



Designation: D 3143 – 98

## 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 asphalts having flash points of less than 93°C.

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

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.

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:

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup<sup>2</sup>

D 1310 Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus<sup>3</sup>

E 1 Specification for ASTM Thermometers<sup>4</sup>

#### 2.2 IP Standard:

IP 36 Test for Flash and Fire Points by Cleveland Open Cup<sup>2</sup>

### 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 (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 E 1] shall be used.

### 6. Bath Media

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

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

### 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

<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 D 3143 – 62. Last previous edition D 3143 – 97.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 05.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.03.

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.

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

7.3 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. Procedure

8.1 Place the glass test cup in the metal bath and adjust the thermometer holder so that the thermometer 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 thermometer so that the bottom of the bulb is 6.3 mm above the inner bottom of the cup.

8.2 Fill the metal bath with water or water-glycol solution having a temperature at least 16°C 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 should be up to the overflow tube when the test cup is in place.

8.3 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 below the rim of the cup).

NOTE 4—The test sample should be at least 11°C below the anticipated flash point.

8.4 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.

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

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

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 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.

8.6 Beginning at a point  $13.8 \pm 2.8^\circ\text{C}$  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°C (2°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°C. Therefore, results of two properly conducted tests by the same operator on the same asphalt should not differ by more than 10°C.

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

## 11. Keywords

11.1 cutback asphalt; flash point; open cup; tag

## ANNEX

## (Mandatory Information)

## A1. APPARATUS

A1.1 The Tag Open-Cup Tester is shown in Fig. A1.1. It consists of the following parts, which must conform to the dimensions shown, and have the additional characteristics as noted:

A1.1.1 *Copper Bath*, preferably equipped with a constant level overflow so placed as to maintain the bath liquid level 3.2 mm ( $\frac{1}{8}$  in.) below the rim of the glass cup.

A1.1.2 *Thermometer Holder*, supplied with the tester as shown in Fig. A1.1. It shall support the thermometer firmly in a vertical position.

A1.1.3 *Glass Test Cup* (Fig. A1.2), of molded clear glass, annealed, heat-resistant, and free from surface defects.

A1.1.4 *Leveling Device*, or gage, for proper adjustment of the liquid level in the cup (Fig. A1.3). This shall be made of approximate metal with two projections for adjusting the liquid level in the glass cup to exactly 3.2 mm ( $\frac{1}{8}$  in.) below the top rim of the cup. This leveling device may also be used to adjust the size of the test flame and for gaging the height of the taper above the edge of the cup.

A1.1.5 "*Micro*" of *Small Gas Burner*, of suitable dimensions for heating the bath. A screw clamp may be used to help

regulate the gas. A small electric heater controlled by a variable power transformer may be used.

A1.1.6 *Ignition Taper*, which is a small, straight, blow-pipe type gas burner. The tip of the taper should be approximately 1.6 mm in diameter and the orifice should be 0.8 mm in diameter. The ignition taper should be maintained in a fixed horizontal plane above the test cup by means of a swivel device so that the test flame passes on the circumference of a circle having a radius of at least 152.4 mm. A comparison bead 4.0 mm in diameter may be mounted in a convenient spot. If mounted near the end of the ignition taper, a portion of the tip of the taper 1.6 mm in diameter shall extend at least 3.2 mm ( $\frac{1}{8}$  in.) beyond the bead.

A1.1.7 *Draft Shield*, consisting of two rectangular sheets of noncombustible material, 610 by 710 mm, fastened together along the 710-mm side, preferably by hinges. A triangular sheet, 610 by 610 by 860 mm is fastened by hinges to one of the lateral sheets (to form a top when shield is open). The interior of the draft shield shall be painted a flat black. A draft-free fume hood may be used.

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