Designation: D 2746 – 97 (Reapproved 2002)ε1

Standard Test Method for Staining Tendency of Asphalt (Stain Index)[1]

This standard is issued under the fixed designation D 2746; 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.

ε[1] NOTE—Editorially switched from inch/pound dominant to SI dominant in April 2002.

1. Scope

1.1 This test method covers the determination of the staining tendency of asphalt and the assignment of a stain index proportional to the extent of staining observed.

1.2 This test method is applicable to asphalts having ring-and-ball softening points of 85°C (185°F) or greater.

NOTE 1—This test method may be modified for use with other bituminous materials with softening points less than 85°C (185°F) by using a different temperature than specified in Section 7 by agreement of the interested parties. The report of results from such a test may cite this method but must clearly state the temperature employed in the exception and acknowledge that the interpretation of results in Section 9 and the precision and bias stated in Section 10 may not apply.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.4 *This standard does not purport to address 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:*

D 36 Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)[2]

D 140 Practice for Sampling Bituminous Materials[3]

E 1 Specification for ASTM Thermometers[4]

3. Summary of Test Method

3.1 A horizontal disc of asphalt, cast in a brass retaining ring, is placed on a sheet of filter paper supported on a flat plate and heated at 80°C (175°F) for 120 h. The diameter of the resulting stained circle on the paper is compared to the inside diameter of the brass ring to determine the staining characteristic of the asphalt. The stain index is the difference between the diameter of the stained circle and the initial disc diameter measured to the nearest 0.5 mm (1⁄64ths of an inch).

4. Significance and Use

4.1 This test method measures the tendency for oil components to separate spontaneously from asphalt. The separation of oil components can cause staining in asphalt roofing products and adjacent materials in storage and use.

4.2 The stain index is related to the thermal stability of the asphalt. Higher stain index values indicate lower stability and greater tendency for staining.

4.3 Use this procedure to determine the staining tendency of asphalt and to compare the results against a material for which the staining tendency is known.

5. Apparatus

5.1 *Rings*—Square shouldered brass retaining rings conforming to the dimensions required for use in the ring-and-ball softening point apparatus (see Fig. 1 (a) of Test Method D 36).

5.1.1 The inside diameter of the ring to be placed in contact with the filter paper during the test is 16 mm (40⁄64ths of an inch).

NOTE 2—This test method depends on accurate measurement of diameter and precise alignment of the face and rim of the ring on a flat surface. Therefore, deformed rings must not be used.

5.2 *Pouring Plate*—A flat, smooth, brass plate approximately 50 by 75 mm (2 by 3 in.).

5.3 *Paper*—Filter paper of the standard double acid-washed analytical grade.[5]

5.3.1 The filter paper must be of sufficient area to accommodate the number of samples and the known material arranged as described in 7.3.

5.4 *Support Plate*—A flat, clean, smooth metal plate approximately 1.5 mm (1⁄16 in.) thick and area at least sufficient to support the size of filter paper being used.

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[1] This test method is under the jurisdiction of ASTM Committee D08 on Roofing, Waterproofing, and Bituminous Materials and is the direct responsibility of Subcommittee D08.02 on Prepared Roofings, Shingles and Siding Materials.

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[2] *Annual Book of ASTM Standards*, Vol 04.04.

[3] *Annual Book of ASTM Standards*, Vol 04.03.

[4] *Annual Book of ASTM Standards*, Vol 14.03.

[5] The sole source of supply of the paper known to the committee at this time is Whatman No. 40 filter paper, available from laboratory supply and service companies. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

5.5 *Oven*—A constant temperature oven capable of maintaining the test temperature of 80°C (175°F) within ±1°C (±2°F).

5.6 *Thermometer*—An ASTM high softening point thermometer having a range from 30 to 200°C (85 to 392°F), and conforming to the requirements for Thermometer 16C (or 16F) as prescribed in Specification E 1.

5.7 *Measuring Rule*—A steel rule graduated in 0.5 mm (64ths of an inch).

5.7.1 *Hole Template*—A metal or plastic template provided with holes of diameter from 16 to 24 mm (40⁄64 to 60⁄64 in.) in 0.5-mm (1⁄64-in.) increments may be used as an alternative to the steel rule to measure the diameter of the stain circle after the test.

6. Sampling

6.1 Sample the material in accordance with Practice D 140.

7. Procedure

7.1 Melt the asphalt sample and pour into the preheated brass softening point ring, allow to cool, and trim off the excess asphalt from each face of the ring as described in Test Method D 36.

7.1.1 It is important that the lower face and rim of the ring (16-mm (40⁄64-in.) inside diameter) be clean and that the asphalt disc completely fill the ring and be flush with the lower face. There should be no trace of any release agent which may have been used on the pouring plate (see Test Method D 36) on either the lower face of the ring or the asphalt.

7.2 Place the filter paper on the flat support plate and put the filled and trimmed softening point rings on the paper with the 16-mm (40⁄64-in.) diameter asphalt disc face in contact with the paper. Each ring should be no closer than 40 mm (1.5 in.) from the edge of the filter paper or from another ring.

7.2.1 The known material (Note 3) must be placed on the same piece of filter paper and support plate as the sample(s) being tested.

NOTE 3—The "known" material for the purpose of this test is a material whose staining tendency is known to the investigator and which is used to compare with the material being tested (see also Note 6).

7.2.2 Identify each asphalt sample and known material by appropriately marking the filter paper in pencil near each ring.

7.3 Place the entire assembly on the support plate in the oven, preheated to 80 ± 1°C (175 ± 2°F), and allow to remain at that temperature for 120 ± 1 h.

7.4 Remove the assembly on the support plate from the oven and allow to cool to room temperature (about 24°C (75°F)).

7.5 Remove the ring and the asphalt disc from the filter paper taking care to avoid tearing of the paper.

7.6 Determine and record the average of three measurements, taken at about 120° apart, of the diameter of the stained circle on the filter paper expressed numerically in 0.4–mm units (64ths of an inch) to the nearest 0.4 mm (1⁄64 in.) using a steel rule.

7.6.1 Alternatively, use the hole template and determine the diameter of the hole which best fits the stained circle on the filter paper and record the result numerically in 0.4–mm units (64ths of an inch) to the nearest 0.4 mm (1⁄64in.).

8. Calculation and Interpretation of Results

8.1 Subtract the initial diameter of the asphalt disc expressed numerically in 0.4–mm units (64ths of an inch), that is, 40 from the average, or best fit, diameter of the stained circle on the filter paper expressed numerically in 0.4–mm units (64ths of an inch) to obtain the stain index.

NOTE 4—If the dimensional measurements have been made in metric units, the average diameter *must* be converted to inch units at this point in order to compute the numerical value for stain index which is derived from the diameter expressed numerically in 64ths of an inch.

NOTE 5—Example: If the average, or best fit, diameter of the stained circle on the filter paper is 19.5 mm (49⁄64ths of an inch), then the stain index = 49 − 40 = 9.

8.2 *Interpretation of Results*—The following ranges of stain index have been determined to represent the staining tendency of asphalts used in the production of asphalt roofing shingles.

Stain Index	Staining Tendency
0 to 10	low
10 to 20	moderate
Greater than 20	high

The staining tendency in roofing products is strongly influenced by storage conditions especially temperature and time, by the pressure generated in stacked material from the mass of material in the overlying stack, and by the nature, amount, and distribution of backsurfacing material.

9. Report

9.1 Report the stain index value determined as in 8.1.

10. Precision and Bias

10.1 Results of two properly conducted tests by a single operator should not differ by more than two stain index numbers for asphalts with stain index of ten or less nor by more than three stain index numbers for asphalts with stain index greater than ten.

10.2 Results of two properly conducted tests on the same sample of asphalt between different laboratories should be considered suspect if they differ by more than four stain index numbers when one of the values is ten or less, or if they differ by more than six stain index numbers when both values are greater than ten.

10.3 A test should be considered suspect if the stain index obtained for the known material differs by more than two from the expected value for materials with stain index of ten or less, or by more than three for materials with stain index greater than 10.

NOTE 6—The major cause of bias error in this test method has been found to be inadvertent changes in the temperature of the test oven. This is the primary reason for suggesting comparison to a material with known staining tendency in the performance of the test.

11. Keywords

11.1 asphalt; stain index; staining