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Standard Specification for Hot-Applied Asphalt Aggregate-Filled Mastic[1]

This standard is issued under the fixed designation D8260; 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 hot-applied asphalt aggregate-filled mastics for repairing distresses in asphalt pavements and hydraulic concrete pavements. These distresses include, but are not limited to: depressions, wide cracks not suitable for crack sealing, pot holes, corner breaks and longitudinal joint distresses, and other repairs smaller than those requiring remove and replace procedures.

1.2 The values stated in SI units are to be regarded as standard. No other units are included in this 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 *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.*

1.5 *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]

C1305/C1305M Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane

D1985 Practice for Preparing Concrete Blocks for Testing Sealants, for Joints and Cracks

D2794 Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

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

D4989/D4989M Test Method for Apparent Viscosity (Flow) of Roofing Bitumens Using the Parallel Plate Plastometer

E171/E171M Practice for Conditioning and Testing Flexible Barrier Packaging

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *aggregate-filled mastic, n*—voidless asphalt mix with an aggregate size smaller than 12.7 mm and pourable at application temperature under the force of gravity.

4. Significance and Use

4.1 This specification describes procedures for determining specification conformance for hot-applied asphalt aggregate-filled mastics.

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 the 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.

5. Standard Conditions

5.1 The laboratory atmospheric conditions, hereinafter referred to as standard conditions, shall be as detailed in Practice E171/E171M: 23 ± 2 °C and 50 ± 10 % relative humidity. The material shall be conditioned 24 h at standard conditions before melting or heating.

6. General Requirements

6.1 The hot-applied asphalt aggregate-filled mastic shall be composed of a mixture of binder and aggregate and will form a resilient, stable, and adhesive compound capable of effectively repairing or alleviating (or both) the distresses in pavements so that the ride quality is improved or the pavement life is extended (or both). The material shall be capable of being brought to the application temperature without segregation, will pour easily from a gravity-fed field melter, and is suitable for completely filling the area without inclusion

[1] This specification is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.33 on Formed In-Place Sealants for Joints and Cracks in Pavements.

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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.

of large air holes or discontinuities. The material shall remain relatively unchanged in application characteristics for at least 6 h at the maximum heating temperature in the field.

7. Physical Requirements

7.1 *Maximum Heating Temperature*—The maximum heating temperature is the highest temperature to which mastic can be heated and still conform to all the requirements specified herein. For purposes of testing as specified hereinafter, the application temperature shall be the same as the maximum heating temperature. The maximum heating temperature shall be set forth by the manufacturer, shall be shown on all containers, and shall be provided to the testing agency before any laboratory tests are begun.

7.2 The material shall conform to the requirements prescribed in Table 1 when heated to the maximum heating temperature.

8. Sampling and Heating

8.1 *Sampling:*

8.1.1 Samples may be taken at the plant or warehouse prior to delivery or at the time of delivery, at the option of the purchaser. If sampling is done prior to shipment, the inspector representing the purchaser shall have free access to the material to be sampled. The inspector shall be afforded all reasonable facilities for inspection and sampling which shall be conducted so as not to interfere unnecessarily with the operation of the works.

8.1.2 Samples shall consist of two of the manufacturer's original sealed containers selected at random from the lot or batch of finished material. A batch or lot shall be considered as all finished material that was manufactured simultaneously or continuously as a unit between the time of compounding and the time of packaging or placing in shipping containers.

8.1.3 One entire container of aggregate and binder shall be placed in a mixing vessel or bucket used in any type of mechanical asphalt mixer; the mixing vessel shall be large enough to accommodate an entire container of aggregate and binder.

8.2 *Heating:*

8.2.1 The mixing vessel with sample shall be placed in a thermostatically controlled, forced-draft oven; the forced-draft oven shall be capable of maintaining the specified test temperature ±1 °C and large enough to accommodate the mixing vessel. The oven shall be able to bring the material temperature to within 18 °C of the maximum heating temperature within 6 h of placement in the oven. Do not go over the maximum heating temperature; otherwise discard the material. It is recommended to set the temperature of the oven between the application temperature and 10 °C above it. Stir as needed to ensure thorough heating.

8.2.2 Once the sample is within 18 °C of the maximum heating temperature in the mixing vessel, it will be thoroughly mixed by mechanical means while heating until all particles of aggregate are fully coated and aggregate is dispersed evenly throughout to the maximum heating temperature. Do not heat with a direct flame. Material must reach maximum heating temperature within 1 h. Immediately upon reaching the maximum heating temperature, pour all specimens for testing directly. Finish all required testing within a week.

9. Test Methods

9.1 *Mastic Resilience:*

9.1.1 *Scope*—This test method measures the ability of mastic to recover after being compressed to a fixed thickness. 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.

9.1.2 *Significance and Use*—To function properly, the mastic material must recover after compression and maintain internal adhesion between the binder and the aggregate.

9.1.3 *Apparatus:*

9.1.3.1 *Load Frame,* or hydraulic press capable of maintaining a crosshead speed of approximately 50 mm/min under maximum load, with a minimum travel distance of 25 mm.

9.1.3.2 *Platens,* two. Steel, circular, or square, with attachment points suitable to the load frame or hydraulic press used for the test. Circular 152 mm minimum diameter, 6.4 mm minimum thickness; or square 152 mm minimum width and height, 6.4 mm minimum thickness.

9.1.3.3 *Ring Molds,* steel or brass, 66 ± 0.2 mm inside diameter, 2 mm minimum wall thickness, 25 ± 0.4 mm in height.

9.1.3.4 *Spacers,* two each. Steel, aluminum, or brass; height 12.5 ± 0.2 mm, width 12.5 ± 0.2 mm, 25 to 68 mm in length.

9.1.3.5 *Outside Calipers,* accurate to at least ±0.1 mm.

9.1.3.6 *Laboratory Gas Burner.*

9.1.3.7 *Trimming Tool,* straight edge, steel, 100 mm minimum blade width.

9.1.3.8 *Release Agent*—Silicone grease, glycerin/talc mixture, or other suitable non-petroleum material.

9.1.3.9 *Release Paper,* suitable for release after test.

TABLE 1 Material Requirements

	Type 1	Type 2	Type 3
Mastic Resilience	50 % minimum	50 % minimum	50 % minimum
Effects of Rapid Deformation	3 passing specimens no chipping, cracking, or separation 8 N-m –7 °C	3 passing specimens no chipping, cracking, or separation 8 N-m –18 °C	3 passing specimens no chipping, cracking, or separation 8 N-m –29 °C
Crack Bridging	3 cycles –7 °C	3 cycles –18 °C	3 cycles –29 °C
Mastic Stability	40.0 mm maximum 70 °C	40.0 mm maximum 60 °C	40.0 mm maximum 50 °C

9.1.4 *Conditioning*—Allow samples taken according to the sampling section above to acclimate to standard lab temperatures a minimum of 24 h before testing. Discard samples if the conditioning time exceeds five days.

9.1.5 *Specimen Preparation*—Coat the inside of the mold with release agent. Sample and heat the material according to the sampling and heating sections above. Pour the material into the mold and condition the specimen 2 h minimum at standard lab conditions before trimming. Trim the top of the specimen by heating the trimming tool with the burner and cutting flush with the top of the mold. Allow the material to condition in the mold at standard conditions for 12 to 24 h. Prepare three specimens for each sample.

9.1.6 *Procedure*—Remove the material from the mold, being careful to not distort the specimen. Make two measurements of the diameter of the material to 0.1 mm, approximately 90 degrees apart, with the calipers. Record the average of these two measurements to the nearest 0.1 mm as the starting diameter (*S*). Place a sheet of release paper on the base platen in the press or load frame. Place the material specimen on the release paper approximately at the center of the platen. Place the spacer blocks, 12.5 ± 0.2 mm in height, on either side of the specimen and at least 35 mm from the specimen. Place a sheet of release paper on top of the specimen. Slowly lower the press head until it just contacts the specimen. Start the compression by lowering the top platen at a rate of 2 mm per second, compressing the material until the top platen just contacts the spacers. Within 10 s of contacting the spacers, make two measurements of the compressed diameter of the material, approximately 90 degrees apart. Record the average of these two measurements to the nearest 0.1 mm as the compressed diameter (*C*). At 10 s, release the compression. Allow the specimen to recover on the release paper at standard conditions for 24 h ± 10 min. At the end of the recovery time, make two measurements of the recovered diameter of the material, 90 degrees apart, with the calipers. Record the average of these two measurements to the nearest 0.1 mm as the final diameter (*F*). Repeat this procedure for the two other specimens.

9.1.7 *Calculations*—Calculate the resilience:

$$\text{Resilience} = (C - F) / (C - S) \times 100 \quad (1)$$

9.1.8 *Report*—Report the average as the resilience in percent to the nearest 1.0 %.

9.1.9 *Precision and Bias*—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.

9.2 *D2794 Effects of Rapid Deformation*—With the following modifications.

9.2.1 Test specimen shall be 50 ± 1.0 mm in diameter with a thickness of 25 ± 1.0 mm. The ring molds can be steel or brass with 50 ± 0.2 mm inside diameter, 2 mm minimum wall thickness, and 25 ± 0.4 mm height. Coat the inside of the mold with release agent. Sample and heat the material according to the sampling and heating sections above. Pour the material into the mold and condition the specimen 2 h minimum at standard lab conditions before trimming. Trim the top of the specimen by heating the trimming tool with the burner and cutting flush with the top of the mold. Prepare three specimens for each sample.

9.2.2 Condition the specimens at test temperature for 20 ± 4 h in conditioning chamber at test temperature ±1 °C.

9.2.3 Remove the specimens from the freezer and impact the material in accordance with Test Method D2794 within 30 s.

9.2.4 Remove the specimens from the apparatus and observe the impact area for cracks, and note pass or fail. Any crack or fracture will be defined as failure.

9.2.5 *Precision and Bias*—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.

9.3 *C1305/C1305M Crack-Bridging Ability*—With the following modifications.

9.3.1 The substrate shall be concrete blocks and concrete blocks only, made according to Practice D1985.

9.3.2 In the place of spreading the compound, material prepared according to the sampling and heating section shall be applied in a mold over the concrete blocks (Test Method C1305/C1305M, Option B). The specimen mold shall be 50 ± 0.2 mm in length, 50 ± 0.2 mm in width, and 12.5 ± 0.2 mm thick. Three specimens shall be tested for each sample.

9.3.3 Condition the specimens in the test chamber or freezer according to the temperatures listed in Table 1 ±1°C for 4 to 24 h.

9.3.4 Three cycles shall be performed on each specimen. Between each cycle, the specimen shall be removed from the freezer and examined according to the standard. The cycles shall be in extension only.

9.3.5 The specimens shall be allowed to recompress for 2 h at standard conditions. The specimens must be returned to the chamber for at least 4 h between each cycle.

9.3.6 *Precision and Bias*—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.

9.4 *Mastic Stability:*

9.4.1 *Scope*—This test is to determine the resistance of the mastic to deformation at high temperatures during its service life.

9.4.2 *Significance and Use*—The ability of mastic to resist deformation at high temperatures is important in the functioning of a mastic material.

9.4.3 *Apparatus:*

9.4.3.1 *Ring Molds,* steel or brass, 66 ± 0.2 mm inside diameter, 2 mm minimum wall thickness, 25 ± 0.4 mm in height.

9.4.3.2 *Outside Calipers,* accurate to ±0.1 mm.

9.4.3.3 *Laboratory Gas Burner.*

9.4.3.4 *Release Agent*—Silicone grease, glycerin/talc mixture, or other suitable non-petroleum material.

9.4.3.5 *Parallel Plate Plastometer (PPP) Apparatus,* as described in Test Method D4989/D4989M.

9.4.3.6 *Bull's-Eye Level,* capable of leveling in two dimensions.

9.4.3.7 *Silicone-Coated Release Paper,* six squares, approximately 114 mm by 114 mm.

9.4.4 *Conditioning*—Allow samples taken according to the sampling section above to acclimate to standard lab temperatures a minimum of 24 h before testing. Discard samples if the conditioning time exceeds five days.

9.4.5 *Specimen Preparation*—Coat the inside of the mold with release agent. Sample and heat the material according to the sampling and heating section above. Pour the material into the mold and condition the specimen 2 h minimum at standard lab conditions before trimming. Trim the top of the specimen by heating the trimming tool with the burner and cutting flush with the top of the mold. Allow the material to condition in the mold at standard conditions for 12 to 24 h. Prepare three specimens for each sample.

9.4.6 *Procedure:*

9.4.6.1 Remove the specimen from the mold, being careful to not distort the specimen. Make two measurements of the diameter of the specimen, approximately 90 degrees apart, with the outside calipers. Record the average of these two measurements to the nearest 0.1 mm as the starting diameter (*S*). Place the specimen centered on a square of release paper and place another piece of release paper on the top.

9.4.6.2 Place PPP in a 70 °C forced-draft oven and level with the bull's-eye level. Condition the PPP without the specimen for at least 16 h.

9.4.6.3 Place the specimen with the release paper in the PPP, centered on the base platen with the top platen in the open position as described in Test Method D4989/D4989M. Condition the specimen and the PPP in an oven set according to the temperatures listed in Table 1 for 2 h ± 1 min. Rotate the upper platen of the PPP so that it is removed from its support and gently seat it on the specimen and start the timer.

9.4.6.4 After 10 min ± 10 s of compression, lift the top platen off the specimen into the open position and remove the specimen from the oven and place on a flat surface at standard lab conditions. Condition the specimen for 60 ± 5 min.

9.4.6.5 Make two measurements of the diameter of the material, approximately 90 degrees apart, with outside calipers. Record the average of these two measurements to the nearest 0.1 mm as the final diameter (*F*).

9.4.7 *Calculations*—Calculate the mastic stability of the specimens by subtracting the starting diameter from the final diameter.

$$\text{Mastic Stability} = (F) - (S) \tag{2}$$

9.4.8 *Report*—Report the average stability to the nearest 0.1 mm.

9.4.9 *Precision and Bias*—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.

10. Packaging and Package Marking

10.1 The sealing compound shall be delivered in the manufacturer's original containers. Each container shall be legibly marked with the name of the manufacturer, the trade name of the sealant, the manufacturer's batch or lot number and specification number and type, the minimum application temperature, and the maximum heating temperature. The maximum heating temperature must be at least 11 °C higher than the minimum application temperature.

11. Keywords

11.1 hot applied; mastic; patching

APPENDIX

(Nonmandatory Information)

X1. MATERIAL HEATING PRECAUTIONS

X1.1 Some, if not all, materials conforming to this specification may be damaged by heating to too high a temperature, reheating, or by heating for too long a time. Care should be exercised to secure equipment for heating and application that is suitable for the purpose and approved by the manufacturer of the material. The material should be heated in a kettle or melter constructed as a double boiler, with the space between the inner and outer shells filled with oil or other heat transfer medium. Thermostatic control for the heat transfer medium shall be provided and shall have sufficient sensitivity to maintain sealant temperature within the manufacturer's specified application temperature range. Temperature-indicating devices shall have intervals no greater than 5 °F (2.8 °C) and shall be calibrated as required to ensure accuracy. The melter shall have a continuous sealant agitation and mixing system to provide uniform viscosity and temperature of material being applied. If equipped with an application system to deliver sealant to the pavement, the melter shall incorporate a recirculation pump or other means of maintaining sealant temperature in the delivery system. Sealant that has been damaged due to overheating, reheating, or prolonged heating may experience poor adhesion, softening or bleeding, difficult application, or jelling in the melter. Direct heating must not be used.