



SURFACE VEHICLE RECOMMENDED PRACTICE

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Method for the Determination of Expansion and Water Absorption in Automotive Sealers

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Documents

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Foreword—This document describes three different methods for measuring the expansion of an automotive sealer

Method #1—Gravimetric Method

Method #2—Volumetric Method

Method #3—Vertical Method

and two methods for measuring water absorption

Method #1—Uncut Method

Method #2—Cut Method

The gravimetric and volumetric methods would be used to determine the amount of compound needed to completely fill an enclosed or “boxed in” area to effect a moisture and/or sound resistant barrier. The gravimetric method, Method #1, is analytical in nature and thus is more precise in its calculated values, and is especially useful when measuring expansions of less than 100%. The volumetric method, Method #2, is a quick way to check expansion where errors of $\pm 5\%$ points are not crucial.

The vertical expansion method, Method #3, measures the vertical rise that a sealer achieves and is useful in determining bead size and expansion requirements in sealing applications, such as roof bows, where the critical function of the compound involves “jumping” an air gap, thereby joining two irregularly spaced surfaces.

The water absorption methods measure a sealer’s resistance to moisture transmission when the sealer’s outer surface is intact and/or damaged. Generally water absorption values, after 24 h immersion, of 2% or less for intact films and 3% or less for cut films are acceptable.

- 1. Scope**—This SAE Recommended Practice sets forth methods for determining total expansion gravimetrically and volumetrically, calculating vertical expansion and measuring the water absorption of cut and uncut sealer beads.

2. References

2.1 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

2.1.1 DAIMLERCHRYSLER PUBLICATIONS—Available from DaimlerChrysler Corporation, ????

LP-463NB-5-01 Change C—Volume Change of Heat Expandable Sealers—Determination of, DaimlerChrysler Corporation, Laboratory Procedure (Gravimetric Test Method)

LP-463NB-33-01 Change A—Sealers—Vertical Rise Method of Determining Volume Change, DaimlerChrysler Corporation, Laboratory Procedure (Vertical Expansion Test Method)

LP-463NB-07-01 Change C—Sealers—Water Absorption—Determination of, DaimlerChrysler Corporation, Laboratory Procedure (Water Absorption Test Method)

2.1.2 FORD PUBLICATIONS—Available from Ford Motor Company, ????

FLTM BV 108-02 1992 01 21—Volume Change Test for Adhesives and Sealants, Ford Motor Company, Automotive Safety and Engineering Standards (Gravimetric Test Methods)

ESB-M18P11-A 1988 12 09—3.8 Expansion, Ford Motor Company, Engineering Material Specification (Vertical Expansion Test Method)

FLTM BV 117-01 1992 02 03—Water Absorption Test for Adhesives and Sealants, Ford Motor Company, Engineering Material Specification (Water Absorption Test Method)

2.1.3 GENERAL MOTORS CORPORATION—Available from General Motors Corporation, ????

GM9037P September 1988—Test for Measuring Expansion of Sealers, General Motors Engineering Standards, Materials and Processes—Procedures (Gravimetric Test Method)

GM9640P January 1992—Water Absorption Test for Adhesives and Sealants, General Motors Engineering Standards, Materials and Processes—Procedures (Water Absorption Test Method)

GM9764P October 1989—Test for Measuring the Ramp Expansion of Sealers, General Motors Engineering Standards, Materials and Processes—Procedures (Vertical Expansion Test Method)

3. Equipment—The following materials are required:

3.1 Expansion

3.1.1 GRAVIMETRIC TEST METHODS (METHOD #1)

- a. Sealer to be tested
- b. Mechanical Convection Oven
- c. Analytical Balance (0.0001 g accuracy)
- d. 150 mL beaker
- e. Three count 0.9 x 25 x 62 mm (0.035 x 1 x 2.5 in) Aluminum Coupons with 0.25 mm diameter wire
- f. 0.9 x 300 x 300 mm (0.035 x 12 x 12 in) Cold Rolled Steel Panel
- g. 0.9 x 75 x 150 mm (0.035 x 3 x 6 in) Cold Rolled Steel Panel

3.1.2 VOLUMETRIC TEST METHODS (METHOD #2)

- a. Sealer to be tested
- b. Mechanical Convection Oven
- c. 500 mL graduated cylinder (50 mm (2.0 in) diameter)
- d. Three count 15 mL (0.5 oz) seamless containers with 0.25 mm (0.010 in) diameter wire
- e. 0.9 x 300 x 300 mm (0.035 x 12 x 12 in) Cold Rolled Steel Panel

3.1.3 VERTICAL EXPANSION TEST METHODS (METHOD #3)

- a. Sealer to be tested
- b. Mechanical Convection Oven
- c. Six count 0.9 x 100 x 300 mm (0.035 x 4 x 12 in) Cold Rolled Steel Panels
- d. Six count 32 mm Wide Spring Clips

3.2 Water Absorption

- a. Sealer to be tested
- b. Mechanical Convection Oven
- c. Analytical Balance (0.001 g accuracy)
- d. 0.9 x 25 x 62 mm (0.035 x 1 x 2.5 in) Aluminum Coupons without wire
- e. 0.9 x 300 x 300 mm (0.035 x 12 x 12 in) Cold Rolled Steel Panel

4. Gravimetric Expansion Procedure (Method #1)

- 4.1** Fabricate a small platform, from a 75 x 150 x 0.9 mm (3 x 6 x 0.035 in) steel panel, that will support a 150 mL beaker full of water as shown in Figure 1 (exact dimensions will vary depending on the model of balance used). The positioning of the platform and beaker should be arranged to allow complete freedom of movement of the pan.
- 4.2** Individually identify each of three 0.9 x 25 x 62 mm (0.035 x 1 x 2.5 in) aluminum coupon assemblies, as shown in Figure 2, and determine the dry weight of each panel (W1) to the nearest milligram (0.0001).
- 4.3** Determine the wet weight of each coupon assembly (W2) to the nearest milligram (0.0001) after suspending each coupon in water as in Figure 3, making sure the entire coupon is submerged.
- 4.4** The volume of each coupon (V1) in milliliters is equal to the difference between the dry and wet weights divided by the specific gravity of water, 1 g/mL

$$V1 = \frac{W1(\text{mg}) - W2(\text{mg})}{1 \text{ g/mL}} \quad (\text{Eq. 1})$$

- 4.5** Apply a semi-circular bead of sealer, approximately 10 mm (0.39 in) in diameter, down the center of each panel.
- 4.6** Trim the ends of each bead leaving a 38 mm (1.5 in) length of sealer centered on each coupon as shown in Figure 4.

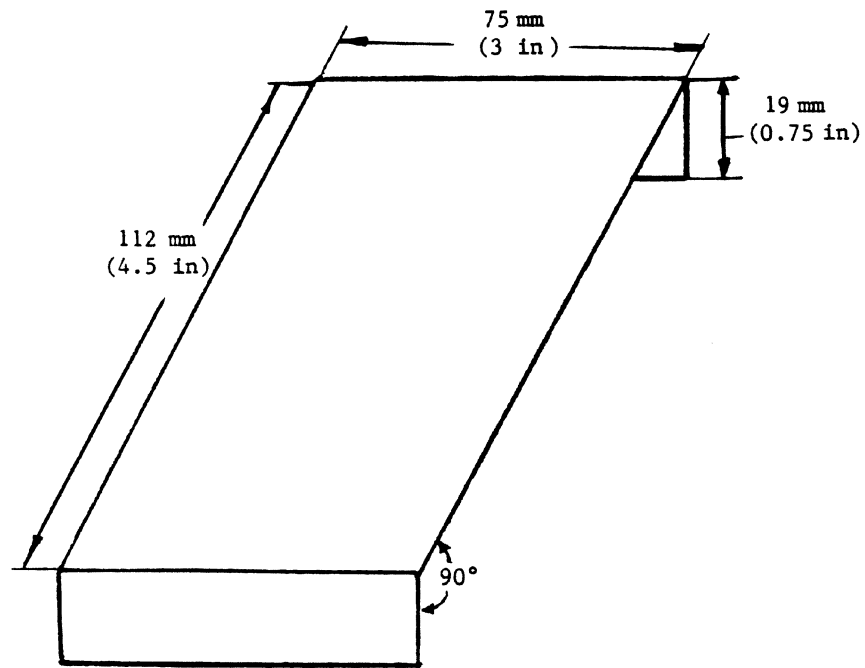


FIGURE 1—PLATFORM PANEL