



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

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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 SI units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

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

- C 501 Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
- C 717 Terminology of Building Seals and Sealants
- C 719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
- C 794 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
- C 836 Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
- C 1250 Test Method for Nonvolatile Content of Cold Liquid-Applied Elastomeric Waterproofing Membranes
- C 1305 Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane
- C 1442 Practice for Conducting Tests on Sealants Using Artificial Weathering Apparatus
- D 412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- D 471 Test Method for Rubber Property—Effect of Liquids
- D 609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products
- D 1133 Test Method for Kauri-Butanol Value of Hydrocarbon Solvents
- D 2370 Test Method for Tensile Properties of Organic Coatings
- G 113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

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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.

2.2 *U.S. Department of Commerce Standard: Product Standard PS-1, Construction and Industrial Plywood*³

3. Terminology

3.1 *Definitions*—Refer to Terminology **C 717** for definitions of terms used in this guide.

3.2 The definitions given in Terminology **G 113** 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 (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 ± 2°C (70 to 77°F) and 50 ± 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 Flexibility and Crack Bridging*—Perform the test as specified in the Test Method section of Specification **C 836**, and conform to specified requirements. Make the following changes in the test method of Specification **C 836**.

5.5.1 Use equipment similar to that in Test Method **C 719**. Other equipment, such as an automatic tension-compression test machine fitted with an environmental chamber, is permissible, provided it can give the required strain rates and environment.

5.5.2 Use 25.4 by 25.4 by 50.8 mm (1 by 1 by 2 in.) mortar blocks.

5.5.3 Cement aluminum angles 75 by 50 by 25 mm (3 by 2 by 1 in.), positioned with the 50-mm legs pointed down, to the bottom of the mortar blocks with an epoxy adhesive for insertion into an automatic compression and extension machine.

5.5.4 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.).

5.5.5 Extend the blocks until the space between each is 1.6 mm (1/16 in.) rather than 3.2 mm (1/8 in.).

5.6 *Adhesion-in-Peel after Water Immersion*—Perform the test as specified in Test Method **C 794** 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).

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	C 1250
Low temperature crack bridging	No cracking in base coat	C 1305 as modified in 5.5 of this specification C 794 as modified in 5.6 of this specification
Adhesion-in-peel after water immersion, min, N/m (lbf/in.)		
Cement mortar substrate	875 (5)	
Plywood substrate	525 (3)	
Chemical resistance, min, avg % tensile retention		D 471 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)	C 501 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 Chemical Resistance—Perform the test for change in tensile strength as specified in Test Method **D 471**, 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 **D 412** or, in the case of coatings thinner than 0.16 mm (6.25 mils), by Test Method **D 2370**.

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 **D 412**, 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 **D 1133**.

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 **D 412**. 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 **D 412**, 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 **D 412**, 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 **C 1442**. The devices use either xenon arc, fluorescent UV, or open flame carbon arc radiation. Consult Practice **C 1442** 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 **C 1442** 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 **D 412**. 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 **C 501**, 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 **D 609**. 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.

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

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