



Standard Practice for Evaluating the Effects of Heat on Asphalts¹

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1. Scope

1.1 This practice covers a procedure for evaluating some of the effects on asphalts of heating in the presence of little or no air.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 *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:*²

D5 Test Method for Penetration of Bituminous Materials
D36 Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
D140 Practice for Sampling Bituminous Materials
D1079 Terminology Relating to Roofing and Waterproofing
D2170 Test Method for Kinematic Viscosity of Asphalts (Bitumens)
D2171 Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer
D4402 Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
E1 Specification for ASTM Liquid-in-Glass Thermometers
E145 Specification for Gravity-Convection and Forced-Ventilation Ovens
E230 Specification and Temperature-Electromotive Force

¹ This practice is under the jurisdiction of ASTM Committee D08 on Roofing and Waterproofing and is the direct responsibility of Subcommittee D08.03 on Surfacing and Bituminous Materials for Membrane Waterproofing and Built-up Roofing.

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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.

(EMF) Tables for Standardized Thermocouples
E1137/E1137M Specification for Industrial Platinum Resistance Thermometers

3. Terminology

3.1 *Definitions*—Definitions of terms used in this practice can be found in Terminology D1079.

4. Summary of Practice

4.1 A sample of asphalt in a loosely covered container is heated to a temperature chosen by the investigator for a period of $5\text{ h} \pm 10\text{ min}$. Certain characteristics of the asphalt after heat exposure at the test temperature chosen are then compared with those characteristics before exposure.

NOTE 1—A set temperature is required when this practice is used as part of a specification. Historically, a temperature of 204°C [400°F] has been used.

5. Significance and Use

5.1 When asphalts are maintained at elevated temperatures in the presence of air, their characteristics may change. Certain blown asphalts also soften when maintained near, and particularly above, their final blowing temperatures under virtually air-free conditions. This may happen if the asphalt is overheated for application purposes. This practice provides a uniform heat-treatment procedure and methods for evaluating the effect of this treatment on some of the characteristics of asphalts. Changes observed when asphalts are overheated are not indicative of changes to be expected when asphalts are heated to normal application temperatures.

6. Apparatus

6.1 *Oven*—A forced-ventilation oven conforming to the requirements for Type IIA as prescribed in Specification E145, capable of maintaining temperatures up to 300°C [572°F], and with a chamber at least 300 by 300 by 300 mm [12 by 12 by 12 in.].

6.2 *Thermometer*—ASTM Low-Distillation Thermometer, having a range from -1 to $+300^\circ\text{C}$ [30 to 580°F] and conforming to the requirements for Thermometers 7C or 7F as prescribed in Specification E1.

6.2.1 As an alternative, any other thermometric device used shall be at least: (1) of equal accuracy to that of the thermometer specified in Specification E1, (2) capable of indicating

temperature to within 1°C [2°F], and (3) stable to within 1°C [2°F] for the duration of the exposure.

6.2.2 When used, platinum resistance thermometers shall be in accordance with the requirements of Specification **E1137/E1137M**.

6.2.3 When used, thermocouples shall be in accordance with the requirements of Specification **E230**.

6.3 Containers, triple-seal, friction-top, 1-L [1-qt] and 0.5-L [1-pt] cans with lids, free of any interior resinous or lacquer coatings.

6.4 *Laboratory Timer*.

6.5 *Hot Plate*.

7. Sampling

7.1 Sample the asphalt in accordance with Practice **D140**.

8. Test Specimen and Sample

8.1 Heat a minimum of 1 L [1 qt] of the asphalt on the hot plate. Stir occasionally to prevent local overheating. Keep covered whenever possible to minimize volatiles loss. Heat the material until sufficiently fluid to pour, but in no case more than 93°C [200°F] above the softening point of the asphalt.

8.2 When molten, pour the asphalt into a 0.5-L [1-pt] container to within 25 ± 2 mm [1.0 ± 0.1 in.] of the top, and also pour test specimens for determination of the characteristics of the original material in accordance with the methods listed in Section 10. Test these specimens within the time limits specified by the respective test procedures.

NOTE 2—Pour a small amount of the asphalt in the groove around the top of the can, sufficient to act as a seal when the lid is placed loosely in position.

8.3 Cover the container loosely with a lid and set aside to cool. Subject the sample to heat treatment within 18 to 24 h after pouring.

9. Procedure

9.1 Preheat the test oven to the selected temperature. Place the container on a shelf in the oven so as to permit air circulation around it.

9.2 Start the laboratory timer when the container has been placed in the oven and the door closed. Continue the heating for 5 h.

9.3 Remove the container from the oven after 5 h. Remove the lid; if a skin is present, remove it carefully before allowing the asphalt to cool. Stir the molten asphalt gently.

9.4 Cool the sample to approximately the original pouring temperature. Gently stir the sample to avoid air entrapment. Then, proceed to pour the test specimens.

10. Test Methods

10.1 Characteristics of asphalt before and after heat exposure may be evaluated in duplicate by any desired procedures, but the following methods are recommended:

10.1.1 *Softening Point*—Test Method **D36**.

10.1.2 *Penetration*—Test Method **D5**.

10.1.3 *Viscosity*—Test Method **D2170** or **D2171** or **D4402**.

11. Report

11.1 Report the heat-exposure temperature used.

11.2 Report the presence or absence of a skin on the heat-exposed sample.

11.3 Report the tests used to evaluate the sample before and after heat exposure and the individual test result from each procedure.

12. Keywords

12.1 asphalts; heat exposure; overheated; physical property changes

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