



Standard Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Integral Wearing Surface¹

This standard is issued under the fixed designation C957/C957M; 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 describes the required properties and test methods for a cold liquid-applied elastomeric membrane for waterproofing building decks not subject to hydrostatic pressure. The specification applies only to a membrane system that has an integral wearing surface. This specification does not include specific requirements for skid resistance or fire retardance, although both may be important in specific uses.

1.2 The type of membrane system described in this specification is used for pedestrian and vehicular traffic and in high-abrasion applications. The membrane may be single- or multi-component, and may consist of one or more coats (for example base coat, top coat, etc.). The coat(s) may be built to the desired thickness in one or more applications. One coat (base coat) provides the primary waterproofing function and normally comprises the major amount of organic material in the membrane. The function of the top coat(s) is to resist wear and weather. Aggregate may be used as a component of the membrane system, as all or part of a course, to increase wear and skid resistance.

1.3 The committee with jurisdiction over this standard is not aware of any comparable standards published by other organizations.

1.4 Test methods in this specification require a minimum 0.5-mm [0.020-in.] base coat dry film thickness. Actual thickness required for a particular application and the use of aggregate in topcoats shall be established by the membrane manufacturer.

1.5 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.

1.6 The following safety hazards caveat pertains only to the test method portion, Section 5, of this specification: *This standard does not purport to address all of the safety problems, 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:²

- C501 Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
- C794 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
- C1305 Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane
- C1442 Practice for Conducting Tests on Sealants Using Artificial Weathering Apparatus
- D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- D471 Test Method for Rubber Property—Effect of Liquids
- D609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products
- D1079 Terminology Relating to Roofing and Waterproofing
- D1133 Test Method for Kauri-Butanol Value of Hydrocarbon Solvents
- D2370 Test Method for Tensile Properties of Organic Coatings
- D6511 Test Methods for Solvent Bearing Bituminous Compounds
- G113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

¹ This specification is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.25 on Liquid Applied Polymeric Materials Used for Roofing and Waterproofing Membranes that are Directly Exposed to the Weather.

Current edition approved Jan. 1, 2015. Published January 2015. Originally approved in 1981. Last previous edition approved in 2014 as C957/C957M – 14. DOI: 10.1520/C0957_C0957M-15.

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.



2.2 U.S. Department of Commerce Standard:

Product Standard **PS-1**, Construction and Industrial Plywood³

3. Terminology

3.1 *Definitions*—Refer to Terminology **D1079** for definitions of terms used in this guide.

3.2 The definitions given in Terminology **G113** for terms related to natural and artificial weathering tests are applicable to this specification.

4. Physical Requirements

4.1 *Material*—Membrane materials shall cure, after application by spreading or spraying, to form an elastomeric film system composed of one or more layers and capable of maintaining a seal against water despite the existence or development of small (1.6 mm [$\frac{1}{16}$ in.] maximum) cracks in the substrate. It must maintain complete integrity under pedestrian or vehicular traffic.

4.2 The physical, mechanical, and performance properties of the membrane shall conform to the requirements described in **Table 1**.

5. Test Methods

5.1 *Standard Conditions*—Standard conditions for all tests shall be $23 \pm 2^\circ\text{C}$ [70 to 77°F] and $50 \pm 5\%$ relative humidity:

5.2 Conditioning and Mixing:

5.2.1 Store all membrane materials to be tested in an unopened container at standard conditions for at least 24 h before preparing any test specimens.

5.2.2 Follow the manufacturer's instructions for all mixing and preparation of membrane materials.

5.3 *Substrates*—In addition to the substrates specified herein, conduct tests on such other substrates as may be required by the specifier.

5.4 *Primer*—When required by the manufacturer, use a primer, as directed by the manufacturer, on all substrate materials in all test assemblies.

5.5 *Low-Temperature Crack Bridging*—Perform the test as specified in Test Method **C1305** with the following exceptions.

5.5.1 Test the total membrane system (primers, base coat(s) and top coat(s)) including any aggregate specified. Total thickness of the cured membrane, excluding aggregate, shall be a minimum of 0.5 mm [0.020 in.].

5.5.2 Extend the blocks until the space between each is 1.6 mm [$\frac{1}{16}$ in.] rather than 3.2 mm [$\frac{1}{8}$ in.].

5.6 *Adhesion-in-Peel after Water Immersion*—Perform the test as specified in Test Method **C794** with the following qualifications:

5.6.1 Cement mortar shall be used as the test substrate. Additional substrates, such as plywood, shall be used when specified.

5.6.2 Test only the base coat and any primer.

5.6.3 Cast the base coat in the thickness specified by the manufacturer for one coat of the base coat, or the wet-film thickness necessary to attain a dry-film thickness of 0.5 mm [0.020 in.], whichever is greater. Follow the instructions of the manufacturer regarding the time of placement of the airplane cloth or aluminum screen.

5.6.4 For testing on plywood, use the A side of Exterior Type Marine Grade AA, AB, or AC plywood conforming to U.S. Department of Commerce, Plywood Standard PS-1 as the substrate.

5.6.5 The sample shall be cured 2 weeks at standard conditions followed by 1 week at 70°C [158°F].

5.7 *Chemical Resistance*—Perform the test for change in tensile strength as specified in Test Method **D471**, with the following qualifications:

5.7.1 Cast test samples of the base coat to a minimum cured thickness of 0.5 mm [0.020 in.] in accordance with the directions of the manufacturer. Test any required top coats separately from the base coat. Cast the top coat test samples according to Method A of Test Methods **D412** or, in the case of coatings thinner than 0.16 mm [6.25 mils], by Test Method **D2370**.

³ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

TABLE 1 Requirements

Property	Requirement	Test Method
Weight loss of base coat, ^A max, %	40	D6511 as modified in 5.11
Low temperature crack bridging	No cracking in base coat	C1305 as modified in 5.5 of this specification
Adhesion-in-peel after water immersion, min, N [lbf]		C794 as modified in 5.6 of this specification
Cement mortar substrate	22.2 [5]	
Plywood substrate	13.3 [3]	
Chemical resistance, min, avg % tensile retention		D471 as modified in 5.7 of this specification
Water exposure	70	
Ethylene glycol exposure	70	
Mineral spirits exposure	45	
Weathering resistance and recovery from elongation, min, %		5.8 of this specification
Recovery from elongation, initial	90	
Tensile retention	80	
Elongation retention	90	
Abrasion resistance, max, mg [oz.]	50 [0.002]	C501 as modified in 5.9 of this specification
Stability, min, months	6	5.10 of this specification

^A A separate top coat or primer, or both, if required by manufacturer, shall comply with the manufacturer's specifications.

5.7.2 Cure all test samples for 3 weeks at standard conditions.

5.7.3 For each test liquid, cut at least five dumbbells as specified in Method A of Test Methods **D412**, using Die C. In addition, cut and retain ten dumbbells as a control.

5.7.4 The test liquids shall be water, ethylene glycol, and mineral spirits of Kauri Butanol Value 33 to 35, as determined by Test Method **D1133**.

5.7.5 Immerse the test samples in test liquids for 336 h (14 days). Liquid temperature shall be $23 \pm 1^\circ\text{C}$ [$73 \pm 2^\circ\text{F}$]. Age the ten control dumbbells under standard conditions for 2 weeks.

5.7.6 Test the dumbbells and calculate the tensile properties as specified in Test Methods **D412**. Make the crosshead speed 500 mm [20 in.]/min, and set the jaws 51 mm [2 in.] apart. If an extensometer is used, make its gage length 25 ± 0.25 mm [1.00 ± 0.01 in.].

5.7.7 Determine tensile and elongation retention as follows:

$$TR = \frac{P_t}{P_c} \times 100 \quad (1)$$

where:

TR = percent retention of tensile property,

P_t = property after test exposure, and

P_c = property of the control.

5.8 Weathering Resistance and Recovery from Elongation:

5.8.1 Cast a free film of the total membrane system, excluding any aggregate, on release paper or other suitable substrate specified by the manufacturer to a minimum cured thickness of 0.5 mm [0.020 in.], of sufficient size to provide at least twenty dumbbell-shaped samples as specified in Test Methods **D412**, Die C.

5.8.2 Cure the film 21 days at standard conditions followed by 7 days at $70 \pm 2^\circ\text{C}$ [$158 \pm 4^\circ\text{F}$] in a circulating hot-air oven.

5.8.3 Cut 20 dumbbell specimens, as specified in Test Methods **D412**, Die C from the cured film. Ten specimens are weathered as described in **5.8.4** and **5.8.5** and ten specimens are retained as unexposed file specimens.

5.8.4 Expose the ten specimens in one of the three types of laboratory accelerated weathering devices described in Practice **C1442**. The devices use either xenon arc, fluorescent UV, or open flame carbon arc radiation. Consult Practice **C1442** for the test parameters. Because of differences in type of light source and test conditions, test results may differ with the type of device used. The choice of device shall be by mutual agreement among the interested parties.

5.8.5 Expose the ten specimens for a minimum of 500 h. The exposure duration shall be sufficiently long to screen for products with unacceptable weather resistance. The required duration may differ with the type of weathering device used. For the xenon arc device, the radiant exposure is 500 h at an irradiance level of $0.51 \text{ W}/(\text{m}^2 \cdot \text{nm})$ at 340 nm is $917.5 \text{ kJ}/(\text{m}^2 \cdot \text{nm})$ at 340 nm. See Annex A1 in Practice **C1442** for determining the exposure time required to obtain the same radiant exposure at other irradiance levels.

5.8.6 After weathering, allow the specified samples to equilibrate for at least 24 h under standard conditions. Set the

jaws of the tension tester 51 mm [2 in.] apart. Place the bench marks on the sample pieces, as specified in Test Methods **D412**. Following the specified procedures, test the sample pieces for tensile strength and elongation, using a crosshead speed of 500 mm [20 in.]/min. Allow them to recover for 30 min and measure elongation after recovery. Determine recovery as follows:

$$R = \frac{E_B - E_R}{E_B} \times 100 \quad (2)$$

where:

R = percent recovery,

E_B = percent elongation at break, and

E_R = percent elongation after recovery.

Tensile and elongation retention are defined in **5.7.7**.

5.9 *Abrasion Resistance*—Perform the test as specified in Test Method **C501**, with the following qualifications:

5.9.1 Cast test samples of the entire membrane excluding aggregate to a minimum total cured thickness of 0.5 mm [0.020 in.] on a 102 mm [4-in.] square steel panel 3 mm [0.125 in.] thick with a 6.33-mm [$1/4$ -in.] hole drilled in the center. Prepare panels as specified in Practice **D609**. Steel shall be Type 3. Preparation shall be Method D.

5.9.2 Cure the samples 14 days at standard conditions followed by 7 days at $70 \pm 2^\circ\text{C}$ [$158 \pm 4^\circ\text{F}$] in a circulating hot-air oven.

5.9.3 Run test for 1000 cycles using 1000-g weight and the CS-17 abrasion wheel.

5.10 *Stability*—When stored at a temperature not exceeding 27°C [80°F] in a dry environment, or kept protected from moisture, or both, the membrane material shall be capable of meeting the requirements of this specification for at least six months from the time of production.

5.11 Test in compliance with the requirements of Test Method **D6511**, Section 7; utilize a forced draft oven controlled to $70 \pm 2^\circ\text{C}$ [$158 \pm 3.6^\circ\text{F}$] for 72 h. Remove the specimens from the oven and allow to cool at standard conditions for 30 minutes prior to weighing samples.

6. Rejection and Resubmittal

6.1 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.

7. Packaging and Product Marking

7.1 The date of production shall be marked on each package.

7.2 Unless otherwise specified in the contract or order, the material shall be packaged in standard commercial containers constructed so as to ensure acceptance by common or other carrier for safe transportation to the point of delivery. Shipping containers shall be marked with the name, type, and quantity of the material contained therein, as defined by the contract or order under which the shipments are made.



8. Report

8.1 The test report shall include a brief description of the system tested including thicknesses of layers of material, substrates used on and whether a primer was used.

8.2 Report type and description of laboratory accelerated weathering device, test cycle, test parameters, and duration of exposure.

9. Keywords

9.1 liquid-applied; membrane; waterproofing

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>