



Standard Specification for Adhesive Lubricant for Installation of Preformed Elastomeric Bridge Compression Seals in Concrete Structures¹

This standard is issued under the fixed designation D4070; 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 covers an adhesive lubricant for facilitating the insertion and positioning of preformed elastomeric bridge compression seals in either concrete or steel-faced joints, and which bonds the seal to the joint faces to waterproof the joint.

1.2 Since a precision estimate for this standard has not been developed, this test method is to be used for research or informational purposes only. Therefore, this test should not be used for acceptance or rejection of a material for purchasing purposes.

1.3 SI units are the standard. Units in parenthesis are for information only.

2. Referenced Documents

2.1 *ASTM Standards*:²

D1084 Test Methods for Viscosity of Adhesives

3. General Requirements

3.1 The adhesive lubricant shall be a one-component, moisture-curing, polyurethane compound extended with aromatic hydrocarbon solvent. The compound shall provide adequate lubrication for insertion of the seal into the joint and, in the actual field application, shall bond the seal to the joint face throughout repeated cycles of expansion and contraction, effectively sealing the joint against infiltration of moisture.

4. Physical Requirements

4.1 The material shall conform to the physical properties described in **Table 1**.

¹ This specification is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.34 on Preformed Joint Fillers, Sealers and Sealing Systems.

Current edition approved Jan. 1, 2015. Published February 2015. Originally approved in 1981. Last previous edition approved in 2008 as D4070–08. DOI: 10.1520/D4070-15.

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.

5. Sampling

5.1 Samples of the adhesive lubricant shall be 1 L (1 qt) consisting of a composite taken from three or more separate containers chosen at random from the same batch. A batch or lot shall be considered as all finished material that was manufactured simultaneously or continuously as a unit prior to packaging. Each of the containers sampled shall be resealed and marked for identification.

5.2 Samples shall be taken at the point of manufacture or warehouse prior to delivery, or at the point of delivery from each lot.

6. Test Conditions

6.1 Tests shall be conducted at standard laboratory conditions of $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$). All materials and equipment shall be held at these conditions prior to test for a sufficient time to assure equilibrium.

7. Specimen Preparation

7.1 Using a square-tipped spatula, thoroughly hand-mix approximately 500 mL (1 pt) of lubricant adhesive in a round can for 1 min.

8. Apparatus

8.1 *Oven*—The oven shall be a circulating air oven capable of maintaining temperature of $105 \pm 2^\circ\text{C}$ ($221 \pm 4^\circ\text{F}$).

8.2 *Viscometer, Rotational*—The essential instrumentation required providing the minimum rotational viscometer analytical capabilities for this method include:

8.2.1 A *drive motor*, to apply a unidirectional displacement to the specimen at a rate from 0.05 to 0.5 rad/s (0.5 to 50 r/min) constant to within 1 %.

8.2.2 A *force sensor* with a constant of 0.72 mN·m to measure the torque developed by the specimen to the rotational displacement of the spindle.

8.2.3 A *coupling shaft* or other means to transmit the rotational displacement from the motor to the specimen.

8.2.4 A *rotational element, spindle or tool* of the t-bar type with bar length between 15 and 48 mm (see **Fig. 1**) to fix the specimen between the drive shaft and a stationary position.

TABLE 1 Physical Requirements

Property	Requirements	Test Method Section
Solids content, min %	60	9.1
Homogeneity	shall be uniform, no lumps or agglomerates, no settlement in the container	None
Viscosity, mPa-s (cP)	20 000 to 300 000	9.2
Shear ratio, min, for viscosity		9.2
in the range of:		
20 000 to 100 000 mPa-s (cP)	1.5	
100 001 to 200 000 mPa-s (cP)	2.0	
200 001 to 300 000 mPa-s (cP)	2.5	
Shear ratio, max	4.0	9.2
Lubricating life, min, h	2	9.3
Sag	no sagging	9.4
Peel strength test	maximum length peeled from concrete within 3 min	9.6
500-g load	none	
1000-g load	12 mm (½ in.)	
Shelf life	for 6 months after manufacture, no skinning over and settling in the container to the extent that it cannot be brought to a smooth uniform product by stirring	

8.2.5 A *stand* to support, level, and adjust the height of the drive motor, shaft and spindle.

8.2.6 A *temperature sensor* to provide an indication of the specimen temperature in the range of 20 to 26°C to within ±0.1°C.

8.2.7 A *data collection device* to provide a means of acquiring, storing, and displaying measured or calculated signals, or both. The minimum output signals required for rotational viscosity are torque, rotational speed, temperature and time.

8.2.8 A *specimen container* to contain the test specimen during testing.

NOTE 1—A low-form 600 ml Griffin beaker may be used as a container.

8.2.9 Auxiliary instrumentation considered necessary or useful in conducting this method includes:

8.2.9.1 *Data analysis capability* to provide viscosity, stress or other useful parameters derived from the measured signals.

8.2.9.2 A *level* to indicate the vertical plumb of the drive motor, shaft and spindle.

8.3 *Rubber Strips*—The rubber strips shall be 150 mm (6 in.) long, 25 mm (1 in.) wide and 1.5 mm (1/16 in.) thick, and shall be obtained from an outside wall of preformed elastomeric bridge seal representative of the seal to be bonded with the adhesive lubricant.

8.4 *Concrete Blocks*, 200 by 200 by 75 mm (8 by 8 by 3 in.) and made of concrete similar to the concrete to which the seal is to be bonded. The blocks shall be cured for at least 14 days in a moisture room followed by at least 7 days at normal laboratory air condition. The test surface shall be smooth, freshly sandblasted before testing.

8.5 *Steel Roller*—A suitable 50 mm (2 in.) wide roller weighing 4.5 kg (10 lb).

8.6 *Steel Blocks*, 165 mm (6½ in.) long by 50 mm (2 in.) wide weighing 4.5 kg (10 lb).

8.7 *Weights*—A 500-g and a 1000-g weight shall be provided.

8.8 *Glass Plates*, or smooth-surface paper test charts.³

8.9 *Paint Film Applicator* (doctor blade).

9. Test Methods

9.1 Solids Content:

9.1.1 Place approximately 20 g of the adhesive in a covered weighing bottle.

9.1.2 Weigh a small aluminum foil drying dish together with a small glass stirring rod to the nearest 1 mg. Weigh out to the nearest 1 mg approximately 1½ g of the adhesive by difference from the weighing bottle into the dish, keeping the bottle covered as much as possible. Distribute the adhesive uniformly over the bottom of the dish in as thin a layer as possible by means of the stirring rod.

9.1.3 Place the dish with the rod and contents in a circulating air oven at 105 ± 2°C (221 ± 3.6°F) for 3 h ± 5 min or until a constant weight is reached.

9.1.4 Place the warm dish with rod and contents immediately into a desiccator and allow to cool to room temperature before weighing to the nearest 1 mg.

9.1.5 Calculate the percent solids content as follows:

$$\text{Solids content, \%} = (W_r/W_s) \times 100 \quad (1)$$

where:

W_r = weight of residue, g, and

W_s = weight of specimen, g.

9.2 Viscosity and Shear Ratio:

9.2.1 *Viscosity*—Determine the viscosity of the material at 23 ± 2°C (73.4 ± 3.6°F) in accordance with Method B of Test Methods **D1084**. Measure and report viscosity in mPa-s (cP) at 0.5 rad/s (5 r/min).

9.2.2 *Shear Ratio*—Measure and record the viscosity of the material at 0.25 rad/s (2.5 r/min) and then at 0.05 rad/s (0.5 r/min).

9.2.3 Calculate and report the shear ratio as follows:

$$\text{Shear Ratio} = (\text{viscosity at } 0.05 \text{ rad/s})/(\text{viscosity at } 0.25 \text{ rad/s}) \quad (2)$$

9.3 *Lubricating Life*—Apply a 65 to 78 mm wide, by 150 mm long, by 0.75 ± 0.10 mm thick (2½ to 3 in., by 6 in., by 0.030 ± 0.004 in.) strip of the lubricant adhesive to a glass plate or smooth-surface paper test chart using a film applicator. Test lubricating life by rubbing finger on coated chart at 30-min

³ The sole sources of supply of the apparatus known to the committee at this time are Smooth-surface paper test charts, available from Morest Co., 211 Centre St., New York, NY 10013; and Leneta Co., P.O. Box 576, Ho Ho Kus, NJ 07423. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

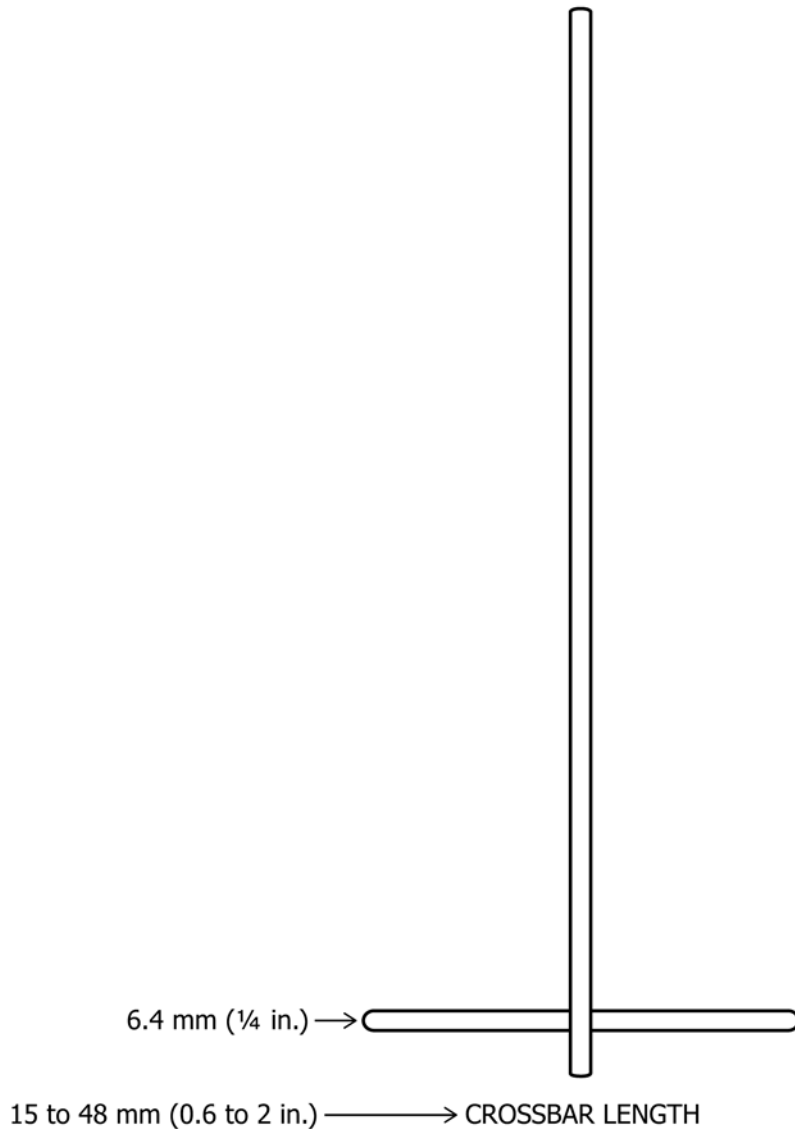


FIG. 1 T-Bar Rotational Element

intervals. Record lubricating life as the time at which drag or friction increases noticeably and material starts to thicken or become tacky.

9.4 *Sag*—Apply a 0.75 ± 0.01 -mm (0.030 ± 0.004 -in.) thick film of material to a glass plate or smooth-surface paper test chart in the manner as described in 9.3. Support glass plate or chart vertically with the 150-mm (6-in.) axis of the strip horizontal. After 1 h, check for sagging or running.

9.5 Since a precision estimate for this test has not been developed, this test method is to be used for research or informational purposes only. Therefore, this test should not be used for acceptance or rejection of a material for purchasing purposes.

9.6 *Peel Strength Test:*

9.6.1 Roughen one side of a 25-mm (1-in.) rubber strip with a coarse grinding wheel or other suitable means. Apply a brush coat of the freshly mixed lubricant adhesive to the roughened surface of the rubber strip and to the concrete block surface.

9.6.2 Immediately place the coated surfaces together and roll down the rubber strip with a 50-mm (2-in.) steel roller weighing 4.5 kg (10 lb), making six single passes, each pass requiring about 2 s. Wipe excess material away from the edges of the rubber strip. Place the 50 mm (2 in.) wide side of the steel block on the strip. Cure specimen for 48 h.

9.6.3 After curing, remove the steel block. Separate about 25 mm (1 in.) of an end of the rubber strip from the concrete. Support the specimen with the surface of the concrete block to which the rubber strip is attached horizontal and facing downward. Suspend a 500-g weight from the free end of the rubber strip for 3 min. Remove the weight and carefully measure to the nearest 1 mm ($1/16$ in.), the distance the rubber strip was peeled from the concrete. Repeat using the 1000-g weight.

9.6.4 Report results in millimetres (or inches or fraction thereof) peeled in 3 min. Should the specimen peel completely in less than 3 min, report as 100 % peeled and record the time.

10. Certification and Acceptance

10.1 The acceptance of the adhesive lubricant shall be based upon one of the following procedures as specified by the purchaser:

10.1.1 A certification indicating conformance to the test requirements. This shall consist of a copy of the manufacturer's test report or a statement by the seller, accompanied by a copy of the test results, that the material has been sampled, tested, and inspected in accordance with the provisions of the specification. Each certification so furnished shall be signed by an authorized agent of the seller or manufacturer.

10.1.2 A certification by an independent testing agency of test results indicating the material has been sampled, tested, and inspected in accordance with the provisions of the specification. Each certification so furnished shall be signed by an authorized agent of the testing agency.

10.1.3 Testing by the purchaser of any or all properties in accordance with the provisions of the specification.

10.1.4 Any alternative method agreed upon by the purchaser and seller.

11. Shelf Life

11.1 Determination of a six month shelf life shall be left to the examination by the purchaser in the field. If material does not meet requirements of **Table 1** in the field at the time of use, it shall be rejected.

12. Packaging and Package Marking

12.1 *Packaging*—The material shall be packaged in 5 and 25-L (1 and 5-gal) containers, so constructed as to ensure acceptance by common carrier.

12.2 *Package Marking*—Containers, and shipping containers, shall be marked with the following information:

12.2.1 Manufacturer's name, address, product name, specification designation, manufacturer's batch or lot number, date of manufacture, application instructions, special precautions required because of product toxicity or flammability, and other such information pertinent to the proper storage and use of the product.

13. Keywords

13.1 adhesive lubricant; bridge compression seals; concrete structures; rotational viscometry; viscometer; viscometry; viscosity

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