
Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

AASHTO Designation: T 27-20 ¹

Technical Subcommittee: 1c, Aggregates

Release: Group 3 (July)

ASTM Designation: C136-06



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1. SCOPE

- 1.1. This method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.
- 1.2. Some specifications for aggregates, which reference this method, contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.
- 1.3. The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only.
- 1.4. *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this procedure to consult and establish appropriate safety and health practices and to determine the applicability of regulatory regulations prior to its use.*

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
 - M 231, Weighing Devices Used in the Testing of Materials
 - R 76, Reducing Samples of Aggregate to Testing Size
 - R 90, Sampling Aggregate Products
 - T 11, Materials Finer Than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
- 2.2. *ASTM Standards:*
 - C125, Standard Terminology Relating to Concrete and Concrete Aggregates
 - C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
 - E11, Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. TERMINOLOGY

- 3.1. *Definitions*—For definitions of terms used in this standard, refer to ASTM C125.

4. SUMMARY OF METHOD

- 4.1. A sample of dry aggregate of known mass is separated through a series of sieves of progressively smaller openings for determination of particle size distribution.

5. SIGNIFICANCE AND USE

- 5.1. This method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specification requirements and to provide necessary data for control of the production of various aggregate products and mixtures containing aggregates. The data may also be useful in developing relationships concerning porosity and packing.
- 5.2. Accurate determination of material finer than the 75- μm (No. 200) sieve cannot be achieved by use of this method alone. T 11 for material finer than the 75- μm (No. 200) sieve by washing should be employed.

6. APPARATUS

- 6.1. *Balance*—The balance shall have sufficient capacity, be readable to 0.1 percent of the sample mass, or better, and conform to the requirements of M 231.
- 6.2. *Sieves*—The sieve cloth shall be mounted on substantial frames constructed in a manner that will prevent loss of material during sieving. The sieve cloth and standard sieve frames shall conform to the requirements of ASTM E11. Nonstandard sieve frames shall conform to the requirements of ASTM E11 as applicable.
- Note 1**—It is recommended that sieves mounted in frames larger than standard 203.2 mm (8 in.) diameter be used for testing coarse aggregate to reduce the possibility of overloading the sieves. See Section 8.3.
- 6.3. *Mechanical Sieve Shaker*—A mechanical sieving device, if used, shall create motion of the sieves to cause the particles to bounce, tumble, or otherwise turn so as to present different orientations to the sieving surface. The sieving action shall be such that the criterion for adequacy of sieving described in Section 8.4 is met in a reasonable time period.
- Note 2**—Use of a mechanical sieve shaker is recommended when the size of the sample is 20 kg (44 lb) or greater, and may be used for smaller samples, including fine aggregate. Excessive time (more than approximately 10 min) to achieve adequate sieving may result in degradation of the sample. The same mechanical sieve shaker may not be practical for all sizes of samples because the large sieving area needed for practical sieving of a large nominal size coarse aggregate very likely could result in loss of a portion of the sample if used for a smaller sample of coarse aggregate or fine aggregate.
- 6.4. *Oven*—An oven of appropriate size capable of maintaining a uniform temperature of $110 \pm 5^\circ\text{C}$ ($230 \pm 9^\circ\text{F}$).

7. SAMPLING

- 7.1. Sample the aggregate in accordance with R 90. The mass of the field sample shall be the mass shown in R 90 or four times the mass required in Sections 7.4 and 7.5 (except as modified in Section 7.6), whichever is greater.

- 7.2. Thoroughly mix the sample and reduce it to an amount suitable for testing using the applicable procedures described in R 76. The sample for test shall be the approximate mass desired when dry and shall be the end result of the reduction. Reduction to an exact predetermined mass shall not be permitted.

Note 3—Where sieve analysis, including determination of material finer than the 75- μm (No. 200) sieve, is the only testing proposed, the size of the sample may be reduced in the field to avoid shipping excessive quantities of extra material to the laboratory.

- 7.3. *Fine Aggregate*—The size of the test sample of aggregate, after drying, shall be 300 g minimum.

- 7.4. *Coarse Aggregate*—The mass of the test sample of coarse aggregate shall conform with the following:

Nominal Maximum Size Square Openings, mm (in.)	Minimum Mass of Test Sample, kg (lb)
9.5 ($\frac{3}{8}$)	1 (2)
12.5 ($\frac{1}{2}$)	2 (4)
19.0 ($\frac{3}{4}$)	5 (11)
25.0 (1)	10 (22)
37.5 ($1\frac{1}{2}$)	15 (33)
50 (2)	20 (44)
63 ($2\frac{1}{2}$)	35 (77)
75 (3)	60 (130)
90 ($3\frac{1}{2}$)	100 (220)
100 (4)	150 (330)
125 (5)	300 (660)

- 7.5. *Coarse and Fine Aggregates Mixtures*—The mass of the test sample of coarse and fine aggregate mixtures shall be the same as for coarse aggregate in Section 7.4.

- 7.6. *Samples of Large-Size Coarse Aggregate*—The size of sample required for aggregate with 50-mm (2-in.) nominal maximum size or larger is such as to preclude convenient sample reduction and testing as a unit except with large mechanical splitters and sieve shakers. As an option when such equipment is not available, instead of combining and mixing sample increments and then reducing the field sample to testing size, conduct the sieve analysis on a number of approximately equal sample increments such that the total mass tested conforms to the requirements of Section 7.4.

- 7.7. In the event that the amount of material finer than the 75- μm (No. 200) sieve is to be determined by T 11, use the procedure described in Section 7.7.1 or 7.7.2, whichever is applicable.

- 7.7.1. For aggregates with a nominal maximum size of 12.5 mm ($\frac{1}{2}$ in.) or less, use the same test sample for testing by T 11 and this method. First test the sample in accordance with T 11 through the final drying operation, then dry sieve the sample as stipulated in Sections 8.2 through 8.6 of this method.

- 7.7.2. For aggregates with a nominal maximum size greater than 12.5 mm ($\frac{1}{2}$ in.), a single test sample may be used as described in Section 7.7.1 or separate test samples may be used for T 11 and this method.

- 7.7.3. Where the specification requires determination of the total amount of material finer than the 75- μm (No. 200) sieve by washing and dry sieving, use the procedure described in Section 7.7.1.