



# Standard Test Method for Bond and Cohesion of One-Part Elastomeric Solvent Release-Type Sealants<sup>1</sup>

This standard is issued under the fixed designation C 910; 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.

## 1. Scope

1.1 This test method determines the bond and cohesion of one-part, elastomeric, solvent release-type sealants after high- and low-temperature aging.

1.2 *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 717 Terminology of Building Seals and Sealants<sup>2</sup>

D 1191 Test Methods for Concrete Joint Sealers<sup>3</sup>

E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens<sup>4</sup>

## 3. Terminology

3.1 *Definitions*—Refer to Terminology C 717 for definitions of the following terms used in this test method: elastomer, elastomeric, sealant, solvent-release sealant.

## 4. Apparatus

4.1 *Extension Machine*,<sup>5</sup> as shown in Fig. 1, so designed that the test specimen can be automatically extended at a constant rate of 3.18 mm ( $\frac{1}{8}$  in.)/h from a joint width of 12.7 mm ( $\frac{1}{2}$  in.) to 14.29 mm ( $\frac{9}{16}$  in.) at  $-23 \pm 3^\circ\text{C}$  ( $-10 \pm 5^\circ\text{F}$ ).

4.2 *Oven*, forced-draft type, having temperature controlled at  $70 \pm 2^\circ\text{C}$  ( $158 \pm 3.6^\circ\text{F}$ ). See Specification E 145.

4.3 *Oven*, convection type, having temperature controlled at  $50 \pm 1^\circ\text{C}$  ( $122 \pm 2^\circ\text{F}$ ).

4.4 *Freezer Chest or Cold Box*, having temperature controlled at  $-23 \pm 3^\circ\text{C}$  ( $-10 \pm 5^\circ\text{F}$ ).

4.5 *Mortar Blocks*, six, prepared as described in Methods D 1191, except that the blocks shall be approximately 25.4 mm (1 in.) wide by 76.2 mm (3 in.) long by 25.4 mm (1 in.) thick and surfaced by wet grinding on an iron lap with No.

60 silicon carbide or aluminum oxide grain.

4.6 *Plates*, six, of water-white polished float or plate glass approximately 25.4 mm (1 in.) wide by 76.2 mm (3 in.) long by 6.35 mm ( $\frac{1}{4}$  in.) thick.

4.7 *Aluminum Alloy Plates*, six, 6063-T5 or 6061-T6 clear anodized a minimum of 20 min over a scale-free finish, approximately 25.4 mm (1 in.) wide by 76.2 mm (3 in.) long by 6.35 mm ( $\frac{1}{4}$  in.) thick.

4.8 *Polyethylene Spacer Bars*, nine, approximately 12.7 mm ( $\frac{1}{2}$  in.) by 12.7 mm ( $\frac{1}{2}$  in.) by 50.8 mm (2 in.), 18 bars 12.7 mm ( $\frac{1}{2}$  in.) by 12.7 mm ( $\frac{1}{2}$  in.) by 25.4 mm (1 in.) and 18 bars 14.29 mm ( $\frac{9}{16}$  in.) by 6.35 mm ( $\frac{1}{4}$  in.) by 25.4 mm (1 in.).

## 5. Reagents

5.1 *Acetone or Methyl Ethyl Ketone Solvents.*

5.2 *Detergent Solution.*<sup>6,7</sup>

5.3 *Distilled Water.*

## 6. Sampling

6.1 Take all test specimens from a previously unopened container.

## 7. Procedure

7.1 Clean the glass and aluminum plate first with solvent, with detergent solution, followed by a final rinse with distilled water. Allow plates to air dry. Prepare the six mortar blocks as described in 4.5.

7.2 Precondition the unopened containers of sealant at  $23 \pm 2^\circ\text{C}$  ( $73.4 \pm 3.6^\circ\text{F}$ ) and  $50 \pm 5\%$  relative humidity for a minimum of 24 h.

7.3 Prepare three test specimens for each substrate to be tested, as follows: Using the polyethylene spacer bars to control the joint dimensions, form a bead of sealant 12.7 mm ( $\frac{1}{2}$  in.) wide by 12.7 mm ( $\frac{1}{2}$  in.) thick by 50.8 mm (2 in.) long between the parallel 25.4 mm (1 in.) by 76.2 mm (3 in.) long faces of two similar blocks or plates.

7.4 Condition these specimens by allowing them to set for 24 h at  $23 \pm 2^\circ\text{C}$  ( $73.4 \pm 3.6^\circ\text{F}$ ) and  $50 \pm 5\%$  relative humidity, then drying them in a convection oven for 7 days at  $50 \pm 1^\circ\text{C}$  ( $122 \pm 2^\circ\text{F}$ ).

7.5 Place the specimens in freezer for 24 h at  $-23 \pm 3^\circ\text{C}$  ( $-10 \pm 5^\circ\text{F}$ ). Dislodge spacer bars from sealant, but do not

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.07.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.03.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.

<sup>5</sup> An automatic compression-extension machine manufactured by Applied Test Systems, Inc., 348 New Castle Road, Butler, PA 16001, or an equivalent has been found suitable for this purpose.

<sup>6</sup> Neodol 25-35, a registered trademark of Shell Oil Co., One Shell Plaza, Houston, TX 77002, has been found suitable.

<sup>7</sup> Dawn, a registered trademark of Proctor and Gamble Co., P.O. Box 579, Cincinnati, OH 54201, or Palmolive Green, a registered trademark of Colgate Palmolive Co., 300 T. Park Ave., New York, New York, have been found suitable for this purpose.



NOTE—Three-dimensional view of compression-extension machine with automatic control units shows four specimens ready for compression-extension cycling.

FIG. 1 Compression-Extension Machine

TABLE 1 Precision and Bias

C 910 Bond Cohesion			Adhesion Loss <sup>A</sup>		
Material	Average	Estimated Standard Deviation Within Laboratory	Estimated Standard Deviation Between Laboratories	Repeat-ability Internal	Reproducibility
G1	0.056	0.114	0.120	0.32	0.34
G2	0.001	0.000	0.000	0.00	0.00
G3	0.065	0.144	0.158	0.41	0.45

<sup>A</sup> At 95 % confidence a variation of as much as 0.41 in.<sup>2</sup> can be expected within a laboratory and 0.45 in.<sup>2</sup> between laboratories.

C 910 Bond Cohesion			Cohesion Loss <sup>B</sup>		
Material	Average	Estimated Standard Deviation Within Laboratory	Estimated Standard Deviation Between Laboratories	Repeat-ability Internal	Reproducibility
G1	0.001	0.000	0.000	0.000	0.000
G2	0.001	0.000	0.000	0.000	0.020
G3	0.015	0.035	0.036	0.099	0.102

<sup>B</sup> At 95 % confidence a variation of as much as 0.10 in.<sup>2</sup> can be expected within a laboratory and 0.10 in.<sup>2</sup> between laboratories.

remove spacer bars from assembled specimens.

7.6 Remove specimens from the freezer and condition them for 1 h at  $23 \pm 2^\circ\text{C}$  ( $73.4 \pm 3.6^\circ\text{F}$ ) and  $50 \pm 5\%$  relative humidity.

7.7 Place the specimens in a forced-draft oven for 7 days at  $70 \pm 2^\circ\text{C}$  ( $158 \pm 3.6^\circ\text{F}$ ).

7.8 Remove the specimens from the oven. Place them in a freezer for 24 h at  $-23 \pm 3^\circ\text{C}$  ( $-10 \pm 5^\circ\text{F}$ ).

7.9 Place the specimens, while frozen, in the grips of the extension machine and extend the joint width from the original 12.7 mm ( $1/2$  in.) to 14.29 mm ( $9/16$  in.) at  $-23 \pm 3^\circ\text{C}$  ( $-10 \pm 5^\circ\text{F}$ ) at the rate of 3.18 mm ( $1/8$  in.)/h. After extension is completed, record any initial failure. Then apply appropriate spacers to maintain 14.29 mm ( $9/16$  in.) thickness, remove specimens with spacers in place from machine and allow to warm for 3 h at  $23 \pm 2^\circ\text{C}$  ( $73.4 \pm 3.6^\circ\text{F}$ ). At this time examine specimens for adhesive or cohesive failure.

## 8. Report

8.1 Measure and record the loss in adhesive or cohesive failure, or both, in square centimetres (or square inches) for each individual test specimen of mortar, glass, and aluminum.

## 9. Precision and Bias<sup>\*</sup>

9.1 The precision and bias calculations for this test method are based on the results of four laboratories testing three materials using five specimens. The results are given in Table 1.

## 10. Keywords

10.1 bend; cohesion; elastomeric; solvent-release sealant

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<sup>\*</sup> Supporting data are available from ASTM Headquarters. Request RR: C 24 - 1023.

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