



Standard Test Methods for Sampling, Testing, and Analysis of Asphalt Roll Roofing, Cap Sheets, and Shingles Used in Roofing and Waterproofing¹

This standard is issued under the fixed designation D 228; 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 These test methods cover procedures for sampling, examination, physical testing, and analyses of asphalt-containing materials used in roofing and waterproofing. These materials include but are not limited to roll roofing, cap sheets, and shingles. Any of these materials are allowed to be partially or fully coated, surfaced, or laminated, or a combination thereof.

1.2 The test methods and procedures in this standard appear in the following order:

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| 5 | Types of Roofing |
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| 7 | Mass and Area Determination |
| 8 | Selection of Representative Specimens |
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| 17 | Ash of Desaturated Felt |
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| 20 | Report |
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1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

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 appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:²

- D 95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation
- D 146 Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
- D 225 Specification for Asphalt Shingles (Organic Felt) Surfaced With Mineral Granules
- D 1079 Terminology Relating to Roofing and Waterproofing
- D 1922 Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method
- D 2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
- D 2626 Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing
- D 3462 Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
- D 3909 Specification for Asphalt Roll Roofing (Glass Felt) Surfaced With Mineral Granules
- D 4601 Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
- D 4897 Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing
- D 4932 Test Method for Fastener Rupture and Tear Resistance of Roofing and Waterproofing Sheets, Roll Roofing, and Shingles
- D 6380 Specification for Asphalt Roll Roofing (Organic Felt)
- F 1667 Specification for Driven Fasteners: Nails, Spikes, and Staples

¹ These test methods are under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and are the direct responsibility of Subcommittee D08.02 on Prepared Roofings, Shingles and Siding Materials.

Current edition approved Sept. 15, 2008. Published September 2008. Originally approved in 1925. Last previous edition approved in 2006 as D 228 – 06.

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. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in these test methods, see Terminology D 1079.

3.1.2 As referenced in 14.1, "Materials of Uniform Composition" designates products that are manufactured to be the same thickness, ply count, and mass per unit area in all areas of the material. This would include traditional mineral surfaced rolls, "3 Tab" shingles, and other shingles that have areas of material removed for appearance purposes (cut-outs) but the rest of the shingle is of uniform composition. See Fig. 1, Type 1 or Type 2.

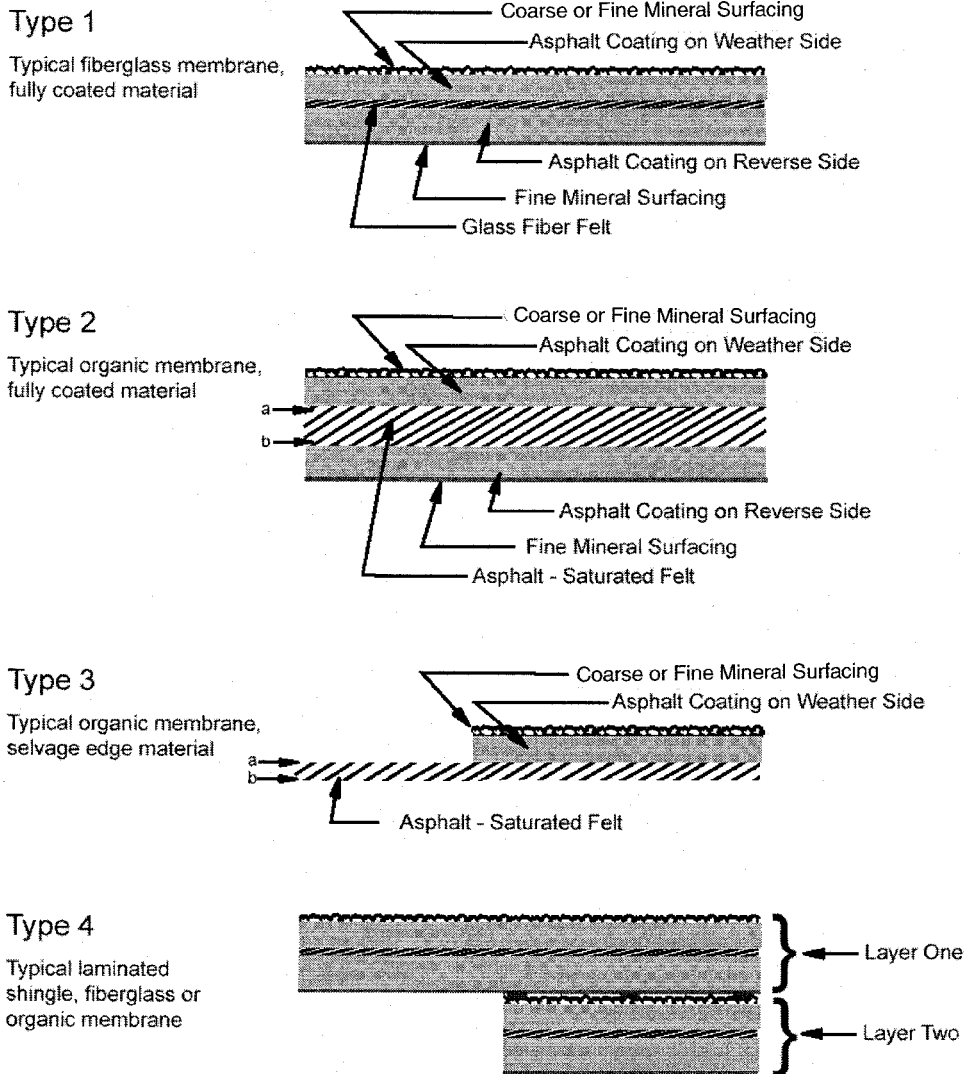
3.1.3 As referenced in 14.2, "Materials of Nonuniform Composition" designates products that are intentionally manufactured to have different thickness or mass per unit area within different areas of the product. Examples of materials of

nonuniform composition are selvage edge rolls and overlaid or embossed shingles (where not all of the product has the same thickness). See Fig. 1, Type 3.

3.1.4 As referenced in 14.4, "Materials of Multiple Layer Composition" designates products that are fabricated in multiple layers. See Fig. 1, Type 4.

3.1.5 As referenced in these test methods, "Machine Direction" (indicated as MD) is the direction running the long dimension of a roll product (before samples or specimens are cut) or the long dimension of a shingle, unless otherwise known and agreed to between supplier and purchaser. "Cross Direction" (indicated as CD) designates the direction perpendicular to the MD.

3.1.6 A production lot is defined as all material produced within one production shift of the same type, composition, and color (where applicable). A delivery lot is defined as a



NOTE 1—Not to scale.

NOTE 2—Type 3 has been illustrated without asphalt coating or fine mineral surfacing on the reverse side. It is not prohibited to fabricate this product with asphalt coating or fine material surfacing on the reverse side.

FIG. 1 Types of Asphalt-Coated Roll Roofing and Shingles

shipment or fraction thereof representing a product of the same type, composition, and color (where applicable).

4. Significance and Use

4.1 These test methods include procedures for sampling, examination, physical testing, and analyses of asphalt roll roofing, cap sheets, and shingles used in roofing and waterproofing. Other components of these materials are allowed to include, but are not limited to, felts, mats, films, foils, mineral stabilizers, papers, and mineral surfacing.

4.2 These test methods include tests that are not required by every product standard that references Test Methods D 228. The individual product standards are the authority for which tests are required for compliance. It is not prohibited to run tests in addition to those required in the product standards, but these test methods make no claim to their suitability or significance.

4.3 Five random samples are required from lots equal to or less than 1000 packages. The number of samples required for lots greater than 1000 packages is dependent on the variation in the unit mass within the lot and is determined by the two-step sampling plan in 6.4.

4.4 The results of a visual examination, physical testing, and compositional analysis are required for each sample. The analytical data are further used to compute the probable minimum and the probable range for the average mass of each of the components.

5. Types of Roofing

5.1 Asphalt-coated roll roofing and shingles are divided into the following types for the purposes of these test methods (see Fig. 1).

5.1.1 *Type 1*—A single thickness of glass felt, coated with asphalt and mineral surfacing such as in Specifications D 2178, D 3462, D 3909, D 4601, and D 4897. The backing material (designated “Fine Mineral Surfacing” in Fig. 1) shall be permitted to be any suitable material that prevents these products from sticking together while packaged.

5.1.2 *Type 2*—A single thickness of asphalt-saturated felt coated with asphalt and mineral surfacing such as in Specifications D 225, D 2626, and D 6380, Class M. The backing material (designated “Fine Mineral Surfacing” in Fig. 1) shall be permitted to be any suitable material that prevents these products from sticking together while packaged.

5.1.3 *Type 3*—Similar to Type 2, but asphalt coated and surfaced with mineral granules for part of one side of the saturated felt such as in Specification D 6380, Class WS. This type also includes products similar to Type 1 or Type 2 that have overlay or embossed areas. This does not include products that are fabricated in multiple layers.

5.1.4 *Type 4*—This material is comprised of multiple layers bonded with a suitable adhesive, typically a bituminous material. Evaluation of the nature of the adhesive or quality of the bond, or both, is outside the scope of this test method. Fig. 1 illustrates a typical configuration for Type 4. This “Type” description is provided to aid the user in understanding how to match a given product composition and assembly to its corresponding Type. It is not intended to limit or exclude products with similar, but not identical constructions. Ex-

amples of known variations, which shall not be prohibited include (but are not limited to):

5.1.4.1 Materials using other adhesives,

5.1.4.2 Materials fabricated with more than two layers,

5.1.4.3 Materials that use different relative proportions for the layers, and

5.1.4.4 Materials with other core compositions

6. Sampling

6.1 The rolls or packages selected in accordance with this section constitute the representative sample used in Sections 7 and 8.

6.2 Select five rolls or packages from the lot at random. Do not select any material that shows visual indications of damage from shipping or handling. Determine the average net mass per g/m^2 ($\text{lb}/100 \text{ ft}^2$) and the standard deviation in accordance with 7.1-7.8.

6.3 If the lot is 1000 or fewer rolls or packages, proceed to Section 7. If the lot is 1001 or greater in number, follow the second part of the sampling plan in 6.4.

6.4 Calculate the required number of samples based on the standard deviation (s) of the preliminary sampling by:

$$n = \frac{t^2 s^2}{d^2} \quad (1)$$

where:

n = total number of samples required ($n - 5$ more rolls or packages must be selected at random as samples),

t = test statistic for number of samples in the preliminary test series for 4° and a 95 % confidence that the calculated average mass will not exceed d ($t = 2.776$), and

d = 100 g/m^2 ($2 \text{ lb}/100 \text{ ft}^2$) (the mean mass obtained from the analysis should be within $\pm 100 \text{ g/m}^2$ of the true value, with 95 % confidence).

6.5 See Fig. 2.

7. As Received Mass and Area Determinations, All Types of Roofing

7.1 *Gross Mass*—Determine and record the mass of each representative sample to the nearest 0.1 kg (0.2 lb).

7.2 *Net Mass*—Disassemble each package or unroll each roll of the representative sample; shake off any loose surfacing and determine and record the net mass of all the shingles or the entire roll to the nearest 0.1 kg (0.2 lb). Where a product standard requires it, the loose surfacing is to be collected and the mass determined.

7.3 *Packaging and Fixture Mass*—Determine and record the mass to the nearest 0.1 kg (0.2 lb) of the packaging and all associated fixtures shipped with each roll or package of the representative sample, such as nails and adhesive.

7.4 *Dimensions of Roll Products*—Measure and record the length and width of each roll of roofing and the selvage width to the nearest 3 mm ($1/8$ in.).

7.5 *Shingle Count and Dimensions*—From each of the representative sample packages generated in Section 6, count and record the number of shingles in each package. Select one shingle randomly from each package. Measure the width, length, and cutout dimensions for each of these selected