



# SURFACE VEHICLE RECOMMENDED PRACTICE

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## Softening Point of Interior Trim Adhesives

### RATIONALE

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**Foreword**—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

**1. Scope**—This SAE Recommended Practice shall be used to determine the temperature at which an adhesive softens to the point at which it no longer can support a given load.

## **2. References**

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

2.1.1 **ASTM PUBLICATION**—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 816-82—Methods of Testing Rubber Cement

2.1.2 **OTHER PUBLICATIONS**

Adhesives Technology Handbook, Arther H. Landrock, Noyes Publications, 1985

## **3. Definitions**

**3.1 Softening Point**—The temperature at which an adhesive will soften to the point where it will be unable to sustain a predetermined load.

**3.2 Interior Trim Adhesives**—Typically solvent or water based, or hot melts, these adhesives typically develop their strength with the application of heat, pressure, and/or time. They are applied to interior components such as door trim panels, arm rests, headlinings, etc.

**3.3 Separation**—The point at which the bonded substrates disconnect from one another at the adhesive.

**3.4 Open Time**—The interval of time between application of the adhesive on the adherent and completion of assembly of parts for bonding. During this period, the adhesive-coated surfaces are exposed to air before being assembled together.

**3.5 Conditioning Time**—The time interval between removal of the joint from conditions of heat and/or pressure used to accomplish the bonding and the attainment of approximately maximum-bond strength.

- 3.6 Creep**—The dimensional change with time of a material under load. Creep at room temperature is sometimes called cold flow.

#### **4. Equipment Required**

- 4.1 Oven**—Capable of holding a temperature to within  $\pm 1$  °C (1.8 °F) in the 37.8 °C (100 °F) to 205 °C (400 °F) range.

#### **4.2 Thermocouple and Recorder**

- 4.3 Timer**—60 min

- 4.4 1.85 Cotton-Drill Cloth Coupons**—Cut into 25.4 x 114.3 mm (1 x 4.5 in) pieces with a centered hole at one end—minimum 9—one possible source is Industrial Coatings Group Inc., 220 Broad Street, Kingsport, TN 37660.

NOTE—1.85 cotton-drill cloth is used for the coupon application because of its consistent surface and negligible weight.

- 4.5 Roller**—Able to apply a load of 0.357 kg/cm (2 lb/in) width.

- 4.6 Weights**—50 g—minimum 6.

- 4.7 Steel Panels**—Clean uncoated, cold rolled—101.6 x 152.4 mm (4 x 6 in)—minimum 3.

- 4.8 Clamps, Stand**—Capable of securing coupon/steel panel test assembly vertically while in oven environment.

#### **5. Sample Preparation—Softening Point Coupons**

- 5.1** Make a 0.2 mm (0.008 in) wet-film thickness (or manufacturer's recommendations) by 12.7 x 101.7 mm (0.5 x 4.0 in) adhesive strip parallel with the 152.4 mm (6 in) edge at the center of the steel panel.

- 5.2** After 1 min open time (or manufacturer's recommended open time) locate three coupons evenly spaced at their ends along the 101.6 mm (4 in) steel panel edge opposite the centered hole and with the centered holes on the 25.4 x 114.3 mm (1 x 4.5 in) coupons opposite the 25.4 mm (1 in) overlap bonded area. Roll the coupons against the steel using 0.357 kg/cm (2 lb/in) roller making three passes.

NOTE—Three cotton cloth coupon/steel panel-test assemblies are required per condition.

- 5.3** Condition the cotton cloth coupon/steel panel-test assemblies for a minimum of 24 h at room temperature (or manufacturer's recommendations).

#### **6. Test Procedure—Softening Point**

- 6.1** Preheat the oven to 37.8 °C (100 °F).

- 6.2** Secure the control (first) test assembly at room temperature in a vertical position in a stand with the coupon-centered holes down. Hang one 50 g weight from each of the three cotton-drill coupons in this first test assembly. Set the first test assembly aside as the control panel.

- 6.3** Secure a second test assembly in a vertical position in a stand with the coupon centered holes down and hang one 50 g weight from each of the three cotton drill coupons. Attach a thermocouple to the center backside of the test assembly steel panel and carefully place the entire assembly in the 37.8 °C (100 °F) preheated oven. Gently close the door and set the timer for 15 min.

- 6.4** After 15 min, carefully observe both test assemblies to determine if any coupons have separated from the steel panel. If no separation is observed, gently close the oven door, increase the open temperature 5.6 °C (10 °F), and set the timer for another 15 min. Repeat this procedure until separation occurs.
- 6.5** When separation occurs record the oven temperature. Observe the control panel; signs of creep or separation existing on the control panel make the test invalid.
- 6.6** Remove the test assembly components, thermocouple, coupons, and weights from the oven. Decrease the oven temperature 5.6 °C (10 °F). Secure the last test assembly vertically in a stand with the coupon centered holes down. Hang one 50 g weight from each of the three coupons and attach the thermocouple to the center backside of the test assembly steel panel. After the oven temperature has stabilized, carefully place the assembly in the oven and gently close the door. Set the timer for 15 min.
- 6.7** After 15 min, open the oven and carefully observe the test assembly to determine if any of the three test coupons have separated from the steel panel. If no separation has occurred gently close the oven and increase the temperature 1.1 °C (2 °F). Set the timer for another 15 min. Repeat until separation occurs.
- 6.8** When separation occurs record the temperature, this is the adhesive's softening point  $\pm 1.1$  °C (2 °F). Observe the control panel; signs of creep or separation existing on the control panel will make the test invalid.

## **7. Report Requirements**

- 7.1** Report the test method and any deviations from the recommended test method.
- 7.2** Report complete identification of samples (coupon and steel type, adhesive type, and wet film thickness), sample preparation (open time, conditioning time, temperature, and humidity during preparation, etc.), and humidity during testing.
- 7.3** Report any inconsistencies or irregularities (substrate elongation, deformation, etc.) noted during the test.

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