



Standard Specification for Aggregate for Single or Multiple Bituminous Surface Treatments¹

This standard is issued under the fixed designation D1139/D1139M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense. This specification replaces Federal Specification SS-S-445, Class C, Types I, II, and III.

1. Scope

1.1 This specification covers the quality and sizes of crushed stone, crushed slag, crushed expanded shale, crushed expanded clay, crushed expanded slate, and crushed or uncrushed gravel suitable for use as aggregate in single or multiple bituminous surface treatments.

1.2 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.

1.3 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 non-conformance with the standard.

1.3.1 Regarding sieves, per Specification E11 “The values stated in SI units shall be considered standard for the dimensions of the wire cloth openings and the diameter of the wires used in the wire cloth. The values stated in inch-pound units shall be considered standard with regard to the sieve frames.” When sieve mesh sizes are referenced, the alternate inch-pound designations are provided for information purposes and enclosed in parentheses.

2. Referenced Documents

2.1 ASTM Standards:²

C29/C29M Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate

¹ This specification is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.50 on Aggregate 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.

C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
C123 Test Method for Lightweight Particles in Aggregate
C125 Terminology Relating to Concrete and Concrete Aggregates
C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
C142 Test Method for Clay Lumps and Friable Particles in Aggregates
D8 Terminology Relating to Materials for Roads and Pavements
D75 Practice for Sampling Aggregates
D448 Classification for Sizes of Aggregate for Road and Bridge Construction
D3665 Practice for Random Sampling of Construction Materials
D4791 Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
D5821 Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Terminology

3.1 Other terms used in this specification are defined in Terminologies C125 and D8.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *crushed slag, n*—the product resulting from the crushing of air-cooled iron blast-furnace slag.

3.2.2 *gravel, n*—the product resulting from natural disintegration and abrasion of rock or processing of weakly bound conglomerate.

3.2.3 *uncrushed gravel, n*—the product resulting from screening and blending of material from the deposit, consisting of particles with a shape and texture largely dependent on the nature of the deposit. Some particles containing fractured



faces, resulting from the crushing of oversized material, are not prohibited from this product.

3.2.4 *crushed gravel, n*—the product resulting from the crushing of gravel, with a requirement that at least a prescribed percentage of the resulting particles have fracture faces. Some uncrushed particles are not prohibited.

3.2.5 *expanded shale, n; expanded clay, n; expanded slate, n*—the product resulting from the expanding of selected materials (shale, clay, or slate) in a rotary kiln at temperatures over 1000°C [1800°F].

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Specification designation number and year of issue,

4.1.2 Size to be furnished (see 6.1),

4.1.3 Quantity required,

4.1.4 Type of aggregate, as covered in the scope of this specification. If the type is not specified, no type shall be prohibited. In the case of crushed gravel, if the percentage of particles with fracture faces desired is different than that specified in 5.3, the minimum percentage desired shall be specified, and

4.1.5 Any special requirements.

5. Physical Requirements

5.1 *Degradation*—The aggregate (with the exception of crushed blast-furnace slag) when subjected to testing in accordance with Test Method C131 shall have a loss not greater than 40 %, by mass.

5.2 *Density*:

5.2.1 *Slag*—Crushed slag shall have a minimum density of 1120 kg/m³ [70 lb/ft³] as determined in accordance with Test Method C29/C29M, rodding procedure.

5.2.2 *Expanded Shale, Expanded Clay, and Expanded Slate*—The coarse aggregate, when tested in size No. 57 or No. 8, shall have a minimum density of 500 kg/m³ [31 lb/ft³] as determined in accordance with Test Method C29/C29M, shoveling procedure.

5.3 *Fractured Particles in Coarse Aggregate*—Not less than 60 %, by mass, of the aggregate particles retained on the 4.75-mm (No.4) sieve shall have at least two fractured faces.

NOTE 1—Some sources of aggregate contain angular particles that will perform similarly to a mechanically fractured particle. Such angular particles may be considered as fractured.

5.4 *Soundness*—The aggregate, when subjected to five cycles of the soundness test, shall have a weighted loss not

greater than 12 % when sodium sulfate is used or 18 % when magnesium sulfate is used. If the salt is not designated by the purchaser, the aggregate will not be prohibited if it meets the indicated limit for the salt used.

5.5 *Deleterious Substances*—The requirements prescribed in Table 1 apply to all aggregate types covered in the scope of this specification except as noted. The limits for clay lumps and friable particles, and for material floating on a liquid with a specific gravity of 2.0, shall be based on the portion of the sample retained on a 4.75-mm (No. 4) sieve.

6. Aggregate Size

6.1 The aggregate shall conform to Classification D448 for the size indicated by the purchaser.

7. Sampling and Testing

7.1 Sample the aggregates and determine the properties enumerated in this specification in accordance with the following test methods:

7.1.1 *Sampling*—Practice D75.

7.1.2 *Random Sampling*—Practice D3665.

7.1.3 *Degradation Resistance*—Test Method C131.

7.1.4 *Bulk Density of Aggregates*—Test Method C29/C29M.

7.1.5 *Sulfate Soundness*—Test Method C88.

7.1.6 *Sieve Analysis*—Test Method C136.

7.1.7 *Clay Lumps and Friable Particles*—Test Method C142.

7.1.8 *Lightweight Pieces*—Test Method C123.

7.1.9 *Flat and Elongated Pieces*—Test Method D4791.

7.1.10 *Fractured Particles*—Test Method D5821.

8. Keywords

8.1 aggregate; bituminous surface treatments; coarse aggregate; crushed slag; crushed stone; gravel; surface treatments

TABLE 1 Requirements for Deleterious Substances

Deleterious Substances	Mass %, max
Clay lumps and friable particles	3.0
Material floating on a liquid with a specific gravity of 2.0 ^A	1.0
Flat and elongated pieces, ^B retained on the 9.5-mm [$\frac{3}{8}$ -in.] sieve:	
Aggregate sizes No. 5, 6, 7	10.0
Aggregate sizes No. 8, 9	no requirement

^A This requirement does not apply to blast-furnace slag, expanded shale, expanded clay, nor expanded slate.

^B Pieces in which the ratio of the maximum to minimum dimensions of its circumscribing rectangular prism is greater than five.



APPENDIX

(Nonmandatory Information)

X1. SELECTION OF AGGREGATE SIZES

X1.1 The size of the aggregate will vary with the thickness of the surface course desired and with the type of construction contemplated, as described in the following statements:

TABLE X1.1 Aggregate Sizes for Different Thicknesses and Surface Treatments

Surface Treatment		Size No.	Sizes of Aggregates
Type	Application		Nominal size, Square Openings
Single	initial	5	25.0 to 12.5 mm [1 to ½ in.]
		6	19.0 to 9.5 mm [¾ to ⅝ in.]
		7	12.5 to 4.75 mm [½ in. to No. 4]
		8	9.5 to 2.36 mm [⅜ in. to No. 8]
		9	4.75 to 1.18 mm (No. 4 to No. 16)
Double	initial	5	25.0 to 12.5 mm [1 to ½ in.]
	second	7	12.5 to 4.75 mm [½ in. to No. 4]
Double	initial	6	19.0 to 9.5 mm [¾ to ⅝ in.]
	second	8	9.5 to 2.36 mm [⅜ in. to No. 8]
Triple	initial	5	25.0 to 12.5 mm [1 to ½ in.]
	second	7	12.5 to 4.75 mm [½ in. to No. 4]
	third	9	4.75 to 1.18 mm (No. 4 to No. 16)
Triple	initial	6	19.0 to 9.5 mm [¾ to ⅝ in.]
	second	8	9.5 to 2.36 mm [⅜ in. to No. 8]
	third	9	4.75 to 1.18 mm (No. 4 to No. 16)

X1.1.1 *Single Surface Treatment*—A single surface treatment is a wearing surface of bituminous material and aggregate in which the aggregate is placed uniformly over the applied bituminous materials in a single layer, the thickness of which approximates the nominal maximum size of the aggregate used.

X1.1.2 *Multiple Surface Treatments*—A multiple surface treatment is a wearing surface composed of bituminous material and aggregate, in which the coarser aggregate is placed uniformly over an initial application of bituminous material and followed by subsequent applications of bituminous material and smaller aggregate. Generally, the designated maximum size of the smaller aggregate is one half that of the aggregate used in the preceding application. Each application of aggregate should be placed uniformly in a single layer, the thickness of which approximates the nominal maximum size of the aggregate.

X1.2 The standard sizes recommended for aggregates for several thicknesses and types of surface treatments are listed in **Table X1.1**. The grading requirements for these standard sizes are given in Classification **D448**.

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