



Designation: D6221/D6221M – 00 (Reapproved 2021)

Standard Specification for Reinforced Bituminous Flashing Sheets for Roofing and Waterproofing¹

This standard is issued under the fixed designation D6221/D6221M; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers factory-prepared reinforced bituminous sheet used in flashing. The bitumen used may be asphalt, coal-tar pitch, or polymer-modified bitumen. The reinforcement may include any one or a combination of organic (wood fiber), polyester, or glass fiber felts, woven fabrics, or thermoplastic films. Fine mineral powders, granules, or metal foils may be used as surfacing.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 The following precautionary statement pertains only to the test method portion, Section 7, of 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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

D228/D228M Test Methods for Sampling, Testing, and Analysis of Asphalt Roll Roofing, Cap Sheets, and

¹ This specification is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.04 on Felts, Fabrics and Bituminous Sheet Materials.

Current edition approved Nov. 15, 2021. Published November 2021. Originally approved in 1998. Last previous edition approved in 2014 as D6221/D6221M – 00 (2014)^{ε1}. DOI: 10.1520/D6221_D6221M-00R21.

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.

- [Shingles Used in Roofing and Waterproofing](#)
- [D751 Test Methods for Coated Fabrics](#)
- [D1079 Terminology Relating to Roofing and Waterproofing](#)
- [D2523/D2523M Practice for Testing Load-Strain Properties of Roofing Membranes](#)
- [D3746/D3746M Test Method for Impact Resistance of Bituminous Roofing Systems](#)
- [D5601 Test Method for Tearing Resistance of Roofing and Waterproofing Materials and Membranes \(Withdrawn 2002\)³](#)
- [D5683/D5683M Test Method for Flexibility of Roofing and Waterproofing Materials and Membranes](#)
- [D5869/D5869M Practice for Dark Oven Heat Exposure of Roofing and Waterproofing Materials](#)

3. Terminology

3.1 *Definitions:*

3.1.1 See Terminology D1079 for terms relating to roofing or waterproofing.

4. Classification

4.1 *Type 1*—Heavy, thick flashing sheets.

4.2 *Type 2*—Lightweight, thin flashing sheets

5. Significance and Use

5.1 The criteria listed in this specification are based on round robin testing of materials that, if correctly installed, can be used as the primary material for flashing membranes. The manufacturer's installation recommendations must be followed in every case.

5.2 Compliance with the criteria in this specification is believed to be necessary for satisfactory performance, but the linkage has not been established between performance and these criteria.

6. Physical Properties

6.1 Conform to criteria in **Table 1**.

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

TABLE 1 Physical Properties

| Property | Type 1 | Type 2 |
|--|-------------|-------------|
| Mass, kg/m ² [lb/100 ft ²], min | 3.4 [70] | 1.7 [35] |
| Thickness, mm [in.], min | 3.3 [0.130] | 0.6 [0.025] |
| Breaking load, kN/m [lbf/in.], minimum at 73.4 °F | 9.6 [55] | 9.6 [55] |
| Elongation at break, min % at 73.4 °F | 10 | 3 |
| Mean tear resistance, N [lbf], minimum at 73.4 °F | 6 | 2 |
| Peak tear resistance, N [lbf], minimum at 73.4 °F | 8 | 5 |
| Flexibility, mandrel diameter, mm [in.], no cracks | 10 [0.375] | 16 [0.625] |
| Impact resistance, % without breaks | 75 | 50 |

6.2 The mean mass, thickness, load at break, and elongation at break shall not change more than 10 % from the expected variance after heat conditioning.

7. Sampling and Test Methods

7.1 Comply with Test Methods **D228/D228M** for sampling.

7.2 Use the following test methods to test the samples:

7.2.1 *Mass*—See Test Methods **D228/D228M**.

7.2.2 *Thickness*—See Test Methods **D751**.

7.2.3 *Load-Strain Properties*—See Practice **D2523/D2523M** except as noted herein: test five 25 by 150 mm [1 by 6 in.] strips in both the length and width of the roll, using a 100 mm [4 in.] jaw gap, and separate the jaws at 0.85 mm/s [2 in./min.]. Record maximum load and elongation at maximum load.

7.2.4 *Impact Resistance*—See Test Method **D3746/D3746M**, test with each sample loose laid on a nominal 25 mm [1 in.] thick fiberboard insulation.

7.2.5 *Tear Strength*—See Test Method **D5601**.

7.2.6 *Flexibility*—See Test Method **D5683/D5683M**.

7.2.7 *Heat Conditioning*—Mass, thickness, load, and elongation after 35 ± 0.25 consecutive days of heat conditioning in a forced-draft oven at 70 ± 3 °C [158 ± 5 °F]. See Practice **D5869/D5869M**.

8. Calculation

8.1 Calculate the mean, estimated standard deviation, and mean variance of test values from five specimens tested before and after heat conditioning.

8.1.1 Calculate the mean “*X*” using:

$$X = \frac{\sum x}{n} \quad (1)$$

where:

x = individual test value, and

n = number of tests.

8.1.2 Calculate the estimated standard deviation “*s*” using:

$$s = \sqrt{\frac{\sum (x - X)^2}{(n - 1)}} \quad (2)$$

8.1.3 Calculate the mean variance “*V*” using:

$$V = \frac{s^2}{n} \quad (3)$$

8.1.4 Calculate the effective degrees of freedom “*f*” using:

$$f = \frac{(V_b + V_a)^2}{\frac{V_b^2}{n_b + 1} + \frac{V_a^2}{n_a + 1}} - 2 \quad (4)$$

where:

V_b and *V_a* = the before and after heat conditioning mean variances, and

n_b and *n_a* = the number of specimens tested.

8.1.5 Look up the percentile of the *t* distribution for the degrees of freedom calculated in **Table 2**.

TABLE 2 Percentile of the *t* Distribution

| <i>f</i> | <i>t</i> _{0.975} | <i>f</i> | <i>t</i> _{0.975} |
|----------|---------------------------|----------|---------------------------|
| 1 | 12.706 | 6 | 2.447 |
| 2 | 4.303 | 7 | 2.365 |
| 3 | 3.182 | 8 | 2.306 |
| 4 | 2.776 | 9 | 2.262 |
| 5 | 2.571 | 10 | 2.228 |

8.1.6 Calculate the expected variance “*u*” between the means using:

$$u = t_{0.975} \sqrt{V_b + V_a} \quad (5)$$

8.1.7 Reject the sample if the difference between the before and after heat conditioning means is more than 10 % greater than the expected variance.

9. Inspection

9.1 *Inspection*—Inspection shall be in accordance with the requirements of this specification.

9.2 *Inspection Alternatives*—Alternative inspection requirements shall be determined by and as agreed upon between the purchaser and supplier.

10. Rejection and Resubmittal

10.1 *Failure to Conform*—Failure to conform to any of the requirements as stated in this specification constitutes grounds for rejection.

10.2 *Rejection Redress*—The supplier shall have the right to inspect the rejected materials. The supplier and the purchaser shall agree to the quantity of rolls deemed unacceptable. The supplier shall then have the right to submit the same number of new rolls as replacement.

11. Packaging and Package Marking

11.1 The rolls shall be securely wrapped or banded in a substantial grade of paper that completely encircles the face of the roll in a manner that will prevent slipping.

11.2 No roll shall contain more than two pieces, and no more than 3 % of the rolls in any lot shall contain two pieces.

11.3 Unless otherwise specified, each package shall be plainly marked with the manufacturer’s name, brand name, ASTM designation, and the appropriate application technique.

12. Keywords

12.1 built-up; flashing for roofing; flashing for waterproofing; reinforced flashing