sup>2</sup>

E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process<sup>4</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *pile yarn mass, n*—for back-coated pile yarn floor covering, the mass per unit area of pile yarn separated from the total mass by shearing and manually removing the pile yarn from the backing fabric with the assistance of solvent.

3.1.1.1 *Discussion*—Pile yarn mass includes pile yarn portions buried in the backing and the short stubble of yarn projecting above the backing after shearing as opposed to measurement of mass per unit area that includes only the amount that can be shorn away from the backing. Some pile floor covering constructions, such as patterned woven Wiltons, may have pile yarns which appear infrequently on the pile surface; however, these inactive pile yarns should be included as part of pile yarn mass per unit area not as backing. Pile yarn mass is not applicable to needlepunch materials.

3.2 For definitions of other terms relating to pile yarn floor coverings, refer to Terminology D 5684. For definitions of other textile terms used in this test method, refer to Terminology D 123.

### 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

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 07.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 11.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.

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 E 122 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 *Test Sample*—A test sample 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 100 mm (4 in.) longer than the specimens required for the tests being conducted. Do not cut a test sample 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 3000 mm (120 in.) 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 1500 mm (60 in.) wide but less than 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 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 460 mm (18 in.) 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 When required, condition the specimens or the test sample in the standard atmosphere for testing textiles, that is  $21 \pm 1^\circ\text{C}$  ( $70 \pm 2^\circ\text{F}$ ) at  $65 \pm 2\%$  relative humidity, for 12 h or until the mass changes no more than 0.1 % in 2 h.

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 D 1909.

## 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, 254 by 254-mm (10.0 by 10.0-in.) test specimen has a mass per unit area of  $1550 \text{ g/m}^2$  ( $457 \text{ oz/yd}^2$ ) while a 1000-g, 457 by 457-mm (18.0 by 18.0-in.) test specimen has a mass per unit area of  $4784 \text{ g/m}^2$  ( $141.1 \text{ oz/yd}^2$ ).

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 Section 1.2.3 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 Section 1.2.2.

7.5.1 For level pile floor covering, the test specimens shall be at least 250 by  $250 \pm 5 \text{ mm}$  ( $10.0 \text{ by } 10.0 \pm 0.2 \text{ in.}$ ).

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  $460 \text{ by } 460 \pm 5 \text{ mm}$  ( $18.0 \text{ by } 18.0 \pm 0.2 \text{ in.}$ ) 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  $0.3 \text{ g/m}^2$  ( $0.01 \text{ oz/yd}^2$ ) using Eq 1.

$$W = M \times K / (B \times L) \quad (1)$$

where:

- $W$  = total mass per unit area of the test specimen,  $\text{g/m}^2$  ( $\text{oz/yd}^2$ ),  
 $M$  = mass of the test specimen, g (oz),  
 $K$  = appropriate conversion factor in Table 1,  
 $B$  = average width of the test specimen to the nearest 0.3 mm (0.01 in.), and  
 $L$  = average length of the test specimen to the nearest 0.3 mm (0.01 in.).

NOTE 2—When the template or clicking die procedure of Annex A1 is used, a standard area value for  $B \times L$  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  $65 \text{ mm}^2$  (0.1  $\text{in.}^2$ ).

7.7.2 Calculate the average total mass per unit area for all test specimens of the test sample to the nearest  $3 \text{ g/m}^2$  (0.1  $\text{oz/yd}^2$ ).

7.8 Report:

7.8.1 State the test sample was tested as directed in Test Method D 5848 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 D 5848 for determining total mass per unit area is being established.

7.9.2 Bias—The procedure in Test Method D 5848 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.

8.2 Summary of Test Method—The test specimens used for determining the total mass per unit area as directed in Section 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 Section 1.2.3 before measuring.

8.5 Test Specimens— Use the test specimens prepared for determining total mass per unit area as directed in Section 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  $0.3 \text{ g/m}^2$  (0.01  $\text{oz/yd}^2$ ), using Eq 2.

$$C = M \times K / (B \times L) \quad (2)$$

where:

$C$  = component mass per unit area for the test specimen,  $\text{g/m}^2$  ( $\text{oz/yd}^2$ ),

$M$  = mass of the component removed from the test specimen, g (oz),

$K$  = appropriate conversion factor in Table 1,

$B$  = average width of the test specimen, mm (in.), and

$L$  = average length of the test specimen, mm (in.).

8.7.2 Calculate the average component mass per unit area for each component to the nearest  $3 \text{ g/m}^2$  (0.1  $\text{oz/yd}^2$ ) 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 D 5848 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 D 5848 for determining component masses per unit area is being established.

8.9.2 Bias—The procedure in Test Method D 5848 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.

9.2 Summary of Test Method—One or two strip specimens are taken as directed in 9.7.2 from each test specimen such that the combined mass per unit area of the strip specimen(s) is within 1 % of the mass per unit area of the test specimen. The total mass of the selected strip specimens taken from all test specimens of the test sample is designated  $M$ . Most of the pile is shear from the strip specimens and discarded, leaving stubble specimens whose total mass is designated  $S$ . The buried pile yarn in the stubble specimens along with adhering coating material is manually removed from the backing fabric with the assistance of a solvent that dissolves or softens the coating material. Most of the adhering coating material is removed from the fiber of this buried pile yarn by further soaking in solvent and by abrasion. The total mass of this partially cleaned fiber from all the strip specimens is designated  $C$ . The amount of residual coating material on this fiber is determined by dissolving the partially cleaned pile fibers, leaving a residue of coating material. The mass of the residue is designated  $R$ . The mass of the pile yarn in the strip specimens equals the mass

**TABLE 1 Conversion Factors for Mass Per Unit Area**

From	To	
	$\text{g/m}^2$	$\text{oz/yd}^2$
$\text{oz/in.}^2$	43 940	1296.0
$\text{oz/mm}^2$	$28.350 \times 10^4$	836 100
$\text{g/in.}^2$	1550.0	45.72
$\text{g/mm}^2$	$10^4$	29 490



sheared from the strip specimens, ( $M - S$ ), plus the mass of the pile yarn buried in the backing, ( $C - R$ ).

### 9.3 Apparatus:

9.3.1 *Balance*, see 7.3.1.

9.3.2 *Shear or Clipper*, capable of shearing close enough to the backing so as to leave a stubble of approximately 1.3 mm (0.05 in.).<sup>5</sup>

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

9.3.4 *Means for Abrading Buried Pile Yarn in Solvent Manual Option*:

9.3.4.1 *16-Mesh Screen*, with rim, approximately 200 mm (8 in.) in diameter.<sup>6</sup>

9.3.4.2 *Shallow Pan*, large enough to hold 16-mesh screen.

9.3.4.3 *Presser*, having a flat, firm surface approximately 38 mm (1.5 in.) wide.

9.3.5 *Means for Abrading Buried Pile Yarn in Solvent—Mechanical Option*:

9.3.5.1 *Container*, polyethylene, approximately 150 mm (6 in.) square at top and 130 mm (5 in.) square at bottom and 180 mm (7 in.) deep.

9.3.5.2 *Wire Mesh Screen Basket*, 16-mesh, approximately 114 mm (4.5 in.) square at top and 100 mm (4 in.) square at bottom and 130 mm (5 in.) deep.

9.3.5.3 *Spacer*, polyethylene ring, approximately 130-mm (5-in.) outside diameter and 50 mm (2 in.) high to fit bottom of the polyethylene container and support the screen basket.

9.3.5.4 *Laboratory Stirrer*.<sup>7</sup>

9.3.5.5 *Shallow Tray*, of glass or plastic, resistant to solvent.

9.3.6 *Spatula*.

9.3.7 *Tweezers*.

9.3.8 *Laboratory Oven*, set at  $105 \pm 2^\circ\text{C}$  ( $221 \pm 5^\circ\text{F}$ ).

9.3.9 *Tea Strainer*, or similar sieve.

9.3.10 *Wire Mesh Screen*, 100-mesh, approximately 100 by 100 mm (4 by 4 in.).

9.3.11 *Gloves*, chemical-resistant.

9.3.12 *Brush*, steel.

9.3.13 *Steam Table*.

9.4 *Reagents*—All technical grade unless otherwise specified.

9.4.1 *Acetone*.

9.4.2 *Ammonium Thiocyanate*, 70.

9.4.3  $\gamma$ -*Butyrolactone*.

9.4.4 *Chloroform*.

9.4.5 *m-Cresol*, clear.

9.4.6 *Decalin*.

9.4.7 *Dimethylacetamide*.

9.4.8 *Dimethylformamide*.

9.4.9 *Formic Acid*, 90 %.

9.4.10 *Hexafluorisopropanol*.

9.4.11 *Hydrochloric Acid*, approximately 6 *N*. Carefully add 1 volume of concentrated hydrochloric acid (sp gr 1.19) to 1 volume of water.

9.4.12 *Methyl Chloroform*, aerosol grade.

9.4.13 *Methylene Chloride*.

9.4.14 *Phenol*, 88 %.

9.4.15 *Sodium Hydroxide*,  $5 \pm 0.5$  %. Dissolve  $5.0 \pm 0.5$  g of reagent grade NaOH in water and dilute to 100 mL.

9.4.16 *Tetrachloroethane*.

9.4.17 *Tetrahydrofuran*.

9.4.18 *Water*, Type IV grade of reagent water conforming to Specification D 1193.

9.4.19 *Xylene*, boiling point between 135 and 140°C (275 and 284°F).

9.5 *Precaution*—In addition to other precautions, the reagents cited in 9.4 can cause damage to health and property if not used with proper precautions. Some are flammable. Some are corrosive. Some are known or suspected to be toxic, carcinogenic, mutagenic, teratogenic, or otherwise harmful to people. Table 2 lists the boiling point, flashpoint, and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for each reagent. The threshold limits are subject to change and precautions should be adjusted accordingly.

9.5.1 Use hoods, gloves, and safety goggles according to the hazard presented by each reagent.

9.5.2 Always refer to the manufacturer material safety data sheet for recommendations on handling, use, storage, and disposal for each chemical reagent.

9.5.3 *It is the responsibility of the user of this test method to establish appropriate safety practices and to determine the applicability of regulatory limitations prior to use.*

9.6 Condition the test specimens and strip specimens as directed in Section 1.2.3 before measuring and before weighing.

### 9.7 Specimens:

#### 9.7.1 Test Specimens:

9.7.1.1 For level pile floor covering, the test specimens shall be at least 250 by 320 mm (10.0 by 12.5 in.).

9.7.1.2 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 9.7.1.2. If the pattern repeat is not known and cannot be determined readily, use test specimens at least 460 by 460 mm (18.0 by 18.0) in size.

NOTE 3—Before selecting test specimens, examine the back of the test sample for signs of variation in the amount of back coating. As far as possible, take test specimens at locations having neither high nor low amounts of back coating.

#### 9.7.2 Strip Specimens:

9.7.2.1 Strip specimens shall be  $250 \pm 3$  mm ( $10.0 \pm 0.1$  in.) in the lengthwise direction and  $64 \pm 3$  mm ( $2.5 \pm 0.1$  in.) in the widthwise direction.

NOTE 4—The actual dimensions of a specimen are not critical as long as the area has been measured accurately.

9.7.2.2 Take one strip specimen from each test specimen for routine quality control and acceptance testing.

<sup>5</sup> Sunbeam Model 510 Clipmaster with EA-1 SUR bottom blade, or equivalent. Available from most agricultural supply sources.

<sup>6</sup> Standard sieve screen, Tyler Screen Scale: 16 mesh. U.S. Standard Sieve Series: 1 mm. Available from most laboratory or scientific supply sources.

<sup>7</sup> Lightning Mixer Model G3-U-05, variable speed, 180–2300 rpm, or equivalent, available from Mixing Equipment Co., 135 Mount Read Blvd., Rochester, NY 14611.

**TABLE 2 Reagent Hazard Characteristics<sup>A</sup>**

Reagent		Characteristics					
Common Name	Formal Name <sup>B</sup>	Number <sup>B</sup>	Boiling Point, <sup>C</sup> °C (°F)	Flash Point, <sup>C</sup> °C (°F)	Exposure Limits, TWA <sup>D</sup>		Dominant Hazard(s) <sup>E,F</sup>
					ppm	mg/m <sup>3</sup>	
Acetone	2-propanone	67-64-1	56 (133)	-17 (1.4)	750	1780	e, f
γ-Butyrolactone	2(3H)-furanone, dihydro-	96-48-0	204 (399)	98 (209)	...	...	i
Ammonium thiocyanate	thiocyanic acid, ammonium salt	1762-94-4	170 (338)	...	...	...	d
Chloroform	methane, trichloro-	67-66-3	61 (142)	...	10	49	a, c, h, t
m-Cresol	phenol 3-methyl-	108-39-4	202 (396)	86 (187)	5	22	i, k, s
Decalin	naphthalene, deca-hydro-	91-17-8	192 (378)	58 (136)	...	...	i
Dimethylacetamide	acetamide, N,N-dimethyl-	127-19-5	166 (331)	70 (158)	10	36	h, s, t
Dimethylformamide	formamide, N,N-dimethyl-	68-12-2	153 (307)	58 (136)	10	30	g, i, s, t
Formic acid	formic acid	64-18-6	108 (226)	85 (185)	5	9	i, k
Hexafluoroisopropanol	2-propanol, 1,1,1,3,3,3-hexafluoro-	920-66-1	58 (137)	...	...	...	c, vk, m, t
Hydrochloric acid	hydrochloric acid	7647-01-0	109 (228)	...	5	7	i, k
Methyl chloroform	ethane, 1,1,1-trichloro-	71-55-6	74 (165)	...	350	1910	a, h
Methylene chloride	methane, dichloro-	75-09-2	40 (104)	...	50	174	a, h, z
Phenol	phenol	108-95-2	182 (359)	79 (174)	5	19	g, i, k, s
Sodium hydroxide	sodium hydroxide	1310-73-2	102 (216)	...	...	2	i, k
Tetrachloroethane	ethane, 1,1,2,2-tetrachloro-	79-34-5	146 (295)	()	1	6.9	a, g, h, s
Tetrahydrofuran	furan, tetrahydro-	109-99-9	66 (151)	-14 (6)	200	590	c, e, f, m, t
Xylene	benzene, dimethyl-	1330-20-7	139 (282)	29 (84)	100	435	f

<sup>A</sup> The information in this table is provided to alert users to the hazards accompanying the use of these reagents. Each user must make his own decisions regarding the kind and extent of risk involved and what protective measures to enforce.

<sup>B</sup> Toxic Substances Control Act Chemical Substance Inventory, *Initial Inventory*, Vol 1, May 1979.

<sup>C</sup> Approximate values from various sources.

<sup>D</sup> ACGIH-TLVs® *Threshold Limit Values for Chemical Substances and Physical Agents* adopted by American Conference of Governmental Industrial Hygienist, TWA = time weighted average.

<sup>E</sup> Sources include: *Documentation of the Threshold Limit Values*, 1992–1993 edition, ACGIH, Cincinnati, OH.

<sup>F</sup> This listing of dominant hazards is indicative, not exhaustive. Suspected as well as confirmed hazards are included in some cases.

Legend:

a= anesthetic, narcotic  
c= carcinogenic  
d= forms cyanide fumes on decomposition or contact with acids  
e= explosive  
f= flammable  
g= gastrointestinal  
h= hepatotoxic-liver

i= irritating  
k= corrosive  
m= mutagenic  
s= skin penetrating  
t= teratogenic, embryotoxic  
v= very  
z= carbon monoxide in blood.

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9.7.2.3 Take two strip specimens from each test specimen for referee testing, and for acceptance testing when the pile yarn mass per unit area is close to a minimum standard to be met or exceeded.

NOTE 5—Two strip specimens may be taken from each test specimen either as a pair at the same time or as directed in 9.7.2.2 on two separate occasions. In the latter case, two sets of analyses are performed but the masses obtained from each set, at each stage of the analysis, are combined as though the two strip specimens had been taken as a pair.

9.8 Procedure:

9.8.1 Preparation of Specimens—Follow the selected procedure in Annex A1.

9.8.1.1 Combination templates or clicking dies may be used to cut the strip specimens together with the test specimens. When a standard size test specimen template or clicking die is used on multilevel pile floor covering, the template or die may be designed to cut as many strip specimens from the test specimen as possible to provide extra strip specimens, if needed.

9.8.1.2 For floor coverings having gages 8 mm (5/16 in.) or greater and essentially straight lengthwise lines of binding sites (less than one-half gage lateral deviation from a straight line), angle the 250 ± 3-mm (10 ± 0.1-in.) specimen dimension approximately 0.24 rad (14°) to the lengthwise direction of the

floor covering. The diagonal of the 64 by 250 ± 3-mm (2.5 by 10.0 ± 0.1-in.) specimen has this angle to the 250 ± 3-mm side.

NOTE 6—With coarse gages and straight lengthwise lines of binding sites it is possible to lose a whole row of tufts by a small lateral shift in the location of the strip specimen location when the long dimension is parallel to the line of binding sites. Angling the strip specimen avoids this problem.

9.8.2 Equivalent Mass for s Strip Specimens:

9.8.2.1 Determine the total mass per unit area of each test specimen as directed in Section 1.3. Convert this to an equivalent mass for s strip specimen using Eq 3.

$$E_i = A_s W_i / K \quad (3)$$

where:

- i = numerical designation of an individual test specimen (1, 2, . . . n; where n = number of test specimens),
- E<sub>i</sub> = equivalent mass of the s strip specimen(s) for the ith test specimen, g,
- A = nominal area of one strip specimen, 16 000 mm<sup>2</sup> (25 in.<sup>2</sup>),
- s = number of strip specimens taken from each test specimen, 1 or 2,

$W_i$  = total mass per unit area of the  $i$ th test specimen,  $\text{g/m}^2$  ( $\text{oz/yd}^2$ ), and

$K$  = appropriate conversion factor from Table 1, converting  $\text{g/mm}^2$  ( $\text{g/in.}^2$ ) to the units of  $W_i$ .

9.8.2.2 Calculate 1 % limiting values for acceptable masses for  $s$  strip specimens using Eq 4 and 5:

$$\text{Upper Limit} = 1.01 E_i \quad (4)$$

$$\text{Lower Limit} = 0.99 E_i \quad (5)$$

9.8.3 *Strip Specimen Selection*—Weigh the strip specimen(s) from each test specimen to the nearest 0.01 g. Select  $s$  strip specimen(s) from each test specimen whose combined mass is between the upper and lower 1 % limiting values calculated in 9.8.2.2 for that test specimen. Cut additional strip specimens, if necessary. Record the total mass of all selected strip specimens from all test specimens as  $M$ .

#### 9.8.4 *Stubble Specimens:*

9.8.4.1 Shear the pile yarn on the selected strip specimens down to a stubble of approximately 1.3 mm (0.05 in.), removing and discarding all loose pile fiber.

NOTE 7—In shearing, avoid including in the pile fiber any removed back coating projections and fiber from fiber layers needle-punched into the backing fabric of tufted floor covering. Stop shearing before this occurs even if the pile stubble has not been reduced to 1.3 mm (0.05 in.). In subsequent steps, care must be exercised to keep the layer fiber separate from the pile fiber.

9.8.4.2 Weigh all the stubble specimens from all test specimens together to the nearest 0.01 g and record as the stubble specimen mass,  $S$ .

NOTE 8—When separate pile yarn mass per unit area estimates are required for individual test specimens, weigh the stubble specimen(s) from each test specimen separately and conduct the subsequent steps of the procedure treating the stubble specimens from each test specimen separately. When individual stubble specimen weighings are required, as for the pile thickness determination on multilevel pile yarn floor covering, add the masses obtained for all stubble specimens together to obtain the value of  $S$ .

9.8.5 *Separation of Buried Pile Yarn from Backing*—The objective of this operation is to separate the buried pile yarn of each selected stubble specimen from the backing fabric(s) and some of the back coating materials. The steps to be followed will vary with the type of floor covering construction: tufted, woven, or knitted; the type of backing fabric: jute, woven polypropylene, with or without needle-punched fiber, and nonwoven polypropylene; and the type of back coating: latex, hot melt, polyurethane, poly(vinyl chloride), and rubber foam. Variations of composition within each type of coating will require variations in treatment, as well. Frequently used procedures are detailed in 9.8.5.1-9.8.5.8.

9.8.5.1 First remove most of any attached cushion manually by slicing with a knife and by abrasion with the steel brush, taking care not to remove pile fiber from the yarn in the backing.

9.8.5.2 Remove the backcoating material as directed in 9.8.5.3 for poly(vinyl chloride) coatings, 9.8.5.4 for hot-melt coatings, and 9.8.5.5 for latex coatings. See 9.5 and Table 2 for safety precaution information.

9.8.5.3 *Poly(Vinyl Chloride) Coatings*—Remove poly(vinyl chloride) coatings by placing the stubble specimen in a beaker

containing tetrahydrofuran at room temperature. Use a spatula to scrape off the softened PVC coating. Proceed to 9.8.5.8.

9.8.5.4 *Hot-Melt Coatings*—Remove hot-melt coatings with methyl chloroform; warm as necessary. If there is a secondary backing, proceed to 9.8.5.6, otherwise to 9.8.5.7 and 9.8.5.8.

9.8.5.5 *Latex Coatings*— Soften the latex in latex coated tufted floor covering by placing the stubble specimen in chloroform, methyl chloroform, or methylene chloride for approximately 10 min at room temperature. Proceed to 9.8.5.6-9.8.5.8.

NOTE 9—A woven polypropylene primary backing often can be mechanically stripped from the rest of the backing of a tufted floor covering with little or no solvent treatment.

9.8.5.6 Peel the secondary backing from the primary backing, repeating the solvent immersion, if necessary.

9.8.5.7 Scrape buried yarn, together with any coating material adhering to the yarn from the primary backing or the secondary backing, or both, with a spatula. Tweezers may be necessary in some instances.

9.8.5.8 Accumulate the separated buried pile yarn in a beaker and cover it with solvent. Combine the buried yarn from all of the selected stubble specimens for the remaining steps of the procedure.

9.8.6 *Cleaning of Buried Pile Yarn*—Remove the back coating material from the buried pile yarn by immersing the yarn in the solvent and abrading the yarn. Two options are suggested.

9.8.6.1 *Manual Option*— After 10 to 60-min immersion in solvent, place the buried yarn on the flat 16-mesh screen in the flat tray and abrade the yarn by passing and rubbing with the presser so as to force separated coating particles to pass through the screen while retaining the opened buried yarn fibers on the screen surface.

9.8.6.2 *Mechanical Option*—Place the buried pile yarn in the 16-mesh screen basket and put the basket in the square polyethylene container filled with solvent. Subject the yarn to power stirring for approximately 30 min. The yarn should circulate vertically while stirring. Adjust the amount of yarn per batch as needed to obtain proper circulation.

9.8.6.3 *Other Options*— As new back coatings are developed, other solvents and procedures may be required to remove the bulk of the back coating material from the fiber. The loss in fiber mass shall be less than 0.1 % when the new procedure is applied to fiber alone, without back coating.

9.8.6.4 Repeat the selected abrasion cleaning process until the buried pile yarn has been separated into individual fibers which are visually clean of coating particles. Periodically transfer the fiber to cleaner solvent with the tea strainer or sieve. Pour the spent solvent through the strainer to catch any fiber remaining and discard the accumulated coating particles, after inspecting to ensure no fiber adheres to them. Use 9.8.6.1 when 9.8.6.2 or 9.8.6.3 does not provide sufficient cleaning. With some coating formulations; rice-like particles will persist even after repeated abradings. When the quantity stabilizes, proceed to the next step.

9.8.6.5 Rinse fiber with solvent and allow most of the solvent to evaporate from the fiber in a hood either at room temperature or on a steam table.