



Designation: D 4811 – 9704

Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing¹

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1. Scope

1.1 This specification covers nonvulcanized (uncured) rubber sheet made of EPDM (ethylene-propylene-diene terpolymer) or CR (polychloroprene) intended for use as watertight roof flashing exposed to the weather.

1.2 The tests and property limits used to characterize these flashing materials are specific for each classification and are minimum values to make the product fit for its intended purpose.

1.3 SI units shall be used in referee decisions.

1.4 In-place roof system design criteria, such as fire resistance, field seaming strength, material compatibility, and uplift resistance, among others, are beyond the scope of this specification.

1.5 The following precautionary caveat pertains to the test methods portion only, Section 8, of this specification: *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address the safety concerns 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:*²

¹ This specification is under the jurisdiction of ASTM Committee D08 on Roofing, Waterproofing, Roofing and Bituminous Materials Waterproofing and is the direct responsibility of Subcommittee D08.18 on Nonbituminous Organic Roof Coverings.

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- D 412 Test Methods for Vulcanized Rubber—Properties in Tension² and Thermoplastic Elastomers—Tension
- D 471 Test Methods for Rubber Property—Effect of Liquids
- D 518 Test Method for Rubber Deterioration—Surface Cracking
- D 573 Test Methods for Rubber—Deterioration in Air Oven
- D 624 Test Methods for Tear Strength of Conventional Vulcanized Rubber—Property—Tear Resistance² and Thermoplastic Elastomers
- D 1079 Terminology Relating to Roofing, Waterproofing, and Bituminous Materials
- D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber
- D 1204 Test Method for Linear Dimensional Changes—~~on a~~ of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperatures
- D 1418 Practice for Rubber and Rubber Latices—Nomenclature
- D 2137 Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics
- D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets
- G 26151 Practice for ~~Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources~~
- G 1534 Practice for Operating Fluorescent Light and Water Exposure (Fluorescent UV/Condensation Type) Apparatus for UV Exposure of Nonmetallic Materials
- G 155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

3. Classification

3.1 The following types are used to identify the principal polymer components of the flashing material (see Note 1):

- 3.1.1 *Type I*—Ethylene-Propylene-Diene Terpolymer (EPDM).
- 3.1.2 *Type II*—Chloroprene Polymer (CR).

NOTE 1—For definitions of polymer types, see Practice D 1418. For definitions of terms related to roofing, see Terminology D 1079.

3.2 The following classes describe the ability to vulcanize on the roof:

- 3.2.1 Class V—Vulcanizing.
- 3.2.2 Class NV—Nonvulcanizing.

NOTE 2—Class V compounds continue to vulcanize (that is, cure) after emplacement on the roof. Class NV indicates non-vulcanizable compounds.

4. Materials and Manufacture

4.1 The flashing material shall be formulated from the appropriate polymer type and other compounding ingredients. The principal polymer in the flashing material shall be one of those listed in 3.1 ~~in accordance with proportions listed in 3.2~~ and greater than 95% of the total polymer.

4.2 The flashing material shall be capable of being bonded to itself, to the roofing membrane, and to substrate for making watertight field splices and repairs. The manufacturer or fabricator shall recommend suitable bonding methods and materials.

5. Physical Property Requirements

5.1 Class V flashing material shall conform to the physical property requirements prescribed in Table 1 and Table 2. Class NV flashing material shall conform to the physical property requirements prescribed in Table 1.

5.2 Other requirements shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

6. Dimensions and Permissible Variations

6.1 The width and length shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

6.1.1 The width and length tolerance shall be + 3 % and – 0 %.

6.2 Sheet thicknesses greater than minimum shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

6.2.1 The thickness tolerance shall be +15 % and –10 % of the specified thickness, but in no case shall the thickness be less than the minimum listed in Table 1.

7. Workmanship, Finish, and Appearance

7.1 The flashing material shall be visually free of pinholes, particles of foreign matter, undispersed raw materials, or other manufacturing defects that might affect serviceability.

7.2 If the number of irregularities appear excessive on a sheet (or portion thereof), then its rejection should be negotiated between involved parties.

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*, Vol 09.01, volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Property Requirements for Flashing Before Vulcanization

	Type I	Type II	
	Type I, Class V	Type II	
Thickness, min.			
Thickne. Class NV	Type II, Class V		
— in. (mm)	0.055 (1.4)	0.055 (1.4)	Green Strength
Thickness, min, mm (in.)	1.4 (0.055)	1.4 (0.055)	1.4 (0.055)
— Modulus 100 % Green Strength Modulus	— at 75°F (20°C)	— at 75°F (20°C)	
Modulus 100 %	25–250	25–75	
— psi (kPa)	(172–1725) (172–1725)	(172–517) (172–517)	
— Elongation (Ultimate), min %	400	(25–75)	
Elongation (Ultimate), (25–250)	172–1725 (25–250)	172–517 (25–75)	
Elongation (Ultimate), min, %	400	400	400
— Modulus 100 % at 122°F (50°C) — psi (kPa)	12 (83)	12 (†)	83
Modulus 100 % at 50°C (122°F) kPa (psi)	83 (12)	83 (12)	83 (12)
— Elongation (Ultimate), min, %	200	200	200
Elongation (Ultimate), min, %	200	200	200
Shelf Stability:			
Shelf Stability:			
— Modulus 100 % at 75°F (20°C), max, psi (kPa)	250 (1725)	n/a	17250 (1725)
Modulus 100 % at 23°C (73°F), max, kPa (psi)	1725 (250)	n/a	1725 (250)
— Elongation, min, %	400	n/a	400
Elongation, min, %	400	n/a	400
Vulcanizability:			
— Tensile strength, min, psi (kPa)	406 (2800)	406 (n/a)	2800
Tensile Strength, min, kPa (psi)	2800 (406)	n/a	2800 (406)
— Elongation, min %	400	n/a	400
Elongation, min, %	400	n/a	400
Tensile Set, min, %	80	80	80
Tensile Set, min, %	80	80	80
Dimensional Stability, max, %	max, %	±10	±10
Weatherability, no cracks or crazing	pass	pass	pass
Weatherability, no cracks or crazing	pass	pass	pass

7.3 Edges of the sheet shall be capable of being seamed to one another and to other roofing components without fish mouthing.

8. Test Methods

8.1 *Thickness*—Test Methods D 412.

8.2 *Green Strength*:

8.2.1 Test a fresh sample manufactured within one week.

8.2.2 Condition Type I material at $73 \pm 23 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) ($73 \pm 2^\circ\text{C}$) (4°F) for a minimum of 1 h and a maximum of 8 h before proceeding with the testing.

8.2.3 Decrystallize Type II material by placing in a circulating air oven at $158 \pm 70 \pm 4^\circ\text{F}$ ($70 \pm 2^\circ\text{C}$) ($158 \pm 2^\circ\text{C}$) (4°F) for 15 min. After removal from the oven, condition at $73 \pm 23 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) ($73 \pm 2^\circ\text{C}$) (4°F) for a minimum of 1 h and a maximum of 8 h before proceeding with the testing.

8.2.4 After conditioning, die out a 0.5-in. (12.7-mm) 13-mm (0.5-in.) dumbbell (Die A) and determine the modulus at 100 % extension and the ultimate elongation at $73 \pm 23 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) ($73 \pm 2^\circ\text{C}$) (4°F) in accordance with Test Methods D 412.

8.2.5 After conditioning, die out a 0.5-in. (12.7-mm) 13-mm (0.5-in.) dumbbell (Die A), condition in a circulating air oven at $122 \pm 50 \pm 4^\circ\text{F}$ ($50 \pm 2^\circ\text{C}$) ($122 \pm 2^\circ\text{C}$) (4°F) for 15 min minimum and 30 min maximum and determine the modulus at 100 % extension and the ultimate elongation at $122 \pm 4^\circ\text{F}$ ($50 \pm 2^\circ\text{C}$) ($122 \pm 4^\circ\text{F}$) in accordance with Test Methods D 412.

8.3 *Shelf Stability*— Determine green strength in accordance with 8.2 after aging in a circulating air oven for 46 h at $158 \pm 70 \pm 4^\circ\text{F}$ ($70 \pm 2^\circ\text{C}$) ($158 \pm 2^\circ\text{C}$) (4°F).

8.4 *Vulcanizability*:

8.4.1 For Type I and Type II, oven age for 166 h at $158 \pm 4^\circ\text{F}$ ($70 \pm 2^\circ\text{C}$) ($158 \pm 4^\circ\text{F}$).

TABLE 2 Property Requirements for Flashing After Vulcanization

	Type I, Class V	Type II, Class V
Vulcanization, at 320°F (160°C), min	20 ± 2	20 ± 2
Vulcanization, at 160°C (320°F), min	20 ± 2	20 ± 2
Tensile Strength, min, psi (MPa)	1305 (9.0)	1205 (8.3)
Tensile Strength, min, MPa (psi)	9.0 (1305)	8.3 (1205)
Elongation, min, %	300	250
Tear Resistance, min, lbf/in. (kN/m)	125 (22)	125 (22)
Tear Resistance, min, kN/m (lbf/in.)	22 (125)	22 (125)
Brittle Point, max, °F (°C)	-49 (-45) pass	-31 (-35) pass
Brittle Point, max, °C (°F)	-49 (-45) pass	-31 (-35) pass
Tensile Set, max, %	10	10
Ozone Resistance, (7×)	no cracks	no cracks
Heat Aging, Air Oven		
— Tensile Strength, min, psi (MPa)	1205 (8.3)	1205 (8.3)
— Tensile Strength, min, psi (MPa)	8.3 (1205)	8.3 (1205)
— Elongation, min, %	200	200
— Tear Resistance (Die C), lbf/in. (kN/m), — min	125 (22)	125 (22)
— Tear Resistance (Die C), lbf/in. (kN/m), — min	22 (125)	22 (125)
Water Absorption, weight change, range, %	+8, -2	+8, -2
Linear Dimension Change, max, %	±2	±2
Weatherability, no cracks or crazing	pass	pass

8.4.2 After removal from the oven, condition the samples at $73 \pm 23 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) ($73 \pm 2^\circ\text{C}$) (4°F) for a minimum of 1 h and a maximum of 8 h before proceeding with testing.

8.4.3 Test for ultimate tensile and elongation in accordance with Test Methods D 412 using a 0.5-in. (12.7-mm) 13-mm (0.5-in.) dumbbell (Die A).

8.5 Tensile Set (see Test Methods D 412):

8.5.1 Decrystallize Type II material in accordance with 8.2.3.

8.5.2 Hold for 10 min at $73 \pm 23 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) ($73 \pm 2^\circ\text{C}$) (4°F) and 200 % elongation for Table 1.

8.5.3 Hold for 10 min at $73 \pm 23 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) ($73 \pm 2^\circ\text{C}$) (4°F) and 50 % elongation for Table 2.

8.6 Dimensional Stability (see Test Method D 1204):

8.6.1 Obtain a flat specimen of 6 ± 150 by 6 in. (150 by 150 mm) (6 by 6 in.) and age in an air circulating oven at $212 \pm 100 \pm 4^\circ\text{F}$ ($100 \pm 2^\circ\text{C}$) ($212 \pm 2^\circ\text{C}$) (4°F) for 1 h. Cool to $73 \pm 23 \pm 4^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) ($73 \pm 2^\circ\text{C}$) (4°F) for 1 h and measure the side of the specimen in both directions.

8.7 Vulcanization— Practice D 3182.

8.8 Tensile Strength— Test Methods D 412, Die C.

8.9 Ultimate Elongation— Test Methods D 412, Die C.

8.10 Tear Resistance— Test Method D 624, Die C.

8.11 Brittle Point— Test Methods D 2137.

8.12 Ozone Resistance— Test Method D 1149.

8.12.1 Type I Material— Test at 50 % extension, 100 MPa, 166 h at $104 \pm 40 \pm 4^\circ\text{F}$ ($40 \pm 2^\circ\text{C}$) ($104 \pm 2^\circ\text{C}$) (4°F).

8.12.2 Type II Material— Test at 20 % extension, 100 MPa, 100 h at $104 \pm 40 \pm 4^\circ\text{F}$ ($40 \pm 2^\circ\text{C}$) ($104 \pm 2^\circ\text{C}$) (4°F).

8.13 Heat Aging (see Test Method D 573):

8.13.1 Type I Material— Age 28 ± 670 h at $240 \pm 115 \pm 4^\circ\text{F}$ ($115 \pm 2^\circ\text{C}$) ($240 \pm 2^\circ\text{C}$) (4°F).

8.13.2 Type II Material— Age 70 ± 0.7 h at $212 \pm 100 \pm 4^\circ\text{F}$ ($100 \pm 2^\circ\text{C}$) ($212 \pm 2^\circ\text{C}$) (4°F).

8.14 Water Absorption (see Test Method D 471):

8.14.1 Type I Material— Age vulcanized specimen in water for 166 h at $158 \pm 70 \pm 4^\circ\text{F}$ ($70 \pm 2^\circ\text{C}$) ($158 \pm 2^\circ\text{C}$) (4°F).

8.14.2 Type II Material— Age vulcanized specimen in water for 46 h at $158 \pm 70 \pm 4^\circ\text{F}$ ($70 \pm 2^\circ\text{C}$) ($158 \pm 2^\circ\text{C}$) (4°F).

8.15 Linear Dimensional Changes (see Test Method D 1204):

8.15.1 Type I Material— Age 28 ± 670 h at $239 \pm 115 \pm 4^\circ\text{F}$ ($115 \pm 2^\circ\text{C}$) ($239 \pm 2^\circ\text{C}$) (4°F).

8.15.2 Type II Material— Age 70 h at $212 \pm 100 \pm 4^\circ\text{F}$ ($100 \pm 2^\circ\text{C}$) ($212 \pm 2^\circ\text{C}$) (4°F).

8.16 Weather Resistance (see Practices G 26155 and G 151) :

8.16.1 Xenon Arc Light Exposure Apparatus Operating Conditions:

8.16.1.1 Filter Type— Borosilicate inner and outer. Daylight Filter.

8.16.1.2 Exposure— 0.35 to $0.70 \text{ W}/(\text{m}^2 \cdot \text{nm})$ at 340 nm (42 to $84 \text{ W}/(\text{m}^2)$ at 300 to 400 nm).

8.16.1.3 Cycle— $690 \text{ min} \pm 15 \text{ min}$ light, 30 min light, and water spray.

8.16.1.4 Black Panel Temperature— $176 \pm 80 \pm 5^\circ\text{F}$ ($80 \pm 3^\circ\text{C}$) ($176 \pm 3^\circ\text{C}$) (4°F) (Uninsulated).

8.16.1.5 Relative Humidity— $50 \pm 5 \%$.

8.16.1.6 Spray Water— Deionized.

8.16.1.7 *Spray Water Temperature*—~~110 ± 43 ± 4°F (43 ± 2°C) (110 ± 2°C), 4°F).~~

8.16.1.8 *Spray Nozzle*—~~Water Cooled-F-80.~~

~~8.16.1.9 *Specimen Rotation*~~*Specimen Repositioning*—Every 315 KJ/(m²·nm) at 340 nm. (If required, 37.8 MJ/m²·nm (37.8 MJ/(m²) at 300 to 400 nm.)

NOTE 2—Approximately 3—Repositioning ranging from every 250 h at 0.35 W/(m²·nm) at 340 nm to 125 h at 0.70 W/(m²·nm) at 340 nm.

8.16.1.10 *Radiant Exposure Time*— 5040 KJ/(m²·nm) at 340 nm. nm (604.8 MJ/(m²) at 300 to 400 nm.)

NOTE 3—Approximately 4—The duration in terms of time ranges from 2000 h at 0.70 W/(m²·nm) at 340 nm to 4000 h at 0.35 W/(m²·nm) at 340 nm.

8.16.2 Mount cured and uncured specimens for exposure under no strain. Recommended specimen size is ~~2.75 in. (76 mm)~~ 75 mm (2.75 in.) wide by ~~8.0 in. (203 mm)~~ 200 mm (8.0 in.) long. After exposure, remove the specimens and inspect immediately. Strain specimens 10 % in the bent loop configuration in accordance with Test Method D 518 and visually inspect for cracks and crazing under 7× magnification. A specimen is rated PASS if no cracks or crazing are observed.

8.17 *Weather Resistance*—(See Practices G 1534 and G 151.)

8.17.1 *UV/Condensation Exposure Apparatus Conditions UVB:*

~~8.17.1.1 *Lamp Type*—Fluorescent UVB-313 (UVB-B).~~

~~8.17.2~~ 313 with irradiance of 0.49 W/(m²·nm) at 310 nm.

8.17.1.2 *Test Cycle:* 20 h UV at ~~176 ± 80 ± 4°F (80 ± 2°C), 4°F~~ (uninsulated black panel temperatures), 4 h condensate at ~~122 ± 4°F (50 ± 2°C) (122 ± 4°F).~~

8.17.1.3 *Exposure*—4000 h.

8.17.1.4 The specimens for exposure shall be mounted under no strain. After exposure, remove the specimens ~~shall be removed and inspected immediately for cracks and crazing at~~ inspect immediately. Strain specimens 10 % ~~strain~~ in the bent loop configuration in accordance with Test Method D 518 and ~~7×~~ visually inspect for cracks and crazing under 7× magnification. A specimen is rated PASS if no cracks or crazing are observed.

9. Inspection

9.1 Inspection of the material shall be agreed upon between the involved parties.

9.2 The purchaser shall, in the contract, order special tests which the supplier shall be required to make beyond those in Section 8.

10. Rejection and Rehearing

10.1 Failure to conform to any of the requirements prescribed in this specification shall constitute grounds for rejection. Rejection shall be reported to the producer or supplier promptly and in writing. The seller shall then have the right to reinspect the rejected shipment material and resubmit the lot after removal of those packages not conforming to the specified requirements.

11. Certification

11.1 Upon request of the purchaser, a manufacturer's certification that the material was manufactured in accordance with the requirements outlined in this specification, together with a report of test results, will be provided.

12. Packaging and Package Marking

12.1 The material shall be wound on a release liner, rolled on a substantial core, and packaged in a standard commercial manner unless otherwise specified so as to be acceptable by commercial or other carriers for safe transportation to the point of delivery.

12.2 Shipping containers shall be marked with:

12.2.1 The name of the material,

12.2.2 Product code,

12.2.3 ASTM number and type,

12.2.4 Size or quantity, and

12.2.5 Name of manufacturer ~~or~~ or supplier.

13. Keywords

13.1 chloroprene; EPDM; flashing; nonvulcanized; ~~roofing~~

■ roofing; vulcanized

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