



# Standard Practice for Sampling and Analysis of New Built-Up Roof Membranes<sup>1</sup>

This standard is issued under the fixed designation D 3617; 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.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope

1.1 This practice is a guide for removing specimens from new built-up bituminous roof membranes before 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.

1.3 This standard is applicable to 910-mm (36-in.) wide felt rolls and does not apply to metric-sized (that is, 1000-mm [39<sup>3</sup>/<sub>8</sub>-in.] wide) felt rolls.

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:

- D 226 Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing<sup>2</sup>
- D 227 Specification for Coal-Tar Saturated Organic Felt Used in Roofing and Waterproofing<sup>2</sup>
- D 250 Specification for Asphalt-Saturated Asbestos Felt Used in Roofing and Waterproofing<sup>3</sup>
- D 2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing<sup>2</sup>
- D 2626 Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing<sup>2</sup>

D 3158 Specification for Asphalt-Saturated and Coated Organic Felt Used in Roofing<sup>4</sup>

D 3378 Specification for Asphalt-Saturated and Coated Asbestos Felt Base Sheet Used in Roofing<sup>5</sup>

## 3. Sampling

3.1 Unless otherwise specified, take at least one specimen for each separate roof, plus one for each 929 m<sup>2</sup> (10 000 ft<sup>2</sup>); take specimens at random.

3.2 Take additional specimens in which 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

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D08 on Roofing, Waterproofing, and Bituminous Materials and is the direct responsibility of Subcommittee D08.20 on Roofing Membrane Systems.

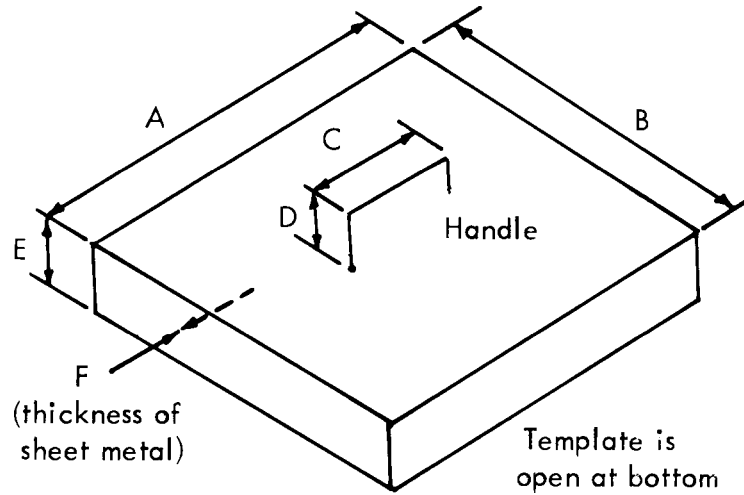
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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.04.

<sup>3</sup> Discontinued—See 1991 *Annual Book of ASTM Standards*, Vol 04.04.

<sup>4</sup> Discontinued—See 1983 *Annual Book of ASTM Standards*, Vol 04.04.

<sup>5</sup> Discontinued—See 1985 *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

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 (as a result of 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

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

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

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

<sup>A</sup>Use conversion factor of 0.020 48.

<sup>B</sup>If no mopping is attached to the bottom of the lowest ply, reduce the number of plies (from line 5) by one.

for components not within the scope of the following specifications:

6.3.1 *Specification D 226*—Use 635 g/m<sup>2</sup> (13 lb/100 ft<sup>2</sup>) for Type I; 1270 g/m<sup>2</sup> (26 lb/100 ft<sup>2</sup>) for Type II; and 830 g/m<sup>2</sup> (17 lb/100 ft<sup>2</sup>) for Type III.

6.3.2 *Specification D 227*—Use 635 g/m<sup>2</sup> (13 lb/100 ft<sup>2</sup>).

6.3.3 *Specification D 250*—Use 635 g/m<sup>2</sup> (13 lb/100 ft<sup>2</sup>) for Type I and 1367 g/m<sup>2</sup> (28 lb/100 ft<sup>2</sup>) for Type II.

6.3.4 *Specification D 2178*—Use 366 g/m<sup>2</sup> (7.5 lb/100 ft<sup>2</sup>) for Type I; 474 g/m<sup>2</sup> (9.7 lb/100 ft<sup>2</sup>) for Type III; 342 g/m<sup>2</sup> (7.0 lb/100 ft<sup>2</sup>) for Type IV; and 713 g/m<sup>2</sup> (14.6 lb/100 ft<sup>2</sup>) for Type V.

6.3.5 *Specifications D 2626 and D 3378*—Use 1806 g/m<sup>2</sup> (37 lb/100 ft<sup>2</sup>) for Type I and 1904 g/m<sup>2</sup> (39 lb/100 ft<sup>2</sup>) for Type II.

6.3.6 *Specification D 3158*—Use 1416 g/m<sup>2</sup> (29 lb/100 ft<sup>2</sup>).

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/m<sup>2</sup> (0.2 lb/100 ft<sup>2</sup>).

6.7.4 *Dimension of Felts*, to the nearest 1 mm (0.04 in.) and 0.001 m<sup>2</sup> (0.01 ft<sup>2</sup>).

6.7.5 *Results*—Round mass per unit area to the nearest 50 g/m<sup>2</sup> (1 lb/100 ft<sup>2</sup>) 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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