



Evaluation of Volume Expansion of Adhesives and Sealing Materials

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. This test procedure is used to estimate the volume expansion of adhesives and sealing materials after being baked. It can be used to evaluate either pumpable or preformed materials.

1.2 Foreword. Not applicable.

1.3 Applicability. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities. Not applicable.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Circulation Oven. Capable of maintaining a set temperature within ± 3 °C.

3.2.2 Cartridge Gun. Not required for preformed materials.

3.2.3 Balance. With an accuracy of 0.001 g.

3.3 Test Vehicle/Test Piece.

3.3.1 Number of Test Samples. For initial approval, the expansion factor shall be determined with a minimum of three (3) test samples.

3.3.2 Sheet Metal. Approximate size: 4 cm to 6 cm length and width, or diameter, 1 mm thickness. Not required for preformed materials.

3.3.3 Adhesive/Sealer. To be tested.

3.3.4 Distilled Water.

3.4 Test Time. Not applicable.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

4 Procedure

This Test Procedure determines the volume expansion of adhesives and sealing materials through the difference of the volume of the cured and the uncured adhesive/sealer sample.

4.1 Preparation.

4.1.1 Curing Schedule.

4.1.1.1 Body Shop Applied Adhesive and Sealer Materials. Separate sets of samples shall be cured. One (1) according to the minimum Bake Schedule and one (1) according to the maximum Bake Schedule stated in the associated Material Specification.

4.1.1.2 Paint Shop. Separate sets of samples shall be cured. One (1) according to the minimum Bake Schedule and one (1) according to the maximum Bake Schedule stated in the associated Material Specification.

4.1.1.3 Deviations. Samples shall be cured according to the **time and temperature** parameters identified by the Material Engineer specifying the deviation.

4.2 Conditions.

4.2.1 Environmental Conditions. All measurements shall be performed at $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions. Report the method used.

4.3.1 Method 1. This method requires a sheet metal backing plate. It is typically used to evaluate pumpable adhesives, pumpable sealers, or other non-self supporting materials.

4.3.1.1 Volume of Sheet Metal. The sheet metal shall be first weighed in air (W_1) and then in water (W_2). From the difference of these weights, results the volume of sheet metal.

4.3.1.2 Volume of Uncured Test Sample. The adhesive/sealer to be tested shall be applied to the sheet metal in the form of a bead with a diameter of $6.0\text{ mm} \pm 2.0\text{ mm}$, and a length of $50.0\text{ mm} \pm 5.0\text{ mm}$.

This test sample shall be first weighed in air (W_3) and then in water (W_4). From the difference of weights results the volume of the sheet metal and of adhesive/sealer shall be tested.

4.3.1.3 Volume of Cured Test Sample. The test sample from 4.3.1.2 shall be baked in an oven according to curing schedule, (4.1.1). After cooling to $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, the test sample shall be weighed first in air (W_5) then in water (W_6). From the difference of weights results the volume of the sheet metal and of adhesive/sealer to be tested.

4.3.2 Method 2. This method does not require a sheet metal backing plate. It is typically used to evaluate preformed adhesives, preformed sealers, or other self-supporting materials.

4.3.2.1 Sample Size. Approximately 20 mm length $\times$ 20 mm width $\times$ 3 mm to 4 mm thickness, or as limited by the properties of the material.

4.3.2.2 Volume of Uncured Test Sample. The test sample shall first be weighed in air (W_3) and then in water (W_4). From the difference of weights results the volume of the adhesive/sealer to be tested.

4.3.2.3 Volume of Cured Test Sample. The test sample from 4.3.2.1 shall be baked in an oven according to curing schedule (4.1.1). Bake the sample on a non-stick surface. After cooling to $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, the test sample shall be weighed first in air (W_5) then in water (W_6), from the difference of weights results, the volume of the adhesive/sealer to be tested.

5 Data

5.1 Calculations. The percentage volume expansion shall be calculated according to the following formula: