Designation: D8254 – 19

Standard Test Method for Flash and Fire Points of Asphalt by Cleveland Open Cup Tester[1]

This standard is issued under the fixed designation D8254; 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 (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This flash point and fire point test method is a dynamic method and depends on definite rates of temperature increases to control the precision of the test method. Its primary use is for viscous materials having flash point of 79 °C (174 °F) and above. It is also used to determine fire point, which is a temperature above the flash point, at which the test specimen will support combustion for a minimum of 5 s. Do not confuse this test method with Test Method D4206, which is a sustained burning test, open cup type, at a specific temperature of 49 °C (120 °F).

Flash point values are a function of the apparatus design, the condition of the apparatus used, and the operational procedure carried out. Flash point can therefore only be defined in terms of a standard test method, and no general valid correlation can be guaranteed between results obtained by different test methods, or with test apparatus different from that specified.

1. Scope

1.1 This test method describes the determination of the flash point and fire point of asphalt by a manual Cleveland open cup apparatus or an automated Cleveland open cup apparatus.

NOTE 1—Apparatus is the same as described in Test Method D92 with the addition of the materials for the skin prevention technique.

1.2 This test method is applicable to asphalts that can form a skin, and those that do not form a skin during heat treatment.

1.3 This test method is applicable to products with flash points above 79 °C (174 °F) and below 400 °C (752 °F), except fuel oils.

1.4 The precision has been determined over the temperature range of 300 °C to 370 °C (572 °F to 698 °F).

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For specific warning statements, see 6.4, 7.1, 11.1, 11.2.3, and 11.3.4.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester

D140 Practice for Sampling Asphalt Materials

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D4206 Test Method for Sustained Burning of Liquid Mixtures Using the Small Scale Open-Cup Apparatus

E1 Specification for ASTM Liquid-in-Glass Thermometers

E300 Practice for Sampling Industrial Chemicals

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.08 on Volatility.

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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.

2.2 *Energy Institute Standard:*[3]
Specifications for IP Standard Thermometers

2.3 *ISO Standards:*[4]
ISO 17034 General requirements for the competence of reference material producers
ISO Guide 35 Reference materials—Guidance for characterization and assessment of homogeneity and stability

3. Terminology

3.1 *Definitions:*

3.1.1 *dynamic, adj—in petroleum products—in petroleum product flash point test methods,* the condition where the vapor above the test specimen and the test specimen are not in temperature equilibrium at the time that the ignition source is applied.

3.1.1.1 *Discussion*—This is primarily caused by the heating of the test specimen at the constant prescribed rate with the vapor temperature lagging behind the test specimen temperature.

3.1.2 *fire point, n—in flash point test methods,* the lowest temperature of the test specimen, adjusted to account for variations in atmospheric pressure from 101.3 kPa, at which application of an ignition source causes the vapors of the test specimen to ignite and sustain burning for a minimum of 5 s under specified conditions of test.

3.1.3 *flash point, n—in flash point test methods,* the lowest temperature of the test specimen, adjusted to account for variations in atmospheric pressure from 101.3 kPa, at which application of an ignition source causes the vapors of the test specimen to ignite under specified conditions of test.

4. Summary of Test Method

4.1 Approximately 50 mL of test specimen is filled into a test cup which has been previously prepared for running the skin-prevention procedure. The temperature of the test specimen is increased rapidly at first and then at a slower constant rate as the flash point is approached. At specified intervals, a test flame is passed across the cup. The flash point is the lowest liquid temperature at which application of the test flame causes the vapors of the test specimen of the sample to ignite. To determine the fire point, the test is continued until the application of the test flame causes the test specimen to ignite and sustain burning for a minimum of 5 s.

5. Significance and Use

5.1 The flash point is one measure of the tendency of the test specimen to form a flammable mixture with air under controlled laboratory conditions. It is only one of a number of properties that should be considered in assessing the overall flammability hazard of a material.

5.2 Flash point is used in shipping and safety regulations to define flammable and combustible materials. Consult the particular regulation involved for precise definitions of these classifications.

5.3 Flash point can indicate the possible presence of highly volatile and flammable materials in a relatively nonvolatile or nonflammable material.

5.4 Skin prevention technique involves assembling a restraining ring over a centrally-holed qualitative filter paper that is laid at the bottom of the COC (Cleveland open cup) test cup, prior to introduction of the sample specimen into the cup. This allows a column of the hot sample specimen to move up constantly, through the hole, to the surface of the test specimen so that the surface is maintained in the hot condition to prevent skin formation. (See 9.6).

5.5 Skin-forming asphalts may not be limited to those which are air blown/oxidized, polymerized or non-homogeneous materials that, although infrequently, exhibit some unique behavior and characteristics, as far as manifestation of flash point is concerned. At the flash point stage, this behavior may involve flame propagation across the surface or just a flame appearing at one or more points on the surface.

5.6 This test method shall be used to measure and describe the properties of materials, products, or assemblies in response to heat and a test flame under controlled laboratory conditions and shall 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 method may be used as elements of a fire risk assessment that takes into account all of the factors that are pertinent to an assessment of the fire hazard for a particular end use.

5.7 The fire point is one measure of the tendency of the test specimen to support combustion.

6. Apparatus

6.1 *Cleveland Open Cup Apparatus (manual)*—This apparatus consists of the test cup, heating plate, test flame applicator, heater, and supports described in detail in the Annex A1. The assembled manual apparatus, heating plate, and cup are illustrated in Figs. 1-3, respectively. Dimensions are listed with the figures.

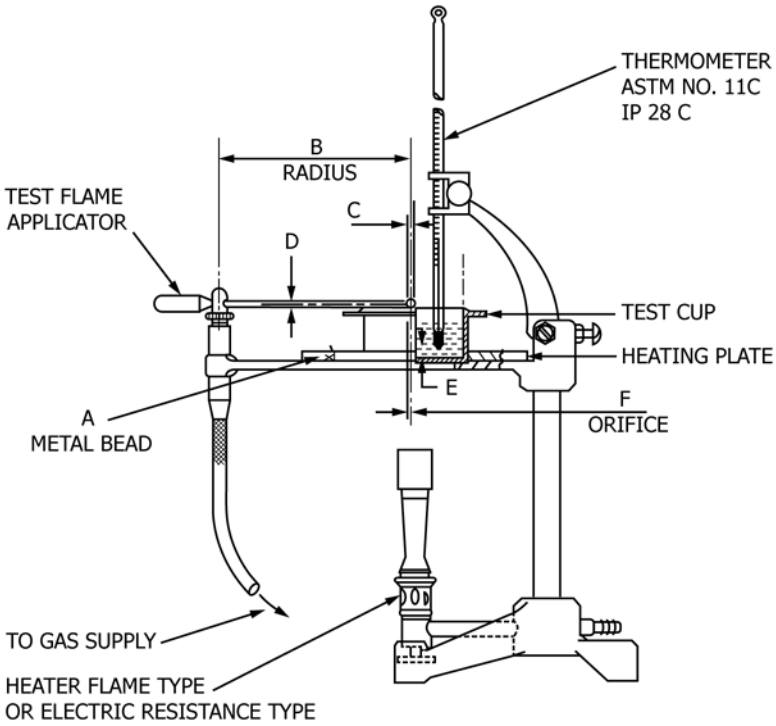
6.2 *Cleveland Open Cup Apparatus (automated)*—This apparatus is an automated flash point instrument that shall perform the test in accordance with the procedure, 11.3. The apparatus shall use the test cup with the dimensions as described in Annex A1 and the application of the test flame shall be as described in Annex A1.

6.3 *Temperature Measuring Device*—A thermometer having the range as shown below and conforming to the requirements prescribed in Specification E1 or in the Specifications for IP Standard Thermometers, or an electronic temperature measuring device, such as a resistance thermometer or thermocouple. The device shall exhibit the same temperature response as the liquid in glass thermometers.

Temperature Range	Thermometer Number ASTM IP
	11C 28C
–6 °C to +400 °C	

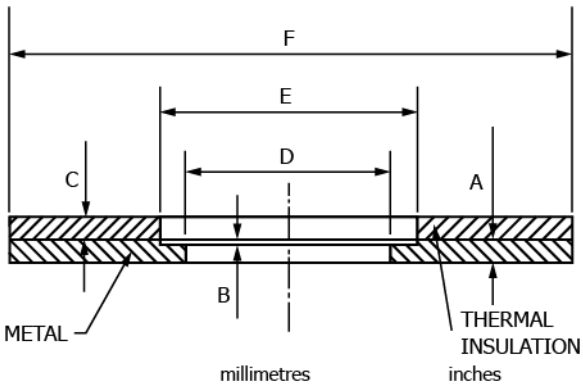
[3] Available from Energy Institute, 61 New Cavendish St., London, W1G 7AR, U.K., http://www.energyinst.org.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.



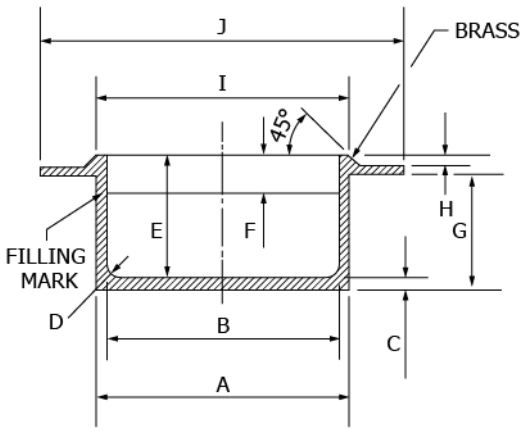
	millimetres		inches	
	min	max	min	max
A—Diameter	3.2	4.8	0.126	0.189
B—Radius	152	nominal	6	nominal
C—Diameter	1.6	nominal	0.063	nominal
D		2		0.078
E	5.9	6.9	0.23	0.27
F—Diameter	0.8	nominal	0.031	nominal

FIG. 1 Cleveland Open Cup Apparatus



	millimetres		inches	
	min	max	min	max
A	6	7	0.236	0.276
B	0.5	1.0	0.020	0.039
C	6	7	0.236	0.276
D—Diameter	55	56	2.165	2.205
E—Diameter	69.5	70.5	2.736	2.776
F—Diameter	146	159	5.748	6.260

FIG. 2 Heating Plate



	millimetres		inches	
	min	max	min	max
A	67.5	69	2.658	2.717
B	63	64	2.480	2.520
C	2.8	3.5	0.110	0.138
D—Radius	4	nominal	0.157	nominal
E	32.5	34	1.280	1.339
F	9	10	0.354	0.394
G	31	32.5	1.221	1.280
H	2.8	3.5	0.110	0.138
I	67	70	2.638	2.756
J	97	100	3.819	3.937

FIG. 3 Cleveland Open Cup

6.4 *Test Flame*—Natural gas (methane) flame and bottled gas (butane, propane) flame have been found acceptable for use as the ignition source. The gas flame device is described in