



## Designation: D8140 – 18 (Reapproved 2023)

# Standard Guide for the Use of Foundry Sand in Asphalt Mixtures<sup>1</sup>

This standard is issued under the fixed designation D8140; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This guide covers the physical and chemical requirements of virgin or recovered foundry sand for use as a fine aggregate in asphalt mixtures.

1.2 This guide is for use by contractors, foundry sand suppliers, or other purchasers as part of the purchase document describing the material to be furnished. Those responsible for selecting the proportions for the asphalt mixture should have the responsibility of determining the proportions of foundry sand as a fine aggregate.

1.3 The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this standard.

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

1.5 *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.*

1.6 *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:<sup>2</sup>

**C88/C88M Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate**

<sup>1</sup> This guide 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

**C117 Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing**

**C125 Terminology Relating to Concrete and Concrete Aggregates**

**C128 Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate**

**C136/C136M Test Method for Sieve Analysis of Fine and Coarse Aggregates**

**C566 Test Method for Total Evaporable Moisture Content of Aggregate by Drying**

**D8 Terminology Relating to Materials for Roads and Pavements**

**D75/D75M Practice for Sampling Aggregates**

**D2488 Practice for Description and Identification of Soils (Visual-Manual Procedures)**

**D3665 Practice for Random Sampling of Construction Materials**

### 2.2 EPA Standards:<sup>3</sup>

**SW-846 Test Method 1312 Synthetic Precipitation Leaching Procedure**

**SW-846 Test Method 9045 Soil and Waste pH**

**SW-846 Section 7.3.3 Interim Guidance for Reactive Cyanide**

**SW-846 Section 7.3.4 Interim Guidance for Reactive Sulfide**

## 3. Terminology

### 3.1 Definitions:

3.1.1 *environmental consideration*—foundry sand should be evaluated for environmental consideration (air quality, water quality, and storage) using the required local, state, and federal test methods in effect at the time of use.

3.1.2 *foundry sand*—a fine aggregate used to produce molds or cores in foundry facilities, which are used to cast ferrous and non-ferrous metals, consisting mostly of silica sand, lake sand, olivine sand, or zircon sand.

3.2 For definitions of other terms used in this standard, refer to Terminologies D8 and C125 and EPA SW-846—Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods.

<sup>3</sup> Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, <http://www.epa.gov>.

#### 4. Ordering Information

4.1 The order for the material under this guide should include the following information:

4.1.1 Quantity, in metric tonnes.

4.1.2 If the soundness of the material in 6.5.1 is required, indicate whether the test was conducted with sodium or magnesium sulfate.

4.1.3 Any exceptions or additions to this guide.

4.2 *Certification*—When specified in the purchase order or contract, the purchaser should be furnished certification that samples representing each lot have been tested as directed in this guide and the specified requirements have been met. When specified in the purchase order or contract, a report of the test results should be furnished.

#### 5. General Characteristics

5.1 The foundry sand should consist of hard, tough, durable pieces of fine aggregates. The aggregates should be processed as necessary to meet the requirements of this guide by crushing or screening (or both) and by magnetic separation for the removal of metallic particles.

5.2 The foundry sand should be free of potential waste streams in foundry facilities: slag, dust, sludge, and other waste streams.

5.3 At the time of delivery, by visual inspection, the foundry sand should not contain deleterious amounts of sand agglomerations or foreign materials such as clay, loams, wood, tramp metal, hard cores, and other mill wastes. (See Note 1.)

NOTE 1—Deleterious contents typically do not exceed 4 to 6 %. Plasticity index usually does not exceed 4 %.

#### 6. Material Quality

6.1 The grading of the foundry sand should conform to the requirements for grading prescribed in Table 1 or as prescribed by the end user.

6.2 The grain shape of foundry sand particles should be sub-angular to round, as per Practice D2488.

6.3 The relative density of foundry sand should be between 2.4 and 2.8.

6.4 The maximum moisture content of the foundry sand should be 5 % or less.

6.5 *Optional Physical Requirements:*

6.5.1 *Soundness* (Test Method C88/C88M)—Foundry sand subjected to five cycles of the soundness test should have a

weighted average loss not greater than 15 % when sodium sulfate is used or 20 % when magnesium sulfate is used.

6.5.2 Foundry sand failing to meet the requirements of 6.5.1 could be regarded as meeting the requirements of soundness, provided that the supplier of the foundry sand demonstrates to the purchaser or specifier that bituminous mixtures containing the proposed foundry sand have previously provided satisfactory service when exposed to weathering similar to that to be encountered.

#### 7. Environmental Requirements

7.1 Foundry sand from bronze/brass foundry is not covered in this standard.

7.2 The foundry sand should meet all applicable local, state, and federal environmental requirements in effect at the time of use.

7.2.1 *Toxicity*—The characteristics of leachate from the foundry sand should be tested using the synthetic precipitation leaching procedure (SPLP) described in EPA SW-846 Test Method 1312 (see Note 2), or appropriate test method as approved by the purchaser. Results should indicate that all areas tested (inorganic chemicals and organic chemicals) are below regulatory limits.

NOTE 2—The synthetic precipitation leaching procedure (SPLP) is a water leaching procedure for determining solubility/availability of various metals in a sample.

7.2.2 *Reactivity*—The amount of reactive cyanide and reactive sulfide in the foundry sand should be tested using the interim guidance for reactive cyanide (EPA SW-846 Section 7.3.3) and interim guidance for reactive sulfide (EPA SW-846 Section 7.3.4), respectively. Results should be below regulatory limits.

#### 8. Sampling and Testing Methods

8.1 Sample and test the foundry sand in accordance with one or more of the following methods, except as otherwise provided in this guide. It is not intended to prohibit use of separated sizes from the sieve analysis for preparation of samples for soundness test.

8.1.1 *Sampling*—Practices D75/D75M and D3665.

8.1.2 *Grading*—Test Method C136/C136M.

8.1.3 *Particles Finer Than 75 μm (No. 200) Sieve by Washing*—Test Method C117.

8.1.4 *Grain Shape*—Practice D2488.

8.1.5 *Evaporable Moisture Content*—Test Method C566.

8.1.6 *Specific Gravity*—Test Method C128.

8.1.7 *Soundness*—Test Method C88/C88M.

8.1.8 *Toxicity*—EPA SW-846 Test Method 1312.

8.1.9 *Reactivity*—EPA SW-846 Sections 7.3.3 and 7.3.4.

#### 9. Foundry Sand Supplier's Statement

9.1 At the request of the purchaser, the manufacturer should state in writing the nature of the foundry sand, including metal cast, the material mineral type, the cast processing type (mold or core), the binder materials, and the binding methods. The amount and any processing to foundry sand should be available at the request of the purchaser.

**TABLE 1 Foundry Sand Grading**

Sieve Size	Particle Size Distribution	
	Percent Passing	
4.75 mm (No. 4)	100	
2.36 mm (No. 8)	95–100	
1.18 mm (No. 16)	90–100	
600 μm (No. 30)	85–100	
300 μm (No. 50)	50–90	
150 μm (No. 100)	5–25	
75 μm (No. 200)	0–10	