



Designation: C 184 – 94^{ε1}

Standard Test Method for Fineness of Hydraulic Cement by the 150-μm (No. 100) and 75-μm (No. 200) Sieves¹

This standard is issued under the fixed designation C 184; 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.

^{ε1} NOTE—The calculation in 6.1.1.1 was corrected editorially in February 1996.

1. Scope

1.1 This test method covers determination of the fineness of hydraulic cement by means of the 150-μm (No. 100) and 75-μm (No. 200) sieves.

1.2 *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.3 The values given in SI units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

C 114 Test Methods for Chemical Analysis of Hydraulic Cement²

E 11 Specification for Wire-Cloth Sieves for Testing Purposes³

3. Apparatus

3.1 *Sieves*—Standard 150-μm (No. 100) or 75-μm (No. 200) sieves conforming to the requirements of Specification E 11. Wire cloth for standard sieves for cement shall be woven (not twilled) from brass, bronze, or other suitable wire, and mounted without distortion on a frame about 50 mm (2 in.) below the top of the frame. The joint between the cloth and frame shall be smoothly filled with solder to prevent lodging of the cement. The sieve frame shall be circular, 203 mm (8 in.) in diameter and provided with a pan and cover.

3.2 *Balance*—The analytical balance used in fineness determinations shall conform to the requirements of 4.2.1 of Test Methods C 114.

3.3 *Weights*—The weights used in fineness determinations shall conform to the requirements of 4.2.2 of Test Methods C 114.

3.4 *Brush*—A bristle brush will be required for use in

cleaning the 150-μm (No. 100) or 75-μm (No. 200) sieve. A25 or 38-mm (1 or 1½-in.) brush with a 250-mm (10-in.) handle is a convenient size.

4. Sieve Correction

4.1 *150-μm (No. 100) Sieve*—Correction of the residues obtained on the No. 100 sieve is not required.

4.2 *75-μm (No. 200) Sieve:*

4.2.1 A 75-μm (No. 200) sieve may or may not need to be standardized, depending on the accuracy required. For internal laboratory use, where changes in fineness are of more importance than the absolute value, standardization may not be necessary. A correction factor should be established where accuracy is desired in order to compare results between laboratories.

4.2.2 If the intended use of the sieve is such that a correction need be established, follow the procedure described in Annex A1.

5. Procedure

5.1 Place a 50-g sample of the cement on the clean, dry 150-μm (No. 100) or 75-μm (No. 200) sieve with the pan attached. Do not use washers, shot, slugs, or coins on the sieve. While holding the sieve and uncovered pan in both hands, sieve with a gentle wrist motion until most of the fine material has passed through and the residue looks fairly clean. This operation usually requires only 3 or 4 min. When the residue appears clean place the cover on the sieve and remove the pan. Then, with the sieve and cover held firmly in one hand, gently tap the side of the sieve with the handle of the brush used for cleaning the sieve. Dust adhering to the sieve will thus be dislodged and the underside of the sieve may then be swept clean. Empty the pan and thoroughly wipe it out with a cloth or waste, replace the sieve in the pan, and carefully remove the cover. Return any coarser material that has been caught in the cover during the tapping to the sieve.

5.2 Continue the sieving without the cover as described in 5.1 for 5 or 10 min, depending on the condition of the cement. The gentle wrist motion involves no danger of spilling the residue, which shall be kept well spread out on the sieve. Continuously rotate the sieve throughout the sieving. This open sieving may usually be continued safely for 9 min or more, but

¹ This test method is under the jurisdiction of ASTM Committee C-1 on Cement and is the direct responsibility of Subcommittee C01.25 on Fineness.

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² *Annual Book of ASTM Standards*, Vol 04.01.

³ *Annual Book of ASTM Standards*, Vol 14.02.

take care that it is not continued too long. Then replace the cover and clean, following the same process as described in 5.1. If the cement is in proper condition, there should now be no appreciable dust remaining in the residue nor adhering to the sieve or pan.

5.3 Make 1-min tests as follows: Hold the sieve, with the pan and cover attached, in one hand in a slightly inclined position and move it forward and backward in the plane of inclination; at the same time gently strike the side about 150 times/min against the palm of the other hand on the upstroke. Perform the sieving over a white paper. Return any material escaping from the sieve or pan and collecting on the paper to the sieve. After every 25 strokes, turn the sieve about one sixth of a revolution, in the same direction (see Note). Continue the sieving operation until not more than 0.05 g of the material passes through in 1 min of continuous sieving. Then transfer the residue on the sieve to the balance pan, taking care to brush the sieve cloth thoroughly from both sides to ensure the removal of all the residue from the sieve.

NOTE 1—Sieve covers may be marked with three straight lines, intersecting at 60°, through the center. If one of the lines is marked with an arrowhead and the habit of starting with this point under the right hand has been formed, one can easily follow the progress of the 1-min tests. Be certain to take a full 10 s for the 25-stroke period. This will mean that the 150 strokes, plus turning the sieve, will take more than 1 min total. It is important that a full minute of sieving takes place.

6. Calculation

6.1 Calculate the fineness of the samples as follows:

6.1.1 *When No Correction is Used:*

$$F = 100 - [(R_s \times 100)/W] \quad (1)$$

where:

F = fineness of cement expressed as the percentage passing the 150- μ m (No. 100) or the 75- μ m (No. 200) sieve,

R_s = residue from sample retained on the 150- μ m (No. 100) or the 75- μ m (No. 200) sieve, g, and

W = weight of sample, g.

6.1.1.1 *Example—150- μ m (No. 100) Sieve:*

Residue from sample being tested = 0.82 g

Sample weight = 50.00 g

Amount passing 150- μ m sieve, % = $100 - [(0.82 \times 100)/50]$
= $100 - 1.64 = 98.36$ % (round to 98.4 %)

6.1.2 *Using Correction*—The correction determined by the procedure in the Annex is a point correction valid in the same general fineness area as the sample used in the standardization procedure:

$$R_c = [(R_s \times 100)/W] + C \quad (2)$$

$$F = 100 - R_c \quad (3)$$

where:

F = fineness of cement expressed as the percentage passing the 75- μ m (No. 200) sieve,

R_s = residue from sample retained on the 75- μ m (No. 200) sieve, g,

C = sieve correction, %, which may be either plus or minus, determined by the procedures given in the Annex,

R_c = corrected residue, %, and

W = weight of sample, g.

6.1.2.1 *Example—75- μ m (No. 200) Sieve:*

Residue from sample being tested = 0.82 g

Sieve correction applied to percent of residue = -0.2 %

Sample weight = 50.00 g

Corrected residue = $[(0.82 \times 100)/50] - 0.2 = 1.64 - 0.2 = 1.44$ %

Amount passing 75- μ m sieve, % = $100 - 1.44 = 98.56$ %
(round to 98.6 %)

7. Report

7.1 Report the fineness as the amount passing the number sieve on which the determination was made.

8. Mechanical Sieving

8.1 Mechanical sieving devices may be used, but the cement shall not be rejected if it meets the fineness requirement when tested by the hand method described in Section 5.

9. Precision and Bias

9.1 No precision data are available due to the limited use of this test method. Therefore, users are advised to develop their own laboratory precision.

9.2 Since there is no accepted reference material suitable for determining any bias that may be associated with this test method, no statement on bias is being made.

10. Keywords

10.1 fineness; hydraulic cement; sieve

(Mandatory Information)

A1. METHOD FOR DETERMINATION OF SIEVE CORRECTION

A1.1 To determine the percentage of a test material passing through a nominal 75- μm (No. 200) sieve, two additional sieves are needed: a 90- μm (No. 170) and a 63- μm (No. 230) sieve. Using NIST SRM No. 1004 (No. 140 to No. 400 sieves), Glass Bead Standard, determine the effective openings of each of the three sieves.⁴

NOTE A1.1—NIST SRM No. 1004 tends to blind the screen during use and the beads lodged in the meshes are difficult to remove. Tapping the frame of the sieve and gentle brushing of the cloth from the underside will aid in recovering all the beads and keep the bead loss down to approximately 50 mg.

A1.2 Select a test sample of calibration. It is important that the sample for calibration be of the same typical fineness as the range at which the sieve is to be used. Determine the percent residue of the test material on each of the three sieves, in accordance with Section 5. Plot the average percent residues *versus* the effective openings determined above. The percent residue at the nominal opening of the 75- μm (No. 200) sieve

can be read off the plot and the difference between the actual obtained residue and the nominal percent residue at 75- μm may be used algebraically as a correction for that sieve only in the same general fineness area.

A1.3 *Example—Determination of Sieve Correction Factor for 75- μm (No. 200) Sieve*

A1.3.1 Using the SRM 1004, the following was determined:

(a) Effective opening of nominal sieves being corrected:

75- μm (No. 200)	72 μm
90- μm (No. 170)	90 μm
63- μm (No. 230)	65 μm

(b) Test sample residue, % (to be plotted on graph paper):

at 90 μm	1.1 %
at 72 μm	2.3 %
at 65 μm	2.8 %

(c) From the above plot:

$$\text{Residue at } 75\text{-}\mu\text{m} = 2.1 \% \quad (\text{A1.1})$$

A1.3.2 Since the sieve is woven too tightly and retains more than it should if it were a 75- μm opening, the correction, *C*, to be applied to the residue in percent is -0.2% .

⁴ Available from the National Institute of Standards and Technology, Gaithersburg, MD 20899.

For additional useful information on details of cement test methods, reference may be made to the “Manual of Cement Testing,” *Annual Book of ASTM Standards*, Vol 04.01.

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