



~~Designation: D3143-98~~ Designation: D 3143 – 08

## Standard Test Method for Flash Point of Cutback Asphalt with Tag Open-Cup Apparatus<sup>1</sup>

This standard is issued under the fixed designation D 3143; 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 covers the determination of flash points by the Tag Open-Cup Apparatus of ~~cut-back~~ cutback asphalts having flash points of less than 93°C (200°F).

NOTE 1—Specifications commonly designate the Cleveland Open Cup (ASTM ~~D92-IP36~~ D 92-IP 36) Method for asphalt cements and ~~cut-back~~ cutback asphalts having flash points above 79°C (175°F).

NOTE 2—This procedure follows in general the procedure outlined in Test Method D 1310, but is restricted to cutback asphalt having flash points of less than 93°C (200°F).

1.2 The values stated in SI units are 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.*

1.4 *This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

~~D92 Test Method for Flash and Fire Points by Cleveland Open Cup<sup>2</sup>~~

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester

D 140 Practice for Sampling Bituminous Materials

D 1310 Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D 6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

D 6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products and Lubricants

~~E 1 Specification for ASTM Thermometers~~ Specification for ASTM Liquid-in-Glass Thermometers

E 300 Practice for Sampling Industrial Chemicals

#### 2.2 IP Standard:

IP 36 Test for Flash and Fire Points by Cleveland Open Cup<sup>3</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-4 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.47 on Miscellaneous Asphalt Tests.

Current edition approved June 10, 1998. Published February 1999. Originally published as D3143-62. Last previous edition D3143-97.

<sup>2</sup> This test method is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.47 on Miscellaneous Asphalt Tests.

Current edition approved July 1, 2008. Published July 2008. Originally approved in 1962. Last previous edition approved in 1998 as D 3143 – 98 which was withdrawn in January 2007 and reinstated in July 2008.

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* Vol 05.01, volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>5</sup> Available from Energy Institute, 61 New Cavendish St., London, WIG 7AR, U.K., <http://www.energyinst.org.uk>.

### 3. Summary of Test Method

3.1 The sample is placed in the cup of the tester and heated at a slow but constant rate. A small test flame is passed at a uniform rate in a level plane across the cup at specified intervals. The flash point is the lowest temperature at which application of the test flame causes the vapor at the surface of the liquid to flash.

### 4. Significance and Use

4.1 This test method is useful in determining that an asphalt cutback has been prepared with solvents that meet the desired range of flammability, and that the product has not been contaminated with lower flash point solvents.

### 5. Apparatus

5.1 *Flash Tester*— Tag Open-Cup Tester (manual) (Fig. A1.1) as described in detail in Annex A1.

5.2 *Shield*, as described in detail in Annex A1.

5.3 *Thermometer*— ~~A Pensky-Martens, low-range thermometer [-7 to +110°C and conforming to the requirement for Thermometer 9C as prescribed in Specification E1] shall be used.~~ Thermometric Measuring Device —A thermometric measuring device having the ranges as shown below and conforming to the requirements prescribed in Specification E 1 or in the Specification for IP Standard Thermometers or a thermometric measuring device containing a platinum or thermocouple sensing element. The device shall exhibit the same temperature response as the mercury thermometers.

Temperature Range	ASTM	Thermometer Number	IP
-5 to +110°C (20 to 230°F)	9C (9F)		15C

### 6. ~~Bath Media Reagents and Materials~~

6.1 *Bath Media:*

6.1.1 *Water*, for flash points to 79°C.

6.2 *Water-Glycol Solution (1+1)*, for flash points above 79°C (175°F), for flash points to 79°C (175°F).

6.1.2 *Water-Glycol Solution (1 + 1)*, for flash points above 79°C (175°F).

6.2 *Cleaning Solvents*—Use technical grade solvent capable of cleaning out the test specimen from the test cup and drying the test cup.

### 7. Assembly and Preparation of Apparatus

7.1 Place the tester in a level position on a solid vibration-free table in a location free of draft. Shield the top of the tester from strong light so that the flash may be easily seen. Maintain a room temperature of  $25 \pm 5^\circ\text{C}$  throughout the test.

7.2 Adjust the horizontal and vertical positions of the ignition taper so that the jet passes on the circumference of a circle having a radius of 152.4 mm and in a level plane 3.2 mm above the upper edge of the cup as measured from the center of the orifice. The jet should pass across the center of the cup at right angles to the thermometer. These adjustments should be made only when required as usually the apparatus is used continuously for a series of tests. Sampling

7.1 Obtain a sample in accordance with the instructions given in Practices D 140, D 4057, D 4177, or E 300.

7.2 Transfer sample to the test cup when the sample is at least  $10^\circ\text{C}$  ( $18^\circ\text{F}$ ) below the expected flash point. Erroneously high flash points may be obtained if precautions are not taken to avoid loss of volatile material. Do not open containers unnecessarily; this will prevent the loss of volatile material and possible introduction of moisture. When possible, the flash point should be the first test performed on a sample.

### 8. Assembly and Preparation of Apparatus

8.1 Place the tester in a level position on a solid vibration-free table in a location free of draft. Shield the top of the tester from strong light so that the flash may be easily seen. Maintain a room temperature of  $25 \pm 5^\circ\text{C}$  ( $77 \pm 10^\circ\text{F}$ ) throughout the test.

8.2 Adjust the horizontal and vertical positions of the ignition taper so that the jet passes on the circumference of a circle having a radius of 152.4 mm (6.0 in.) and in a level plane 3.2 mm (0.13 in.) above the upper edge of the cup as measured from the center of the orifice. The jet should pass across the center of the cup at right angles to the thermometric measuring device. These adjustments should be made only when required as usually the apparatus is used continuously for a series of tests.

NOTE 3—The leveling device is used as a gage to adjust the height of the taper.

7.3 ~~Set~~ 8.3 Set the draft shield around the tester so that the sides form right angles with each other and the tester is well toward the back of the shield. If the apparatus is in a draft-free hood or flash room, the shield is not required.

### 8.9. Calibration and Standardization

9.1 Calibrate the temperature measuring device according to the manufacturer's instructions.

### 10. Procedure

8.1 ~~Place~~ 10.1 *Manual Apparatus:*

10.1.1 Place the glass test cup in the metal bath and adjust the thermometric measuring device holder so that the thermometric measuring device is supported firmly in a vertical position halfway between the center and edge of the cup and on a line passing through the center of the cup and the pivot of the taper. Place the thermometric measuring device so that the bottom of the bulb device is 6.3 mm (0.25 in.) above the inner bottom of the cup.

8.2 Fill 10.1.2 Fill the metal bath with water or water-glycol solution having a temperature at least  $16^{\circ}\text{C}$  ( $18^{\circ}\text{F}$ ) below the probable flash point of the material to be tested. Cool tap water is satisfactory in most instances when water is used, and may be introduced into the chamber between the bath and sample cups until a slight overflow is noted at the overflow spout. The bath solution should be up to the overflow tube when the test cup is in place.

8.3 Rest 10.1.3 Rest the metal leveling device on the rim of the cup and fill the cup with material to be tested until the level just touches the pointer of the leveling device (this should be approximately 3.3 mm (0.13 in.) below the rim of the cup).

NOTE 4—The test sample should be at least  $11^{\circ}\text{C}$  ( $18^{\circ}\text{F}$ ) below the anticipated flash point.

8.4 Light 10.1.4 Light the ignition taper and adjust the test flame to a diameter approximately the same size as the comparison bead on the apparatus but in no case greater than 4 mm (0.16 in.).

NOTE 5—Some instruments have a 4-mm (0.16-in.) hole in the apparatus for comparison instead of the bead.

8.5 Apply 10.1.5 Apply heat to the bath so that the temperature of the sample rises at the rate of  $1^{\circ}\text{C}$  ( $2^{\circ}\text{F}$ )/min  $\pm 0.25^{\circ}\text{C}/\text{min}$ .  
6 s.

NOTE 6—When determining the flash point or fire point, or both, of viscous liquids and those liquids that tend to form a surface film, the following procedure is suggested: About 15 s before the taper is passed over the surface, insert the end of a stirring rod to a depth of about 13 mm (0.5 in.) in approximately a vertical position. Move the rod from side-to-side of the cup for three or four complete passes following approximately the path of the taper, remove, and continue the testing procedure.

8.10.1.6 Beginning at a point  $13.8 \pm 2.8^{\circ}\text{C}$  ( $10^{\circ}\text{F}$ ) below the anticipated flash point, make final adjustment of the sample level in the test cup. (A syringe or medicine dropper provides a convenient means of adding or removing the sample from the cup.) At successive  $1^{\circ}\text{C}$  ( $2^{\circ}\text{F}$ ) intervals, pass the ignition taper across the sample in a continuous motion, such that the time consumed for each pass is 1 s. The first pass should be made immediately after the final adjustment of the sample level.

NOTE 7—Each pass must be made in one direction only and the taper should be kept in the “off” position at one or the other end of the swing, except when the flame is applied to the sample.

8.7 Record, as the flash point, the temperature read on the thermometer at the time the test flame application causes a distinct flash in the interior of the test cup.

## 9. Report

9.1 Report the lowest temperature, in degrees Fahrenheit (or Celsius) at which the first initial flash is noted as the Tag-Open-Cup Flash Point.

## 10. Precision

10.1 The single-operator standard deviation has been found to be  $3.7^{\circ}\text{C}$ . Therefore, results of two properly conducted tests by the same operator on the same asphalt should not differ by more than  $10^{\circ}\text{C}$ .

10.2 The multilaboratory standard deviation has been found to be  $5.4^{\circ}\text{C}$ . Therefore, results of two properly conducted tests from two different samples of the same asphalt should not differ by more than  $15^{\circ}\text{C}$ .

10.1.7 Record, as the flash point, the temperature read on the thermometric device at the time the test flame application causes a distinct flash in the interior of the test cup.

## 11. Calculations

11.1 Correct for barometric pressure. Observe and record the barometric pressure at the time and place of the test. When the pressure differs from 101.3 kPa (760 mm Hg), correct the flash as follows:

$$(1) \text{ Corrected flash point} = C + 0.25 (101.3 - p)$$

$$(2) \text{ Corrected flash point} = F + 0.06 (760 - P)$$

$$(3) \text{ Corrected flash point} = C + 0.033 (760 - P)$$

where:

$C$  = observed flash point,  $^{\circ}\text{C}$ ,

$F$  = observed flash point,  $^{\circ}\text{F}$ ,

$p$  = ambient barometric pressure, kPa, and

$P$  = ambient barometric pressure, mm Hg.

11.2 The barometric pressure used in this calculation shall be the ambient pressure for the laboratory at the time of test. Many aneroid barometers such as those used at weather stations and airports, are pre-corrected to give sea level readings; these shall not be used.