



Standard Practice for Sampling and Analysis of New Built-Up Roof Membranes¹

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^{ε1} NOTE—Section 8 was added editorially in July 1994.

1. Scope

1.1 This practice is a guide for removing specimens from new built-up bituminous roof membranes prior to the application of flood coating and top surfacing, for determining the *approximate* quantities of the components and the possible presence of moisture, or dry spots between plies, in the field. Components may consist of:

- 1.1.1 Insulation, when part of the roof membrane system,
- 1.1.2 Plies of roofing felt,
- 1.1.3 Interply layers of bituminous material, and
- 1.1.4 Top coating, if present, before any surfacing aggregate has been applied.

1.2 The values stated in SI (metric) units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

- D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing²
- D 227 Specification for Coal-Tar Saturated Organic Felt Used in Roofing and Waterproofing²
- D 250 Specification for Asphalt-Saturated Asbestos Felt Used in Roofing and Waterproofing²
- D 2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing²
- D 2626 Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing²
- D 3158 Specification for Asphalt-Saturated and Coated Organic Felt Used in Roofing³
- D 3378 Specification for Asphalt-Saturated and Coated Asbestos Felt Base Sheet Used in Roofing³

3. Sampling

3.1 Unless otherwise specified, take at least one specimen for each separate roof, plus one for each 929 m² (10 000 ft²); take specimens at random.

3.2 Take additional specimens where deficiencies are indicated in the membrane, to determine the extent of the deficient area.

4. Test Specimen

4.1 Sweep the surface of the membrane clean where each test specimen will be taken.

4.2 For determining approximate quantities of components, cut a 300 by 300-mm (12 by 12-in.) specimen from the membrane, using a template (Fig. 1).

4.2.1 If the membrane is adhered to the insulation, remove the membrane with the adhering insulation.

4.2.2 If the membrane is adhered directly to the roof deck, estimate the quantity of bitumen remaining on the deck after the specimen is removed.

4.3 For the purpose of determining the felt spacing, cut a 100 by 1000-mm (4 by 40-in.) rectangular specimen from the membrane, using a template (Fig. 1) placed at right angles to the long dimension of the felts.

4.4 Identify each specimen by location and record the presence of insulation or the estimated quantity of bitumen remaining on the deck.

4.5 If practicable, return the cut membrane specimen to its original location in the roof. Make adequate repairs to the roofing system, using at least the same number of felt plies as the original roof membrane after testing.

5. Procedure

5.1 Remove insulation fully from the 300 by 300-mm (12 by 12-in.) specimen, if present, being careful to remove as little bituminous material as possible, or leave the insulation in place and later use manufacturer's information to correct for its weight. Determine the area of the specimen from three different measurements in each direction, and weigh.

5.2 Measure the individual felts and calculate the area of each ply as in 5.1 (due to lapping, not all plies will be the same size as the original specimen).

5.3 Visually check along the sample edges for moisture within the membrane, and skips or dry spots between layers of felt.

5.4 Determine the number of plies and lap spacing by visual examination of the 100 by 1000-mm (4 by 40-in.) specimen, if lap spacing is desired.

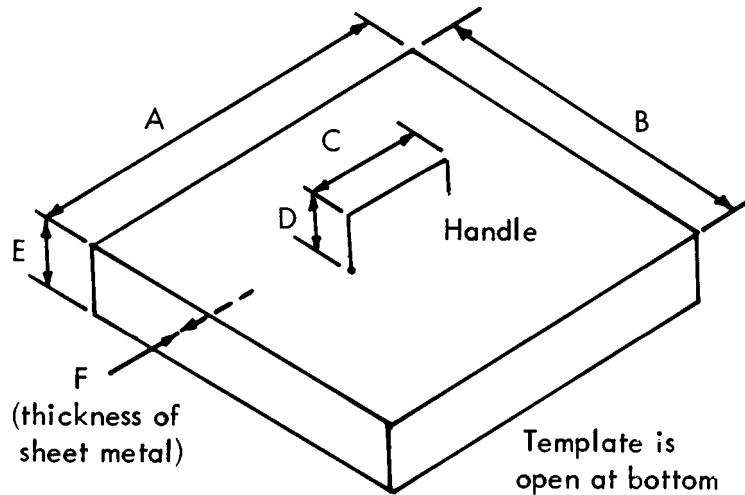
6. Calculation (See Table 1 for Form and Sample

¹ This practice is under the jurisdiction of ASTM Committee D-8 on Roofing, Waterproofing, and Bituminous Materials and is the direct responsibility of Subcommittee D08.20 on Nonstructural Roof Systems.

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² Annual Book of ASTM Standards, Vol 04.04.

³ Discontinued—See 1984 Annual Book of ASTM Standards, Vol 04.04.



Dimension	Square (4.2)		Rectangular (4.3)	
	mm	in.	mm	in.
A	300	12	100	4
B	300	12	1000	40
C	150	6	150	6
D	40	1.5	40	1.5
E	40	1.5	40	1.5
F	3	1/8	3	1/8

FIG. 1 Dimensions of Templates for Roof Sampling

TABLE 1 Computation Form and Sample Computation for a Nominal 4-Ply, Built-Up Roof Mopped to Insulation

Line	Reference	Identification	Factor Component	Computation	Example	SI Units	lb/100 ft ² ^A
1	5.1	original specimen	measured area	0.314 × 0.312	= 0.098	m ²	
2	5.1	original specimen (with insulation)	measured mass		= 749	g	
3	6.1	approximate specimen mass/unit area	line (2)/line (1)	749/0.098	= 7640	g/m ²	156
4	5.2	individual felt areas	sum of measured areas	0.046 + 3 (0.098) + 0.065	= 0.405	m ²	
5	6.2	number of plies	line (4)/line (1)	0.405/0.098	= 4.13	plies	
6	6.3	total felt mass per unit area	line (5) × assumed felt mass per unit area)	4.13 × 635	= 2620	g/m ²	54
7	5.1	insulation mass per unit area	assumed roof insulation mass		900	g/m ²	18
8	6.4	approximate total interply bitumen per unit area	line (3) – line (6) – line (7)	7640 – 2620 – 900	= 4120	g/m ²	84
9	6.5	approximate average interply bitumen per unit area	line (8)/line (5)	4120/4.13 ^B	= 1000	g/m ²	20
10	6.6	total membrane mass per unit area	line (6) + line (8)	2620 + 4120	= 6740	g/m ²	138

^AUse conversion factor of 0.02048.

^BIf no mopping is attached to the bottom of the lowest ply, reduce the number of plies (from line 5) by one.

Computation)

6.1 Calculate the mass (weight) per unit area of the original specimen by dividing the specimen’s weight by its area (and multiplying by 100 if U.S. customary units are used).

6.2 Divide the sum of the individual felt areas by the area of the original specimen, and record as the “number of plies.”

6.3 Calculate the mass per unit area of the saturated felts in the original specimen by dividing the individual felt areas by the area of the original specimen, and then multiplying by the following values. Add the masses per unit area for each felt to find the total mass per unit area of the original felts. If all the plies are the same, multiply the assumed felt mass per unit area by the number of plies (6.2). Use manufacturer’s information

for components not within the scope of the following specifications:

6.3.1 *Specification D 226*—Use 635 g/m² (13 lb/100 ft²) for Type I; 1270 g/m² (26 lb/100 ft²) for Type II; and 830 g/m² (17 lb/100 ft²) for Type III.

6.3.2 *Specification D 227*—Use 635 g/m² (13 lb/100 ft²).

6.3.3 *Specification D 250*—Use 635 g/m² (13 lb/100 ft²) for Type I and 1367 g/m²(28 lb/100 ft²) for Type II.

6.3.4 *Specification D 2178*—Use 366 g/m² (7.5 lb/100 ft²) for Type I; 474 g/m²(9.7 lb/100 ft²) for Type III; 342 g/m² (7.0 lb/100 ft²) for Type IV; and 713 g/m² (14.6 lb/100 ft²) for Type V.

6.3.5 *Specifications D 2626 and D 3378*—Use 1806

g/m² (37 lb/100 ft²) for Type I and 1904 g/m² (39 lb/100 ft²) for Type II.

6.3.6 *Specification D 3158*—Use 1416 g/m² (29 lb/100 ft²).

6.4 Calculate the total interply bituminous material per unit area by subtracting the mass of the saturated felts (6.3) and assumed mass of insulation (5.1), if any, from the mass per unit area of the original specimen (6.1). Add the estimated mass of bituminous material remaining on the deck (4.2.2), if any; or subtract the weight of any bitumen, felt, or coating contributed by the insulation if insulation was removed, in consistent units.

6.5 Calculate the average interply bituminous material per unit area by dividing the total mass per unit area of interply bitumen by the number of plies. If there is no bitumen below the bottom ply, divide the mass of the bitumen by the number of plies minus one.

6.6 Calculate the total membrane mass per unit area by adding the mass per unit area of the felts and the total interply bitumen.

6.7 Calculations should be carried out to the following significance:

6.7.1 *Number of Plies*, in the built-up roofing to the nearest hundredth of a ply.

6.7.2 *Mass of Felts*, interply mopping, top coating, total applied bituminous material and surfacing to the nearest 1 g (0.002 lb).

6.7.3 *Mass per Unit Area*, to the nearest 10 g/m² (0.2 lb/100 ft²).

6.7.4 *Dimension of Felts*, to the nearest 1 mm (0.04 in.) and 0.001 m² (0.01 ft²).

6.7.5 *Results*—Round mass per unit area to the nearest 50 g/m² (1 lb/100 ft²), and number of plies to the nearest tenth.

7. Report

7.1 The report should include the following:

7.1.1 Description of the deck and insulation, if any, over which the built-up roof membrane has been applied,

7.1.2 Description of the built-up roof itself, including type(s) of roofing felts or sheets, nature and type of bituminous material used, and type of surfacing to be applied,

7.1.3 Location of each membrane specimen on the roof,

7.1.4 Total mass per unit area of the membrane, of the total applied bitumen, and average of interply bituminous material,

7.1.5 Type(s) and number of plies, and lap spacing; a diagram showing the number and lapping of felts is recommended. Report the number of felt plies to the nearest tenth, and

7.1.6 Comments on the presence of any moisture or dry spots between plies observed.

8. Keywords

8.1 felts; insulation; interply bituminous material; lap spacing; moisture; plies; surfacing; top coating

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