



Designation: D 3515 – 01

Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures¹

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1. Scope

1.1 This specification covers hot-mixed, hot-laid asphalt, tar, emulsified asphalt, and recycled bituminous paving mixtures for base, binder, leveling, and surface courses.

1.2 The values stated in SI units are to be regarded as the standard. Combining values from the two systems may result in nonconformance with 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.*

2. Referenced Documents

2.1 ASTM Standards:

C 127 Test Method for Specific Gravity and Absorption of Coarse Aggregate²

C 128 Test Method for Specific Gravity and Absorption of Fine Aggregate²

C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates²

D 5 Test Method for Penetration of Bituminous Materials³

D 8 Terminology Relating to Materials for Roads and Pavements

D 75 Practice for Sampling Aggregates³

D 140 Practice for Sampling Bituminous Materials³

D 242 Specification for Mineral Filler for Bituminous Paving Mixtures³

D 448 Classification for Sizes of Aggregate for Road and Bridge Construction³

D 490 Specification for Road Tar³

D 546 Test Method for Sieve Analysis of Mineral Filler for Bituminous Paving Mixtures³

D 692 Specification for Coarse Aggregate for Bituminous Paving Mixtures³

D 946 Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction³

D 977 Specification for Emulsified Asphalt³

D 979 Practice for Sampling Bituminous Paving Mixtures³

D 995 Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures³

D 1073 Specification for Fine Aggregate for Bituminous Paving Mixtures³

D 1856 Test Method for Recovery of Asphalt from Solution by Abson Method³

D 2171 Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer³

D 2172 Test Methods for Quantitative Extraction of Bitumen from Bituminous Paving Mixtures³

D 2489 Test Method for Degree of Particle Coating of Bituminous-Aggregate Mixtures³

D 3203 Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures³

D 3381 Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction³

D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils⁴

D 4552 Practice for Classifying Hot-Mix Recycling Agents³

3. Terminology

3.1 Definitions are in accordance with Terminology D 8.

3.2 *Definitions:*

3.2.1 *bitumen aggregate for recycling*—bituminous pavement or paving mixture removed from its original location and reduced by suitable means to such particle size as may be required for use in hot-mixed, hot-laid recycled bituminous paving mixtures.

NOTE 1—Alternative terminology may be used for bitumen aggregate for recycling so long as the terms are defined or understood to refer to the same material. Reclaimed asphalt pavement (RAP) that has been removed from its original location and reduced in size as may be required.

3.2.2 *hot-mixed, hot-laid paving mixtures*—mixtures of coarse and fine aggregate or fine aggregate alone, with or without mineral filler, uniformly mixed with asphalt, tar, or emulsified asphalt.

3.2.3 *hot-mixed, hot-laid recycled bituminous paving mixtures*—mixtures of bitumen aggregate for recycling with or

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² *Annual Book of ASTM Standards*, Vol 04.02.

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

⁴ *Annual Book of ASTM Standards*, Vol 04.08.

without mineral aggregates and mineral filler, mixed at elevated temperatures with or without additional bitumen.

4. Ordering Information

4.1 Orders for bituminous paving mixtures under this specification shall include the following information:

4.1.1 Type of bitumen (asphalt cement, tar cement, emulsified asphalt),

4.1.2 Grade of bitumen,

4.1.3 The composition of the bituminous paving mixture (dense mixture and mix designation; open mixture and mix designation; open graded friction course mixture and mix designation),

4.1.4 The maximum percentage of bitumen aggregate for recycling permitted in the mixture when limited, and

4.1.5 The percentage of crushed particles required in the aggregate if different from that specified in Specification D 692.

5. Aggregates

5.1 The aggregates shall be crushed stone, crushed slag, crushed gravel, and natural or manufactured sand conforming to the quality and crushed particle requirements of the appropriate ASTM specifications as follows:

5.1.1 *Coarse Aggregate*—Specification D 692.

5.1.2 *Fine Aggregate*—Specification D 1073.

NOTE 2—Other mineral aggregates, such as uncrushed gravel, crushed shell, and various synthetic aggregates, may be specified, provided that local experience or tests have demonstrated their ability to produce satisfactory bituminous paving mixtures.

5.2 Recommended grading requirements for coarse and fine aggregate may be selected from Classification D 448 and Specification D 1073, respectively. Other aggregate gradations may be used, provided that the combined coarse and fine aggregates, and filler, when used, produce a mixture that conforms to the requirements for grading of total aggregate prescribed in Table 1.

5.3 When hot-mixed, hot-laid recycled bituminous mixtures are produced, aggregates conforming to 5.1 may be blended with the bitumen aggregate for recycling as necessary to produce the result required by 5.2.

6. Mineral Filler

6.1 The mineral filler shall conform to Specification D 242.

7. Bitumen

7.1 When asphalt cement is used, it shall conform to either Specifications D 3381 or D 946.

NOTE 3—The viscosity grade or the penetration grade to be used depends on the type of construction, climatic conditions, and amount and nature of traffic. The required viscosity grade or penetration grade should be specified.

7.2 When tar cement is used, it shall conform to Specification D 490.

NOTE 4—The grade to be used shall be RT-10, RT-11, or RT-12, depending upon the type of construction, climatic conditions, and the amount and nature of traffic. The required grade should be specified.

7.3 When emulsified asphalt is used it shall conform to Specification D 977, Grade HFMS-2h or MS-2h.

7.4 When specifically approved by the purchaser, other types of emulsified asphalt may be used, if experience has shown that satisfactory performance will result.

7.5 When hot-mixed, hot-laid recycled bituminous paving mixtures are produced, bitumen conforming to Specifications D 946, D 977, or D 3381 or recycling agents with or without bitumen conforming to Practice D 4552 shall be added to the asphalt bitumen for recycling as necessary.

8. Composition of Bituminous Paving Mixtures

8.1 The mixture shall conform to one of the compositions by weight given in Table 1 or Table 2.

NOTE 5—The mix designation selected should be determined by the intended use, thickness of paving courses, and desired texture.

8.1.1 Compositions shown in Table 1 or Table 2 are based on the use of fine and coarse aggregates having approximately the same bulk specific gravities; grading of the total aggregate, therefore, would be the same on either a weight or bulk volume basis. If the bulk specific gravities of coarse and fine aggregates differ by more than 0.20, it may be necessary to adjust the job mix aggregate grading slightly to account for the differences in volume.

8.2 A job mixture shall be selected that comes within the specification limits and that is suitable for the traffic, climatic conditions, and specific gravities of the aggregates used. Below the 2.36-mm (No. 8) sieve size, the job-mix formula grading curve shall be reasonably parallel to the curves of the grading limits as selected from Table 1.

8.3 Any variation from the job-mix formula in the grading of the aggregate, as shown by the sieve analyses of materials in the plant (Note 6) or, any variation from the job-mix formula in the bitumen content, as indicated by extraction tests of the finished mixture, greater than the percentage shown in Table 3, shall be investigated, and the conditions causing such variation shall be corrected (Note 7).

NOTE 6—It is recognized that the extraction test is a generally accepted and approved method for determining the composition of a bituminous concrete mixture. However, due to the relatively wide difference in the bitumen content and aggregate gradation sometimes found in individual samples of mixture taken from the same batch, as shown by extraction tests, it is recommended that the extraction test results on individual small samples be used as an indication of the mix composition, and not as the sole basis for acceptance or rejection of the product. Unless the mixing plant has automatic batching and recording equipment, it may be necessary to determine both aggregate gradation and bitumen content from extraction test samples.

NOTE 7—Application of tolerances may result in a gradation outside the composition limits in Table 1 or Table 2. This will not be cause for investigation.

9. Mixing Plant

9.1 The mixing plant shall conform to Specification D 995. When emulsified asphalt is used, the pugmill shall be adequately vented to allow for the escape of steam.

10. Mixing Plant Operation

10.1 *Aggregate Storage*—Aggregates furnished in different sizes or from different sources shall be kept separate, and