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Standard Specification for Aggregate for Single or Multiple Bituminous Surface Treatments¹

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This standard has been approved for use by agencies of the 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 values in SI units are to be regarded as standard. Inch-pound units, shown in parentheses, are for information only.

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.

2. Referenced Documents

2.1 ASTM Standards:

- C 29/C 29M Test Method for Unit Weight and Voids in Aggregate²
- C 88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate²
- C 123 Test Method for Lightweight Particles in Aggregate²
- C 125 Terminology Relating to Concrete and Concrete Aggregates²
- C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine²
- C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates²
- C 142 Test Method for Clay Lumps and Friable Particles in Aggregates²
- D 8 Terminology Relating to Materials for Roads and Pavements³

D 75 Practice for Sampling Aggregates³

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

D 3665 Practice for Random Sampling of Construction Materials³

D 4791 Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Course Aggregate³

D 5821 Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate³

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 Other terms used in this specification are defined in Terminologies C 125 and D 8.

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

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

3.1.4 *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.

3.1.5 *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.

3.1.6 *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.

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),

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

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

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 C 131 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 C 29/C 29M, 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 C 29/C 29M, shoveling procedure.

5.3 *Crushed Pieces in Aggregate*—Not less than 60 %, by mass, of the aggregate pieces retained on the 4.75-mm (No.4) sieve shall have at least two fractured faces (see Test Method D 5821).

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

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 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

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 or elongated pieces, ^B retained on the 9.5-mm (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.

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 D 448 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 D 75.

7.1.2 *Random Sampling*—Practice D 3665.

7.1.3 *Degradation Resistance*—Test Method C 131.

7.1.4 *Bulk Density of Aggregates*—Test Method C 29/C 29M.

7.1.5 *Sulfate Soundness*—Test Method C 88.

7.1.6 *Sieve Analysis*—Test Method C 136.

7.1.7 *Clay Lumps and Friable Particles*—Test Method C 142.

7.1.8 *Lightweight Pieces*—Test Method C 123.

7.1.9 *Flat or Elongated Pieces*—Test Method D 4791.

8. Keywords

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

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:

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

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)
Double	initial	5	25.0 to 12.5 mm (1 to ½ in.)
		7	12.5 to 4.75 mm (½ in. to No. 4)
	second	6	19.0 to 9.5 mm (¾ to ⅝ in.)
		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)

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 D 448.

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