Designation: D6114/D6114M – 19

Standard Specification for Asphalt-Rubber Binder[1]

This standard is issued under the fixed designation D6114/D6114M; 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.

1. Scope

1.1 This specification covers asphalt-rubber binder, consisting of a blend of asphalt binder, ground recycled tire (that is, vulcanized) rubber, and other additives, as needed, for use as binder in pavement construction. The rubber shall be blended and interacted in the hot asphalt binder sufficiently to cause swelling of the rubber particles prior to use.

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 nonconformance with the standard.

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4 Since a precision estimate for this standard has not been developed, the test method is to be used for research and informational purposes only. Therefore, this standard should not be used for acceptance or rejection of a material for purchasing purposes.

NOTE 1—The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of Specification D3666 are generally considered capable of competent and objective testing, sampling, inspection, etc. Users of this standard are cautioned that compliance with Specification D3666 alone does not completely ensure reliable results. Reliable results depend on many factors; following the suggestions of Specification D3666 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.

1.5 The following precautionary caveat pertains to the test method portions only, Sections 4 and 5 of this specification: *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.* Specific precautionary statements are given in 4.3.2.

1.6 *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]

D5/D5M Test Method for Penetration of Bituminous Materials

D36/D36M Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

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

D140/D140M Practice for Sampling Asphalt Materials

D946/D946M Specification for Penetration-Graded Asphalt Binder for Use in Pavement Construction

D1566 Terminology Relating to Rubber

D1754/D1754M Test Method for Effects of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)

D1864/D1864M Test Method for Moisture in Mineral Aggregate Used on Built-Up Roofs

D2872 Test Method for Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)

D3381/D3381M Specification for Viscosity-Graded Asphalt Binder for Use in Pavement Construction

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D4402/D4402M Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer

D5329 Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt Pavements and Portland Cement Concrete Pavements

[1] This specification is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.40 on Asphalt Specifications.

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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.

D5603 Classification for Rubber Compounding Materials—Recycled Vulcanizate Rubber
D6373 Specification for Performance Graded Asphalt Binder
D7741/D7741M Test Method for Measurement of Apparent Viscosity of Asphalt-Rubber or Other Asphalt Binders by Using a Rotational Handheld Viscometer

2.2 *DIN Standard:*[3]
DIN 53019-1 Measurement of Viscosities and Flow Curves by Means of Rotational Viscometers—Part 1: Principles and Geometry of Measuring System

3. Materials

3.1 *Asphalt*—The asphalt binder shall meet the requirements of Specification D946/D946M or Table 1 or 3 of Specification D3381/D3381M or D6373. Acceptable grades shall be able to produce the properties of Table 1 of this specification when interacted with ground recycled tire rubber.

3.2 *Ground Recycled Tire Rubber*—The rubber shall conform to the requirements of Terminology D1566 and Classification D5603.

3.2.1 The ground recycled tire rubber shall contain less than 0.75 % moisture by weight and shall be free flowing. The specific gravity of the rubber shall be 1.15 ± 0.05. The ground recycled tire rubber shall contain no visible nonferrous metal particles and no more than 0.01 % ferrous metal particles by weight.

3.2.2 Fiber content shall be determined by using Classification D5603. For use in asphalt binders, the fiber content shall not exceed 0.5 % by weight of ground recycled tire rubber. However, for use in asphalt binder spray applications, fiber content shall not exceed 0.1 % by weight. Up to 4 % by weight of mineral powder (such as talc) is permitted to prevent sticking and caking of the rubber particles. Other foreign contaminating materials (see Note 2) shall be less than 0.25 % by weight.

NOTE 2—Other foreign contaminants include, but are not limited to, materials such as glass, sand, wood, etc.

3.2.3 No rubber particles should be retained on the 2.36-mm (No. 8) sieve. Rubber gradation shall be agreed upon between purchaser and asphalt-rubber binder supplier for the specific mixture applications (see Note 3).

NOTE 3—It has been found that rubber gradation may affect the physical properties and performance of hot paving mixtures using asphalt-rubber binder.

3.3 *Asphalt-Rubber:*

3.3.1 The asphalt-rubber shall be an interacted blend of asphalt binder and ground recycled tire rubber. Other additives not cited herein, including other types of scrap rubber, are permitted.

3.3.2 The asphalt-rubber shall not foam when heated to 175 °C [347 °F].

3.3.3 The asphalt-rubber blend shall conform to the physical requirements of Table 1. This table was developed to provide a reference for specifying asphalt-rubber binder. The tests are intended to measure the degree of modification of the asphalt binder by the ground recycled tire rubber. Table 1 is not intended to be a performance-based specification.

4. Procedure

4.1 *Ground Recycled Tire Rubber:*

[3] Available from Deutsches Institut für Normung e.V.(DIN), Am DIN-Platz, Burggrafenstrasse 6, 10787 Berlin, Germany, http://www.din.de.

TABLE 1 Physical Requirements for Asphalt-Rubber Binder

Binder Designation[A]		Type I	Type II	Type III
Apparent Viscosity, 175 °C [347 °F]: D4402/D4402M[B] or D7741/D7741M[B] Pa·s [cP]	min	1.5 [1500]	1.5 [1500]	1.5 [1500]
	max	5.0 [5000]	5.0 [5000]	5.0 [5000]
Penetration, 25 °C [77 °F] 100 g, 5 s: 1/10 mm (Test Method D5/D5M)	min	25	25	50
	max	75	75	100
Penetration, 4 °C [39 °F], 200 g , 60 s: 1/10 mm (Test Method D5/D5M)	min	10	15	25
Softening Point, °C [°F]: (Test Method D36/D36M)	min	57 [135]	54 [130]	52 [125]
Resilience, 25 °C [77 °F], %: (Test Method D5329)	min	25	20	10
Flash Point, °C [°F]: (Test Method D92)	min	232 [450]	232 [450]	232 [450]
Thin-Film Oven Test Residue (Test Method D1754/D1754M)[C]	. . .	. . .	. . .	. . .
Penetration Retention, 4 °C [39.2 °F]: % of original (Test Method D5/D5M)	min	75	75	75

[A] See Appendix X1 for recommended climate guidelines for usage.
[B] Either modified Test Method D4402/D4402M or Test Method D7741/D7741M may be used for acceptance testing. Modified Test Method D4402/D4402M is the referee test method in case of dispute. See 5.4 for modified Test Method D4402/D4402M details for either acceptance or referee testing.
[C] RTFO residue (see Test Method D2872) may be substituted for TFOT residue, except TFOT shall be the referee method in cases of dispute.