



Designation: **C136/C136M – 14** **C136/C136M – 19**

Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates¹

This standard is issued under the fixed designation C136/C136M; 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.

1. Scope*

1.1 This test 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 test method contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.

1.3 *Units*—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.

NOTE 1—Sieve size is identified by its standard designation in Specification E11. The alternative designation given in parentheses is for information only and does not represent a different standard sieve size. Specification E11 cites the following with respect to SI units versus inch-pound units as standard. “The values stated in SI units shall be considered standard for the dimensions of the sieve cloth openings and the wire diameters used in the sieve cloth. The values stated in inch-pound units shall be considered standard with regard to the sieve frames, pans,” and covers.

1.4 *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.*

1.5 *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:²

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

C125 Terminology Relating to Concrete and Concrete Aggregates

C637 Specification for Aggregates for Radiation-Shielding Concrete

C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

C702 Practice for Reducing Samples of Aggregate to Testing Size

D75 Practice for Sampling Aggregates

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

2.2 AASHTO Standard:

AASHTO No. T 27 Sieve Analysis of Fine and Coarse Aggregates³

3. Terminology

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

4. Summary of Test 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.

¹ This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.20 on Normal Weight Aggregates.

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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.

³ Available from American Association of State Highway and Transportation Officials, 444 North Capitol St. N.W., Suite 225, Washington, DC 20001.

*A Summary of Changes section appears at the end of this standard



5. Significance and Use

5.1 This test 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 test method alone. Use Test Method C117 for determination of material finer than the 75-µm (No. 200) sieve by ~~washing should be employed.~~ washing.

5.3 Refer to methods of sampling and testing in Specification C637 for heavyweight aggregates.

6. Apparatus

6.1 *Balances*—Balances or scales used in testing fine and coarse aggregate shall have readability and accuracy as follows:

6.1.1 For fine aggregate, readable to 0.1 g and accurate to 0.1 g or 0.1 % of the test load, whichever is greater, at any point within the range of use.

6.1.2 For coarse aggregate, or mixtures of fine and coarse aggregate, readable and accurate to 0.5 g or 0.1 % of the test load, whichever is greater, at any point within the range of use.

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 Specification E11. Nonstandard sieve frames shall conform to the requirements of Specification E11 as applicable.

NOTE 2—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 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 8.4 is met in a reasonable time period.

NOTE 3—Use of a mechanical sieve shaker is recommended when the size of the sample is 20 kg 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, since 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 small sample of coarse aggregate or fine aggregate.

6.4 *Oven*—An oven of appropriate size capable of maintaining a uniform temperature of 110 ± 5 °C [230 ± 10 °F].

7. Sampling

7.1 Sample the aggregate in accordance with Practice D75. The size of the field sample shall be the quantity shown in Practice D75 or four times the quantity required in 7.4 and 7.5 (except as modified in 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 Practice C702. The sample for test shall be approximately the quantity desired when dry and shall be the end result of the reduction. Reduction to an exact predetermined quantity shall not be permitted.

NOTE 4—Where sieve analysis, including determination of material finer than the 75-µm 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, after drying, shall be 300 g minimum.

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

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

7.5 *Coarse and Fine Aggregate Mixtures*—The size of the test sample of coarse and fine aggregate mixtures shall be the same as for coarse aggregate in 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 requirement of 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 Test Method C117, proceed as follows:

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 Test Method C117 and this test method. First test the sample in accordance with Test Method C117 through the final drying operation, then dry sieve the sample as stipulated in 8.2 – 8.7 of this test method.

7.7.2 For aggregates with a nominal maximum size greater than 12.5 mm [$\frac{1}{2}$ in.], use a single test sample as described in 7.7.1, or optionally use separate test samples for Test Method C117 and this test method.

7.7.3 Where the specifications require determination of the total amount of material finer than the 75- μm sieve by washing and dry sieving, use the procedure described in 7.7.1.

8. Procedure

8.1 Dry the sample to constant mass at a temperature of 110 ± 5 °C [230 ± 10 °F].

NOTE 5—For control purposes, particularly where rapid results are desired, it is generally not necessary to dry coarse aggregate for the sieve analysis test. The results are little affected by the moisture content unless: (1) the nominal maximum size is smaller than about 12.5 mm ($\frac{1}{2}$ in.); (2) the coarse aggregate contains appreciable material finer than 4.75 mm (No. 4); or (3) the coarse aggregate is highly absorptive (a lightweight aggregate, for example). Also, samples may be dried at the higher temperatures associated with the use of hot plates without affecting results, provided steam escapes without generating pressures sufficient to fracture the particles, and temperatures are not so great as to cause chemical breakdown of the aggregate.

8.2 Select sieves with suitable openings to furnish the information required by the specifications covering the material to be tested. Use additional sieves as desired or necessary to provide other information, such as fineness modulus, or to regulate the amount of material on a sieve. Nest the sieves in order of decreasing size of opening from top to bottom and place the sample on the top sieve. Agitate the sieves by hand or by mechanical apparatus for a sufficient period, established by trial or checked by measurement on the actual test sample, to meet the criterion for adequacy or sieving described in 8.4.

8.3 Limit the quantity of material on a given sieve so that all particles have opportunity to reach sieve openings a number of times during the sieving operation. For sieves with openings smaller than 4.75-mm (No. 4), the quantity retained on any sieve at the completion of the sieving operation shall not exceed 7 kg/m² of sieving surface area (Note 6). For sieves with openings 4.75 mm (No. 4) and larger, the quantity retained in kg shall not exceed the product of $2.5 \times$ (sieve opening, mm \times (effective sieving area, m²)). This quantity is shown in Table 1 for five sieve-frame dimensions in common use. In no case shall the quantity retained be so great as to cause permanent deformation of the sieve cloth.

8.3.1 Prevent an overload of material on an individual sieve by one of the following methods:

8.3.1.1 Insert an additional sieve with opening size intermediate between the sieve that may be overloaded and the sieve immediately above that sieve in the original set of sieves.

8.3.1.2 Split the sample into two or more portions, sieving each portion individually. Combine the masses of the several portions retained on a specific sieve before calculating the percentage of the sample on the sieve.

8.3.1.3 Use sieves having a larger frame size and providing greater sieving area.

TABLE 1 Maximum Allowable Quantity of Material Retained on a Sieve, kg [lb]

Sieve Opening Size, mm	Nominal Dimensions of Sieve ^A				
	[8-in.] diameter ^B	[10-in.] diameter ^B	[12-in.] diameter ^B	[14-in. by 14-in.]	[14.5-in. by 23-in.]
	Sieving Area, m ² [ft ²]				
	0.0285 [0.3]	0.0457 [0.5]	0.0670 [0.7]	0.1225 [1.3]	0.2158 [2.3]
125	^C	^C	^C	^C	67.4 [148½]
100	^C	^C	^C	30.6 [67½]	53.9 [118¾]
90	^C	^C	15.1 [33¼]	27.6 [60¾]	48.5 [106¾]
75	^C	8.6 [19]	12.6 [27¾]	23.0 [50¾]	40.5 [89¼]
63	^C	7.2 [15¾]	10.6 [23¼]	19.3 [42½]	34.0 [75]
50	3.6 [8]	5.7 [13]	8.4 [18½]	15.3 [33¾]	27.0 [59½]
37.5	2.7 [6]	4.3 [9½]	6.3 [13¾]	11.5 [25¼]	20.2 [44½]
25.0	1.8 [4]	2.9 [6½]	4.2 [9¼]	7.7 [17]	13.5 [29¾]
19.0	1.4 [3½]	2.2 [4¾]	3.2 [7½]	5.8 [12¾]	10.2 [22½]
12.5	0.89 [2]	1.4 [3]	2.1 [4¾]	3.8 [8¼]	6.7 [14¾]
9.5	0.67 [1½]	1.1 [2½]	1.6 [3½]	2.9 [6¼]	5.1 [11¼]
4.75	0.33 [¾]	0.54 [1¼]	0.80 [1¾]	1.5 [3¼]	2.6 [5¾]

^A Sieve frame dimensions in inch units: 8.0-in. diameter; 10.0-in. diameter, 12.0-in. diameter; 13.8 by 13.8 in. (14 by 14 in. nominal); 14.6 by 22.8 in. (16 by 24 in. nominal).

^B The sieve area for round sieve frames is based on an effective diameter 12.5 mm [$\frac{1}{2}$ in.] less than the nominal frame diameter, because Specification E11 permits the sealer between the sieve cloth and the frame to extend 6.5 mm [$\frac{1}{4}$ in.] over the sieve cloth. Thus the effective sieving diameter for a 203-mm [8.0-in.] diameter sieve frame is 190.5 mm [7.5 in.]. Sieves produced by some manufacturers do not infringe on the sieve cloth by the full 6.5 mm [$\frac{1}{4}$ in.].

^C Sieves indicated have less than five full openings and should not be used openings. Do not use for sieve testing except as provided in 8.6.