



Designation: D6947/D6947M – 07(Reapproved 2013)^{ε1}

Standard Specification for Liquid Applied Moisture Cured Polyurethane Coating Used in Spray Polyurethane Foam Roofing System¹

This standard is issued under the fixed designation D6947/D6947M; 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.

^{ε1} NOTE—Units information was editorially corrected in July 2013.

1. Scope

1.1 This specification covers a single component, moisture cured, elastomeric urethane polymer coating used as a protective coating for spray polyurethane foam roofing systems.

1.2 This specification does not provide guidance for application.

1.3 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 non-conformance with the standard.

1.4 The following precautionary caveat pertains only to the test method portions, Sections 5 and 6.

1.5 *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 requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D16 Terminology for Paint, Related Coatings, Materials, and Applications

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D471 Test Method for Rubber Property—Effect of Liquids

D522 Test Methods for Mandrel Bend Test of Attached Organic Coatings

D562 Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer

D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

D903 Test Method for Peel or Stripping Strength of Adhesive Bonds

D1079 Terminology Relating to Roofing and Waterproofing

D1644 Test Methods for Nonvolatile Content of Varnishes

D1653 Test Methods for Water Vapor Transmission of Organic Coating Films

D2196 Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield type) Viscometer

D2697 Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings

D2370 Test Method for Tensile Properties of Organic Coatings

D4798 Practice for Accelerated Weathering Test Conditions and Procedures for Bituminous Materials (Xenon-Arc Method)

G21 Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

3. Terminology

3.1 For definitions of terms specific to this standard, refer to Terminologies **D16** and **D1079**.

4. Materials and Manufacture

4.1 *Composition*—The product, as manufactured, shall be in liquid form for application to spray polyurethane foam (SPF) surfaces by brushing, rolling, or spraying. The product shall be composed of a solvent-borne moisture curing urethane elastomeric polymer, to which various pigments or other additives have been added to give the required physical properties.

4.2 *Physical Properties*—Although the product is supplied as a liquid, its performance is based on the functional properties of the dried material in film form. The coating is formed into a film fully adhered to the substrate surface.

¹ This specification is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.06 on Spray Polyurethane Foam Roof Systems.

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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.

5. Physical Properties

5.1 The liquid coating shall comply with physical property requirements in **Table 1**.

5.2 The film shall comply with physical property requirements in **Table 2**.

6. Sample and Test Methods

6.1 *Viscosity (Test Methods D2196)*—Brookfield LVT Viscometer #4 Spindle, 6 RPM.

6.2 *Specimen Preparation (Dry Time)*—Films are prepared by applying two coats, with a minimum of an 8-h drying period between coats, to an FEB sheet substrate to give a total dry film thickness of 0.50 ± 0.5 mm [20 ± 2 mils]. The film is allowed to thoroughly dry at $23 \pm 2^\circ\text{C}$ [$73.4 \pm 3.6^\circ\text{F}$] and 50 ± 10 % relative humidity for 336 ± 12 h. The film shall be removed from the release paper and turned over after the first 168 ± 12 h to allow for complete curing.

6.3 *Elongation and Tensile Strength (Test Method D2370)*:

6.3.1 *Test Conditions*: $23 \pm 2^\circ\text{C}$ [$73 \pm 3.6^\circ\text{F}$] at 50 ± 10 % relative humidity and $-18 \pm 2^\circ\text{C}$ [$0 \pm 3.6^\circ\text{F}$].

6.3.2 Cut specimen measuring 75 mm [3 in.] long by 13 mm [$\frac{1}{2}$ in.] ± 10 % wide.

6.3.3 Test type or functional equivalent:

Cross head speed	0.4 mm/s [1.0 in./min]
Gauge length	25 mm [1.0 in.]

6.4 *Accelerated Weathering (Practice D4798)*:

Cycle Employed	A
Uninsulated Black Panel Temperature	$63 \pm 3^\circ\text{C}$
Filter	Daylight
Radiant Exposure (Minimum)	1260 KJ/[m ² nm] @ 340 nm
	151.2 MJ/m ² @ 300–400 nm

NOTE 1—Based on the irradiance level of $0.35 \text{ W}/(\text{m}^2 \cdot \text{nm})$ at 340 nm specified in Practice D4798, the exposure time required to accumulate the radiant energy specified in 6.4 is 1000 h.

6.5 *Permeance (Test Methods D1653, Procedure B)*—A 0.5 mm [20 mils] ± 10 % film shall be used.

6.5.1 *Test Conditions*: $23 \pm 2^\circ\text{C}$ [$73.4 \pm 3.6^\circ\text{F}$].

6.5.2 Test is run in the inverted position with water in contact with the film.

6.5.3 Value is reported in SI units.

6.6 *Water Absorption (Test Method D471)*—The test shall be conducted at $23 \pm 2^\circ\text{C}$ [$73.4 \pm 3.6^\circ\text{F}$] using a 0.5 mm [20 mil] ± 10 % film immersed in distilled water for a period of 168 ± 4 h. At that time the weight is determined.

6.7 *Adhesion to Specified Substrate (Test Method D903)*:

6.7.1 Crosshead speed 0.8 mm/s [2 in./min].

TABLE 2 Film Physical Property Requirements for Polyurethane Moisture Cured Coating for Use on Sprayed Polyurethane Foam

Physical Property	ASTM	Requirement
Initial Percent Elongation (break)	D2370	Minimum 350 %
Initial Tensile Strength (maximum stress)	D2370	Minimum 4.14 MPa [600 psi]
Final Percent Elongation (break) after accelerated weathering after 1000 h	D412	Minimum 350 %
Permeance	D1653 Procedure B	Maximum Permeance 57 ng/(m ² · s · Pa) [1 grain/(ft ² · h · in.-Hg)]
Water Absorption (Mass)	D471	Maximum 3 %
Accelerated Weathering	D4798	No cracking or checking
1000 h		
Adhesion	D903	Minimum 350 N/m [2.0 pli] Wet
Fungi Resistance	G21	Zero Rating
Tear Resistance	D624	Minimum 17.5 kN-m [100 pli]
Low Temperature Flexibility, 12.5 mm [$\frac{1}{2}$ in.]	D522	Minimum pass mandrel -26°C [-15°F]

6.7.2 Specimens are prepared by brush applying two coats to the specified substrate with the cloth strip (as described in Test Method D903) embedded between the coats to give a total dry film thickness of 0.5 mm [20 mils] ± 10 %. The panels are allowed to cure for 336 ± 12 h at $23 \pm 2^\circ\text{C}$ [$73.4 \pm 3.6^\circ\text{F}$] 50 ± 10 % relative humidity prior to testing for wet adhesion. If a primer is specified, it shall be applied per the manufacturer's or supplier's direction.

6.7.3 Specimens shall be submerged for 168 ± 6 h in tap water at $23 \pm 2^\circ\text{C}$ [$73.4 \pm 3.6^\circ\text{F}$] prior to testing for wet adhesion. Samples are tested immediately after soaking.

6.8 *Tear Resistance (Test Method D624)*—Die "C."

6.9 *Low Temperature Flexibility (Test Method D522)*—Directly cast films to aluminum substrate to result in a dry film thickness of $0.36 \text{ mm} \pm 10$ % [14 mil ± 10 %] and allow to cure 72 h at $23 \pm 2^\circ\text{C}$ [$73.4 \pm 3.6^\circ\text{F}$] and 50 ± 10 % relative humidity followed by 120 h at 50°C prior to testing.

7. Performance Requirements

7.1 Shipping containers shall be marked with the name of the material, the stock number, lot number, ASTM designation number and year of issue, quantity therein, shelf-life date, and the name of the manufacturer or supplier.

8. Inspection

8.1 Inspection requirements shall be determined by and as agreed upon between the purchaser and the supplier.

9. Rejection and Resubmittal

9.1 Failure to conform to any one of the requirements prescribed in this specification shall constitute grounds for rejection. The seller shall have the right to reinspect the rejected shipment and resubmit the lot after removal of those packages not conforming to the specified requirements.

TABLE 1 Liquid Property Requirements

Physical Properties	ASTM	Requirements
Viscosity	D562 D2196	90 to 110 KU 12 to 85 Pa-s
Volume Solids	D2697	Greater than 65 %
Weight Solids	D1644	As listed by Manufacturer