Standard Test Method for Fineness of Hydraulic Cement by the 45-μm (No. 325) Sieve[1]

This standard is issued under the fixed designation C430; 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.

1. Scope*

1.1 This test method covers the determination of the fineness of hydraulic cement by means of the 45-μm (No. 325) sieve.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound equivalents of SI units may be approximate.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E161 Specification for Precision Electroformed Sieves

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

3. Apparatus

3.1 *Sieve:*

3.1.1 *Sieve Frame*—The sieve frame shall be of metal not subject to corrosion by water and shall be circular, either 51 ± 6 mm (2.0 ± 0.25 in.) when woven-wire cloth is mounted in the frame or 76 ± 6 mm (3.0 ± 0.25 in.) in diameter when an electroformed sheet is mounted in the frame. The depth of the sieve from the top of the frame to the cloth or sheet shall be 76 ± 6 mm (3.0 ± 0.25 in.). The frame shall have either side walls of 89 ± 6 mm (3.5 ± 0.25 in.) in total height, or legs at least 12 mm (0.5 in.) in length, sufficient to allow air circulation beneath the sieve cloth or electroformed sheet.

3.1.2 *Sieve Cloth or Electroformed Sheet*—The sieve frame shall be fitted with either a 45-μm (No. 325) stainless steel AISI Type 304 woven-wire sieve cloth, conforming to the requirements of Specification E11 or a 45-μm electroformed reinforced nickel sieve sheet conforming to the requirements of Specification E161 with the exception that the number of openings shall be 71 ± 2 per linear centimetre (180 ± 5 per linear inch).

3.1.3 *Cloth or Sheet Mounting:*

3.1.3.1 *Woven-Wire Cloth Mounting*—Type 304 stainless steel woven-type cloth shall be mounted in the frame without distortion, looseness, or wrinkling. For a sieve fabricated by soldering the cloth to the frame, the joint shall be made smooth to prevent the cement from catching in the joints between the sieve cloth and the frame. Two-piece sieves shall clamp tightly on the cloth to prevent the cement from catching in the joints between the sieve cloth and the frame.

3.1.3.2 *Electroformed Sieve Sheet Mounting*—Electroformed reinforced nickel sieve sheet shall be mounted in the frame without distortion, looseness, or wrinkling. The joint between the sieve cloth and the frame shall be made smooth with a material impervious to water.

3.2 *Spray Nozzle*—The spray nozzle (Fig. 1) shall be constructed of metal not subject to corrosion by water and shall be 17.5 mm (0.69 in.) in inside diameter with a central hole drilled in line with the longitudinal axis, an intermediate row of eight holes drilled 6 mm (0.23 in.) center-to-center at an angle of 5° from the longitudinal axis, and an outer row of eight holes drilled 11 mm (0.44 in.) center-to-center at an angle of 10° from the longitudinal axis. All holes shall be 0.5 mm (0.02 in.) in diameter. The spray nozzle shall have been checked within six months prior to testing a cement sample to ensure that the flow rate is between 1500 and 3000 g/min at 69 ± 3 kPa (10 ± 0.4 psi).

3.3 *Pressure Gage*—The pressure gage shall be 76 mm (3.0 in.) minimum diameter, and shall be graduated in 7-kPa (1-psi) increments, and shall have a maximum capacity of 207 kPa (30 psi). The accuracy at 69 kPa (10 psi) shall be ±2 kPa (±0.25 psi).

4. Calibration of 45-μm (No. 325) Sieve

4.1 Place 1.000 g of the current lot of National Institute of Standards and Technology standard sample No. 114 or No. 46h

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

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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.

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

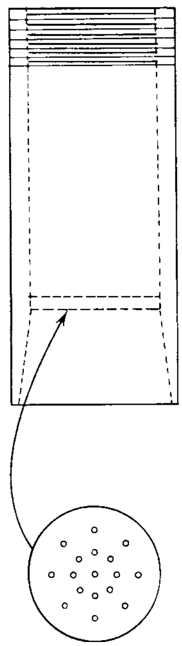

FIG. 1 Spray Nozzle with Seventeen 0.02-in. (0.51-mm) Holes

on the clean, dry, 45-μm (No. 325) sieve and proceed as in Section 5. The sieve correction factor is the difference between the test residue obtained and the assigned residue value indicated by the electroformed sheet sieve fineness specified for the standard sample, expressed as a percentage of the test residue.

NOTE 1—It should be observed that the sieve correction as specified is a factor to be multiplied by the residue obtained and that the amount to be added to or subtracted from the residue in any given test is therefore proportional to the amount of residue.

Example of Determination of Sieve Correction Factor:

Residue on 45-μm (No. 325) Sieve, sample No. 114 or No. 46h		12.2 %
Residue for a 1-g sample		0.122 g
Residue on sieve being calibrated		0.093 g
Difference	=	+ 0.029 g
Correction factor = + 0.029/0.093 × 100 = + 31.18	=	+ 31.2 %

5. Procedure

5.1 Place a 1.000 g sample of the cement on the clean, dry 45-μm (No. 325) sieve. Wet the sample thoroughly with a gentle stream of water. Remove the sieve from under the nozzle and adjust the pressure on the spray nozzle to 69 ± 4 kPa (10 ± 0.5 psi). Return the sieve to its position under the nozzle and wash for 1 min, moving the sieve with a circular motion in a horizontal plane at the rate of one motion per second in the spray. The bottom of the spray nozzle should extend below the top of the sieve frame about 12 mm (0.5 in.). Immediately upon removing the sieve from the spray, rinse once with about 50 cm^3 of distilled or deionized water, using caution not to lose any of the residue, and then blot the lower surface gently upon a damp cloth. Dry the sieve and residue in an oven or over a hot plate (see Note 2), supporting the sieve in such a manner that air may pass freely beneath it. Cool the sieve; then brush the residue from the sieve and weigh on an analytical balance capable of reproducing results within 0.0005 g.

NOTE 2—Care should be taken not to heat the sieve hot enough to soften the solder.

6. Cleaning of 45-μm (No. 325) Sieves

6.1 *Frequency of Cleaning and Calibration*—Sieves fitted with woven wire sieve cloth shall be cleaned after no more than five determinations. Sieves fitted with an electroformed reinforced sieve sheet having 71 openings per linear centimetre shall be cleaned after no more than three determinations. Both types of sieves shall be recalibrated after no more than 100 determinations.

6.2 *Acceptable Cleaning Procedures*—One option for cleaning is to place the sieve in a low-power (150 W maximum power input) ultrasonic bath containing an appropriate laboratory cleaning solution. The bath is to be operated for sufficient time (approximately 10 to 15 min at room temperature) to remove particles lodged in the openings. Be apprised that electroformed sieve sheets containing more than 71 openings per linear centimetre may well be damaged by ultrasonic cleaning. An option for cleaning which does not require an ultrasonic bath can also be employed. Immerse the sieve in a bath of appropriate laboratory cleaning solution heated to just below boiling point. Cover with a watch glass to reduce evaporation. Continue this soaking for a time sufficient to loosen lodged particles with a rinse following the bath. Overnight soaking in similar but unheated cleaning solutions is also acceptable, provided a rinse following the bath is able to wash away lodged particles. Cleaning or rinsing with dilute hydrochloric or acetic acid solutions is to be avoided. Appropriate cleaning solutions are restricted to soap or detergent-type solutions.

7. Calculation

7.1 Calculate the fineness of the cement to the nearest 0.1 % as follows:

$$R_c = R_s \times (100 + C) \quad (1)$$

$$F = 100 - R_c \quad (2)$$

where:

F = fineness of the cement expressed as the corrected percentage passing the 45-μm (No. 325) sieve,
R_c = corrected residue, %,
R_s = residue from the sample retained on the 45-μm (No. 325) sieve, g, and
C = sieve correction factor (determined as prescribed in Section 4) which may be either plus or minus.

Example:

Sieve correction factor, C	=	+31.2 %
Residue from sample being tested, R_s	=	0.088 g
Corrected residue, R_c	=	0.088 × (100 + 31.2)
	=	11.5 %
Corrected amount passing, F	=	100 – 11.5 % = 88.5 %

8. Precision and Bias

8.1 *Normal Fineness Product*—The multilaboratory precision has been found to be ±0.75 % (IS) as defined in Practice E177, therefore, results of properly conducted tests from two different laboratories on identical samples of cement should agree 95 % of the time within ±2.1 %.

8.2 *High Fineness Product*—The multilaboratory precision has been found to be ±0.50 % (IS) as defined in Practice E177; therefore, results of properly conducted tests from two different laboratories on identical samples of cement should agree 95 % of the time within ±1.4 %.

NOTE 3—The use of outside threads instead of inside threads as shown in this figure is permissible.

8.3 Since there is no accepted reference material suitable for determining the bias for the procedure in this test method, no statement on bias is being made.

9. Keywords

9.1 fineness of hydraulic cement

SUMMARY OF CHANGES

Committee C01 has identified the location of selected changes to this test method since the last issue, C430 – 96(2003), that may impact the use of this test method. (Approved December 1, 2008)

(*1*) Revised 4.1.