



Designation: D 4637 – 03

Standard Specification for EPDM Sheet Used In Single-Ply Roof Membrane¹

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

1. Scope

1.1 This specification covers flexible sheet made from ethylene-propylene-diene terpolymer (EPDM) intended for use in single-ply roofing membranes exposed to the weather. The tests and property limits used to characterize the sheet are values to ensure minimum quality for the intended use. The sheet may be non-reinforced, fabric- or scrim-reinforced, or fabric-backed vulcanized rubber sheet.

1.2 The values stated in SI units are to be regarded as the standard. The values stated in parentheses are for information only.

1.3 In-place roof system design criteria, such as fire resistance, field seaming strength, material compatibility, and uplift resistance, among others, are factors that must be considered but are beyond the scope of this specification.

1.4 *This standard may involve hazardous materials, operations, and equipment. 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 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension²
- D 413 Test Methods for Rubber Property-Adhesion to Flexible Substrate²
- D 471 Test Method for Rubber Property—Effect of Liquids²
- D 518 Test Method for Rubber Deterioration-Surface Cracking²
- D 573 Test Method for Rubber-Deterioration in an Air Oven²
- D 624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers²

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

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² Annual Book of ASTM Standards, Vol 09.01.

- D 751 Test Methods for Coated Fabrics³
- D 816 Test Methods for Rubber Cements²
- D 1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber²
- D 1204 Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature⁴
- D 2137 Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics²
- D 5602 Test Method for Static Puncture Resistance of Roofing Membrane Specimens⁵
- D 5635 Test Method for Dynamic Puncture Resistance of Roofing Membrane Specimens⁵
- G 151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources⁶
- G 155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials⁶

3. Classification

- 3.1 Types describe the sheet construction:
 - 3.1.1 *Type I*—Non-reinforced.
 - 3.1.2 *Type II*—Scrim (or fabric) internally reinforced.
 - 3.1.3 *Type III*—Fabric backed.

4. Materials and Manufacture

4.1 The sheet shall be formulated from EPDM polymers and other compounding ingredients. EPDM shall be the principal polymer used in the sheet and shall be greater than 95 % of the total polymer content.

4.2 To make seams and repairs, the sheet shall be capable of being bonded watertight to itself and the supplier or fabricator shall recommend suitable methods.

5. Physical Properties and Tolerances

5.1 The sheet shall conform to the physical requirements prescribed in Table 1.

5.2 The tolerance for time conditions (aging, weathering, and so forth) is ± 15 min or ± 1 % of the period; whichever is greater, unless otherwise specified.

³ Annual Book of ASTM Standards, Vol 09.02.

⁴ Annual Book of ASTM Standards, Vol 08.01.

⁵ Annual Book of ASTM Standards, Vol 04.04.

⁶ Annual Book of ASTM Standards, Vol 14.04.

TABLE 1 Physical Requirements for EPDM Sheet

Type	I	II	III
Thickness, min, mm (in.):			
Sheet-overall	1.016 (0.040)	1.016 (0.040)	...
Coating over scrim or fabric	...	0.38 (0.015)	0.76 (0.030)
Breaking strength, min, N (lbf)	...	400 (90)	400 (90)
Tensile strength, min, MPa (psi)	9.0 (1305)	...	...
Dynamic Puncture Resistance, Type I at 10J, Type II at at 20J	pass	pass	...
Static Puncture Resistance, Type I at 20kg (44.1 lbf), Type II at 25kg (55.1 lbf)	pass	pass	...
Elongation, ultimate, min, %	300	250 ^A	300 ^A
Elongation @ fabric break, ultimate, min, %			
Machine direction		15	
Cross direction		15	
Tensile set, max, %	10	...	...
Tear resistance, min, kN/m (lbf/in.)	26.27 (150)	...	...
Tearing strength, min, N (lbf)	...	45 (10)	45 (10)
Brittleness point, max, °C (°F)	-45 (-49)	-45 (-49)	-45 (-49)
Ozone resistance, no cracks	pass	pass	pass
Heat aging:			
Breaking strength, min, N (lbf)	...	356 (80)	356 (80)
Tensile strength, min, MPa (psi)	8.3 (1205)	...	...
Elongation, ultimate, min, %	200	200 ^A	200 ^A
Tear resistance, min, kN/m (lbf/in.)	21.9 (125)	...	...
Linear dimensional change, max, %	±1	±1	±1
Water absorption, max, mass %	+ 8, - 2	+ 8, - 2 ^A	±8, - 2 ^A
Factory seam strength, min, kN/m (lbf/in.)		8.8 (50) or sheet failure	
Weather resistance:			
Visual inspection	pass	pass	pass
PRFSE, min, %	30	...	...
Elongation, ultimate, min, %	200	...	...
Fabric adhesion, min, N/m (lbf/in.)	...	...	525 (3)

^A Specimens to be prepared from coating rubber compound, vulcanized in a similar method to the reinforced products.

5.3 Tolerances for temperature shall be $\pm 2^{\circ}\text{C}$ ($\pm 4^{\circ}\text{F}$).

6. Dimensions

6.1 The width and length of the sheet shall be agreed upon between the purchaser and the supplier.

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

6.2 The thickness tolerance shall be +15 %, -10 % of the thickness agreed upon between the purchaser and supplier, but in no case shall the thickness be less than the minimum listed in Table 1.

7. Workmanship, Finish, and Appearance

7.1 The sheet, including the full width of factory seams if present, shall be fully adhered, watertight, and visibly free of pinholes, particles of foreign matter, undispersed raw material, or other manufacturing defects that might affect serviceability. If the number of irregularities in the form of pockmarks (see Note 1) appear excessive on the sheet (or portion thereof), then its rejection shall be negotiated between involved parties.

7.2 Edges of the sheets shall be straight and flat so that they may be seamed to one another without fishmouthing.

NOTE 1—Pockmarks are oblong depressions, cavities, or craters on the surface of the sheet that have an approximate surface dimension of 3.2 by 1.6 mm ($\frac{1}{8}$ by $\frac{1}{16}$ in.), and have a maximum depth approaching one half of the sheet thickness.

8. Test Methods

8.1 *Dimensions*—Test Methods D 751, after permitting the sheet to relax at $23 \pm 2^{\circ}\text{C}$ ($73.4 \pm 4^{\circ}\text{F}$) for 1 h \pm 15 min.

8.2 *Thickness, Sheet Overall*—From across the full width of the unbuffered sheet, take three samples, 300 by 300 mm (1 by

1 ft). Measure the thickness of each corner. On fabric backed (Type III) the coating thickness can be measured after cutting or buffing fabric from the rubber. Refer to Test Method D 412 for Type I sheet and Test Method D 751 for Type II and Type III sheet.

8.3 *Thickness of Coating Over Scrim (Reinforcing Fabric)*—Optical Method, see Annex A1.

8.4 *Breaking Strength*—Test Methods D 751, Grab Method.

8.5 *Tensile Strength*—Test Methods D 412, Die C.

8.6 *Dynamic Puncture Resistance*—Test Method D 5635, at an energy of 10J min at $23 \pm 2^{\circ}\text{C}$ ($73.4 \pm 4^{\circ}\text{F}$) for Type I and an energy of 20J min for Type II.

8.7 *Static Puncture Resistance*—Test Method D 5602, at a load of 20 kg (44.1 lbf) min for Type I and a load of 25 kg (55.1 lbf) min for Type II at $23 \pm 2^{\circ}\text{C}$ ($73.4 \pm 4^{\circ}\text{F}$).

8.8 *Elongation, Ultimate*—Test Methods D 412, Die C.

8.9 *Elongation at Fabric Break, Ultimate*—Test Method D 751, Grab Method, 50 mm (2 in) per minute jaw separation rate.

8.10 *Tensile Set*—Test Methods D 412, Method A, Die C, 50 % elongation.

8.11 *Tear Resistance*—Test Method D 624, Die C.

8.12 *Tearing Strength*—Test Methods D 751, B-Tongue Tear.

8.13 *Brittleness Point*—Test Methods D 2137.

8.14 *Ozone Resistance*—Test Method D 1149. Inspect at 7 \times magnification on specimens exposed to 100 mPa (1×10^{-5} psi) ozone in air at $40 \pm 2^{\circ}\text{C}$ ($104 \pm 4^{\circ}\text{F}$). Elongate Type I specimens 50 % for 166 h \pm 1.66 h exposure. Type II and Type III specimens must be wrapped around a 75 mm (3 in.)