



# Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course<sup>1</sup>

This standard is issued under the fixed designation C 836; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This specification has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.*

## 1. Scope

1.1 This specification describes the required properties and test methods for a cold liquid-applied elastomeric-type membrane, one or two component, for waterproofing building decks subject to hydrostatic pressure in building areas to be occupied by personnel, vehicles, or equipment. This specification applies only to a membrane system above which a separate wearing or traffic course will be applied.

NOTE 1—See Guide C 898 for proper application of membrane.

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

1.3 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 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:

- C 33 Specification for Concrete Aggregates<sup>2</sup>
- C 150 Specification for Portland Cement<sup>3</sup>
- C 717 Terminology of Building Seals and Sealants<sup>4</sup>
- C 719 Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)<sup>4</sup>
- C 794 Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants<sup>4</sup>
- C 898 Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Separate Wearing Course<sup>4</sup>
- D 653 Terminology Relating to Soil, Rock, and Contained Fluids<sup>5</sup>

## D 1191 Test Methods for Testing Concrete Joint Sealers<sup>6</sup>

## 3. Terminology

3.1 **Definitions**—Refer to Terminologies C 717 and D 653 for definitions of the following terms used in this specification: cure, elastomeric, hardness, hydrostatic pressure, primer, seal, substrate, waterproofing.

## 4. Physical Requirements

4.1 **Material**—Membrane materials shall cure, after application by spreading or spraying, to form an elastomeric film capable of maintaining a seal against liquid water.

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  $23 \pm 2^\circ\text{C}$  ( $73.4 \pm 3.6^\circ\text{F}$ ) and  $50 \pm 5\%$  relative humidity.

### 5.2 Conditioning/Mixing:

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

5.2.2 Follow the manufacturer's instructions for mixing and preparing membrane materials for testing. Thoroughly mix one-component samples before using. Mix two-component compounds in the ratio recommended by the manufacturer.

5.3 **Test Surfaces**—In addition to the mortar test surfaces specified, use other test surfaces when 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 test assemblies.

### 5.5 Hardness:

5.5.1 Following the manufacturer's instructions, apply a film of membrane,  $1.52 \pm 0.13$  mm ( $60 \pm 5$  mils) thick, on a  $101.5$  by  $152.5$ -mm ( $4$  by  $6$ -in.) piece of 6-mil polyethylene film-coated paper and allow the membrane to cure for 14 days at standard conditions. If more than one application is required, the total time for film application shall not exceed 48 h.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee C-24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.80 on Building Deck Waterproofing Systems.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.02.

<sup>3</sup> Annual Book of ASTM Standards, Vol 04.01.

<sup>4</sup> Annual Book of ASTM Standards, Vol 04.07.

<sup>5</sup> Annual Book of ASTM Standards, Vol 04.08.

<sup>6</sup> Annual Book of ASTM Standards, Vol 04.03.

**TABLE 1 High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane Physical Requirements**

Property	Requirement	Test Method
Hardness, min	50	5.5 <sup>B</sup>
Weight loss, max, %	20	5.6 <sup>B</sup>
Nonvolatile, min, %	80	
Low temperature flexibility	no cracking	5.7 <sup>B</sup>
Low temperature crack bridging	no cracking	5.7 <sup>B</sup>
Film thickness (vertical surface), min, mm (mils)	1.52 ± 0.13 (60 ± 5)	5.9 <sup>A,B</sup>
Adhesion-in-Peel after water immersion, N/m (lbf/in.)	175 (1)	Test Method C 794
Extensibility after heat aging, min, mm (in.)	6.4 (¼)	5.12 <sup>B</sup>
Stability, min, months	6	5.13 <sup>B</sup>

<sup>A</sup> This requirement applies only to materials applied to vertical surfaces. However, any material designed specifically for use on vertical surfaces shall meet all other requirements of this specification.

<sup>B</sup> Numbers refer to portions of the Test Methods section, Section 5, of this specification.

5.5.2 After curing, strip the film from the coated paper, cut into pieces, and lay the pieces one upon another to provide a total membrane thickness of not less than 6.1 mm (240 mils).

5.5.3 Using a Type 00 hardness gage, obtain an instantaneous reading of the film hardness.

#### 5.6 Weight Loss:

5.6.1 Prepare two test specimens by placing approximately 10 g of membrane compound into each of two tared small shallow square dishes 76.2 mm (3 in.) on each side formed from 2-mil aluminum foil and weigh accurately. Then immediately place the dishes in a forced-air oven for 72 h at 70 ± 2°C (158 ± 3.6°F).

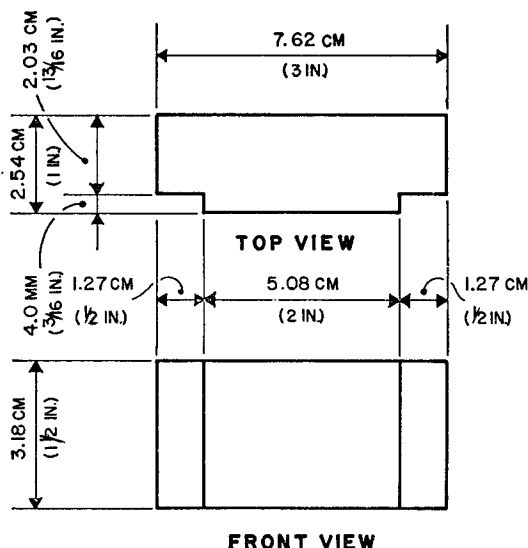
5.6.2 Remove the specimens and after allowing them to cool for ½ h, weigh them and determine the percent of weight loss.

5.6.3 Determine percent of weight loss by averaging the losses measured on the two test specimens.

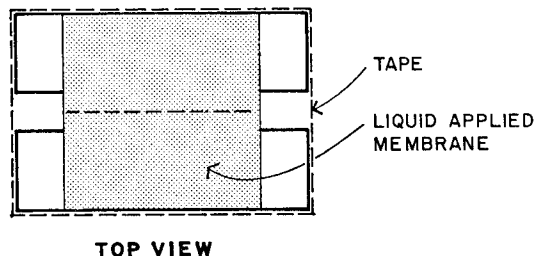
#### 5.7 Low-Temperature Flexibility and Crack Bridging:

##### 5.7.1 Apparatus and Materials:

##### 5.7.1.1 Automatic Compression and Extension Machine,



**FIG. 1 Test Blocks for Testing Low-Temperature Flexibility and Crack Bridging**



**FIG. 2 Test Block Assembly for Testing Low-Temperature Flexibility and Crack Bridging**

as described in Test Method C 719.

##### 5.7.1.2 Circulating Hot-Air Oven.

5.7.1.3 *Portland Cement*, high early strength, conforming to Specification C 150, Type III.

##### 5.7.1.4 Fine Aggregate conforming to Specification C 33.

##### 5.7.1.5 Masking Tape.

5.7.2 Mix 1 part by weight of cement with 2 parts by weight of aggregate and stir in approximately 0.7 parts by weight of water to produce a uniform mortar mix. Then cast two blocks of the dimensions shown in Fig. 1. Cure the cast blocks 1 day at 100 % relative humidity, followed by 6 days in water, both at standard temperature.

5.7.3 Prepare the test assembly as follows: Using the tape, bind the blocks tightly together with the rabbeted edges face to face as shown in Fig. 2. Then spread the membrane compound in a uniform thickness of 1.52 ± 0.13 mm (60 ± 5 mils) over the top 50.8 by 50.8-mm (2 by 2-in.) area bisected by the joint between blocks, as shown in Fig. 2. Leaving the tape in place, cure the assembly for 14 days at standard conditions, followed by 7 days in a circulating hot-air oven at 70 ± 2°C (158 ± 3.6°F).

5.7.4 After curing, remove the tape from the blocks and place them in the automatic compression and extension machine, preconditioned to -26°C (-15°F). Maintaining this temperature, subject the assembly to ten cycles of movement, each cycle consisting of pulling the blocks apart, at the rate of 3.2 mm (¼ in.)/h, until the space between is 3.2 mm, then closing the space at the same rate.

5.7.5 Upon completion of the ten cycles, remove the assembly from the machine and examine the membrane for cracking, loss of adhesion, or any other type of failure.

#### 5.8 Preparation of Mortar Slabs for Tests Other Than Low-Temperature Flexibility and Crack Bridging:

5.8.1 Using the same type of cement and aggregate as specified in 5.7.1.3 and 5.7.1.4, and the mix specified in 5.7.2, cast a 457 by 152 by 76-mm (18 by 6 by 3-in.) block of mortar in a greased mold. Cure the block one day at 100 % relative humidity, followed by 6 days in water, both at standard temperature.

5.8.2 After curing, cut the block crosswise into 152.4 by 76.2 by 25.4-mm (6 by 3 by 1-in.) slabs, using a diamond-type blade mounted on a water-lubricated standard masonry saw. Use the cut surface for all tests. Uncut concrete surface may be prepared as outlined in 6.2 of Test Methods D 1191.

##### 5.9 Film Thickness on Vertical Surface:

5.9.1 Prepare the test assembly by covering one cut face of one of the mortar slabs described in 5.8 with a film of membrane material 1.5 ± 0.13 mm (60 ± 5 mils) in thickness, mixed and applied in accordance with the manu-

facturer's directions. Install the film in one application unless manufacturer's application instructions require application in several coats. If applied in several coats, the test substrate shall be set in a vertical position between applications, and the complete film thickness shall be accomplished in 48 h in accordance with the manufacturer's instructions.

5.9.2 Immediately after applying the film, place the coated slab on its end, in a vertical position, and let remain in this position for 24 h at standard conditions.

5.9.3 Using a vernier caliper, measure the thickness of the total assembly at five points within 25 mm (1 in.) of the top end of the slab, covering the film at each point of measurement with a 25-mm square piece of aluminum, 0.5 mm (0.002 in.) thick, to prevent point indentation on the film.

5.9.4 Cut a 25.4-mm (1-in.) wide band of film from across the top of the mortar strip. Measure the thickness of the test mortar in approximately the same five locations that measurements were made in 5.9.3. Determine the average.

5.9.5 Determine the film thickness by subtracting the average test mortar thickness from the average total assembly thickness (test mortar and film).

#### 5.10 Adhesion-in-Peel:

5.10.1 Perform the test as specified in Test Method C 794 with the following qualifications:

5.10.1.1 Mortar shall be the test substrate. Other substrates may be tested when specified.

5.10.1.2 After the test specimens have cured for 7 days at standard conditions, coat the cloth with a layer of the membrane at a thickness of 0.25 mm (0.10 in.).

5.10.1.3 The cure conditions shall be 14 days at standard conditions followed by 7 days at  $70 \pm 2^\circ\text{C}$  ( $158 \pm 3.6^\circ\text{F}$ ). Then cut and immerse the specimens in the water for 7 days.

5.11 *Optional Test for Adhesion in Peel*—An optional method for running the adhesion test after the assemblies have been completely cured is to attach a 0.45-kg (1-lb) weight to the end of the strip of cloth, and let hang for a period of 2 min. If no separation occurs at the interface during this period, the film has met the minimum adhesion requirements.

#### 5.12 Extensibility After Heat Aging:

##### 5.12.1 Apparatus and Materials:

5.12.1.1 *Circulating-Air Oven* at  $70 \pm 2^\circ\text{C}$  ( $158 \pm 3.6^\circ\text{F}$ ).

5.12.1.2 *Mortar Test Blocks*, three, prepared as in 4.8.

5.12.1.3 *Wood Board, Steel Wedge, and Hammer and Wood Blades*.

5.12.1.4 *Testing Machine* with tension grips capable of pulling at a rate of separation of 12.7 mm (0.5 in.)/min.

5.12.2 Prepare three test specimens for each membrane to be tested as follows:

5.12.2.1 Cut each of the three slabs crosswise in the center of the 152-mm (6-in.) length to a depth of 19 mm ( $\frac{3}{4}$  in.), as shown in Fig. 3.

5.12.2.2 Mark the edge of each slab along the 152.4-mm (6-in.) length so that the bench marks are 50.8 mm (2 in.) apart and approximately 25.4 mm (1 in.) each side of the center cut as shown in Fig. 3.

5.12.2.3 Apply masking tape across the ends of the uncut 76 by 152-mm (3 by 6-in.) faces of the slabs, leaving an exposed 76 by 102-mm (3 by 4-in.) area on each where the membrane may be applied.

5.12.2.4 Apply membrane  $1.52 \pm 0.13$  mm ( $60 \pm 5$  mils) in thickness to the exposed area on each slab within 48 h, in accordance with the manufacturer's instructions, and let the three specimens cure for 14 days at standard conditions.

5.12.3 Place the test assemblies in a circulating-air oven for 14 days at  $70 \pm 2^\circ\text{C}$  ( $158 \pm 3.6^\circ\text{F}$ ). Remove the test assemblies and let cool 1 h at standard conditions. Remove the masking tape.

5.12.4 Place the test assemblies on a polyethylene paper-covered wooden board approximately 152 by 305-mm (6 by 12 in.) with the membrane side face down. Restrain the test blocks by blocking the ends with blocks of wood nailed to the base board to prevent the test blocks from flying apart. Insert a steel wedge into the cut and hit with a hammer no harder than necessary to cause the test block to crack along the cut.

5.12.5 Handling very carefully to prevent tearing the membrane, place each of the specimens in turn in the jaws of the testing machine and pull it in a direction normal to the break, at a separation rate of 12.7 mm (0.5 in.)/min, until the distance between the bench marks is exactly 57.2 mm (2.25 in.). Stop the machine and immediately examine the films for any breaks or cracks. There shall not be any cracking or tearing of the film along the opened area on any of the three specimens.

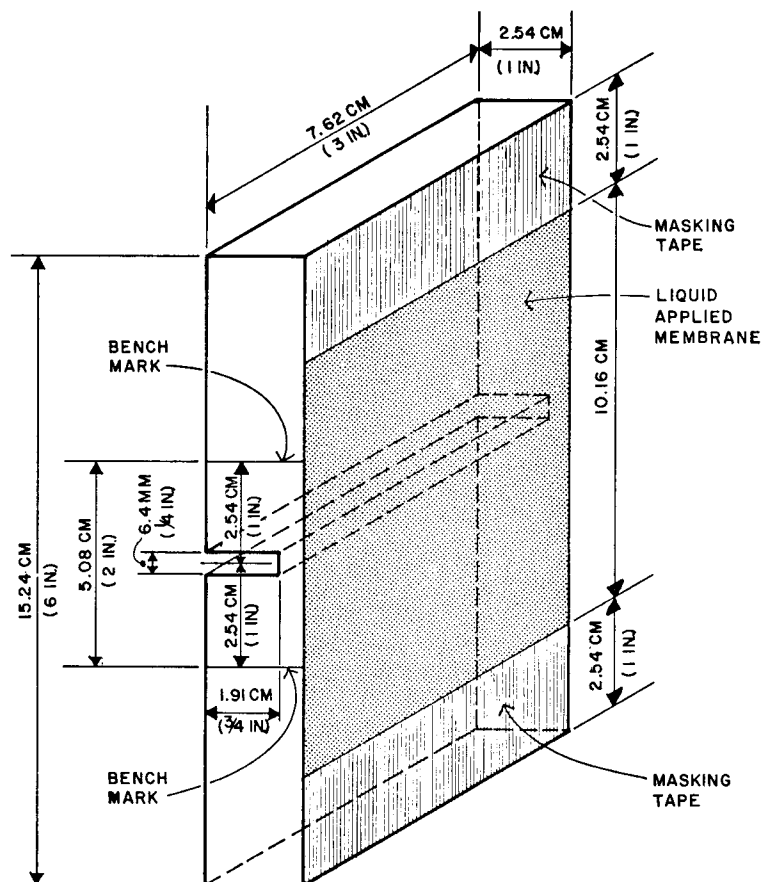
5.13 *Stability*—When stored at a temperature not exceeding  $26.7^\circ\text{C}$  ( $80^\circ\text{F}$ ) in a dry environment, or kept protected from moisture, or both, the membrane material shall be capable of meeting the requirements of this specification for at least 6 months from the time of delivery.

## 6. Precision and Bias

6.1 *Precision*—The precision of the procedures in 5.5 for measuring hardness, 5.6 for measuring weight loss, and 5.9 for measuring film thickness on a vertical surface is being determined. No statements are made about either the precision or bias of 5.7 for measuring low temperature flexibility and crack bridging, 5.11 for the optional test for adhesion in peel, and 5.12 for measuring extensibility after heat aging, since the results merely state whether there is conformance to the criteria for success specified in the procedures. The precision and bias of 5.10 for measuring adhesion-in-peel are as specified in Test Method C 794.

## 7. Keywords

7.1 crack bridging; membrane; waterproofing



NOTE—See 5.8 for method of preparation.

**FIG. 3 Test Block for Testing Film Thickness on Vertical Surface, Adhesion-in-Peel, and Extensibility After Heat Aging**

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