Designation: C1335 – 12

Standard Test Method for Measuring Non-Fibrous Content of Man-Made Rock and Slag Mineral Fiber Insulation[1]

This standard is issued under the fixed designation C1335; 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 a procedure for determining the non-fibrous content (shot) of man-made rock and slag mineral fiber insulation. The procedure covers a dry sieve analysis method to distinguish between fiberized and non-fiberized (shot) portions of a specimen of man-made rock and slag mineral fiber insulation specimen.

1.2 This test method does not apply to rock or slag materials containing any components other than rock and slag mineral fiber and organic thermal setting binders. Products containing other types of fibers, inorganic binders, or refractory clays are excluded.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C168 Terminology Relating to Thermal Insulation

C390 Practice for Sampling and Acceptance of Thermal Insulation Lots

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E178 Practice for Dealing With Outlying Observations

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 *Definitions*—Terminology C168 shall be considered as applying to the terms used in this test method.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *shot*—material that cannot be brushed or mechanically shaken through a No. 100 (150 µm) sieve.

4. Significance and Use

4.1 Inorganic fibrous thermal insulation can contain varying amounts of non-fibrous material. Non-fibrous material does not contribute to the insulating value of the insulation and therefore a procedure for determining that amount is desirable. Several specifications refer to shot content and percent (%) retained on various screen sizes determined by this test method.

5. Apparatus

5.1 *Furnace,* capable of maintaining 1100 ± 10°F (593 ± 5.6°C) for rock and slag wool.

5.2 *U.S.A. Standard Sieve Shaker Machine.*

5.3 *Balance Scale,* capable of weighing to an accuracy of 0.00035 oz (0.01 g).

5.4 *Sieves*—Three 8 in. (203 mm) diameter U.S.A. Standard Sieves. Nos. 20 (850 µm), 50 (300 µm), and 100 (150 µm) nested in order with bottom receiver pan. All sieve design and construction shall be in accordance with Specification E11.

5.5 *Brush*—Approximately 1 in. (25 mm) diameter plastic bristle brush, and approximately 1 in. (25 mm) wide soft paint brush.

5.6 *Crucible Weighing Dish,* tared.

5.7 *Stoppers,* rubber, No. 12 or 13.

5.8 *Cork Borer,* approximately 0.8 in. (20 mm) diameter.

6. Sampling and Preparation of Test Specimen

6.1 For the purposes of standard tests, sampling shall be in accordance with Practice C390 and Practice E178 with a minimum of three specimens per lot to be tested.

6.1.1 *Specimen*—This test method requires approximately a 0.35 oz (10 g) specimen.

6.2 *Specimen Preparation:*

[1] This test method is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.32 on Mechanical Properties.

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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.

6.2.1 Obtain a representative specimen utilizing a 0.8 in. (20 mm) cork borer for blanket or board and random specimens for loose fill. Fire the specimen in a tared dish at 1100 ± 10°F (593 ± 5.6°C) for 15 min. Remove tared dish with specimen and allow to cool for approximately 20 min.

6.2.2 Weigh the crucible weighing dish and fiber on balance scale to the nearest 0.00035 oz (0.01 g), subtract tare dish weight, noting the mass of specimen after firing as *WT*.

7. Procedures

7.1 *Shot–Fiber Separation Procedure A (Includes Shaker Machine):*

7.1.1 Assemble a nest of sieves (Nos. 20, 50, and 100) starting with a cover and the coarsest sieve on the top and a pan on the bottom.

7.1.2 Place the specimen on the top sieve with receiver(s) in place.

7.1.3 With the plastic bristle brush or rubber stopper, brush to brake-up the specimen through the No. 20 sieve.

7.1.4 Deposit one rubber stopper on each sieve screen before final assembly.

7.1.5 Place the entire nested sieve-assembly with specimen on the motor-driven testing sieve shaker and operate the automatic shaker-hammer for 20 min or until all fibrous materials are passed through to the pan.

7.1.6 Carefully remove all material retained on each sieve and weigh individually (without sieve and stopper) on the balance pan.

7.1.6.1 Weigh the material retained on each sieve to the nearest 0.00035 oz (0.01 g).

7.2 *Shot–Fiber Separation Procedure B (Manual Operation):*

7.2.1 Place the specimen on the top sieve with receivers in place.

7.2.2 With the plastic bristle brush or rubber stopper, brush the specimen through the No. 20 and No. 50 sieves.

7.2.3 With the soft paint brush, brush the specimen through the No. 100 sieve. On all sieves, be certain that all fibrous material is brushed through.

7.2.4 Carefully remove all material retained on each sieve and weigh individually (without sieve) on the balance pan.

7.2.4.1 Weigh the material retained on each sieve to the nearest 0.00035 oz (0.01 g).

8. Calculation

8.1 Calculate the percentage of non-fibrous material for one specimen retained on the No. 20 sieve, No. 50 sieve, and No. 100 sieve, respectively.

8.1.1 Add the No. 20 sieve plus No. 50 sieve plus No. 100 sieve masses together noting as *WP* and calculate as follows:

$$WC = \frac{WP\,(100)}{WT}$$

where:

WC = % mass of non-fibrous material for one specimen,
WP = mass of material on all sieves, and
WT = mass of specimen after firing/before seperation.

8.2 Adding the total percentages of all *WC*(s) (minimum of three specimens/tests) and dividing by the number of *WC*(s) equals the average total percent of shot (shot content).

9. Report

9.1 Report the following information:

9.1.1 A description of the material being tested, including specimen source (company name and manufacturing location), color, production code, or any other information that will help identify specimen.

9.2 The non-fibrous content method used.

9.3 The percentage by weight retained for each sieve size, as well as the total percent non-fibrous material (shot content) to the nearest tenth of a percent. The total percentage shot content will be reported for the average of at least three separate specimen results in accordance with 6.1.

9.4 The temperature at which the material was fired and the time the U.S.A. Standard Sieve Shaker Machine was operated.

10. Precision and Bias

10.1 *Precision*—The test results for representation of performance of the material will depend on the variability of the material, plus sampling and specimen preparation.

10.1.1 The results were evaluated using Practice E691. Repeatability and reproducibility are herein defined as 2.8 times the corresponding standard deviation to obtain a 95% confidence level. Repeatability is the variability between test results within each laboratory, and reproducibility is the variability between test results from different laboratories.

10.1.2 *Interlaboratory tests*—The results of interlaboratory tests conducted in 2003 for Total Shot using procedures "A" and "B" are listed in Table 1 and Table 2. The interlaboratory tests were conducted in accordance with Practice E691 with exception of the minimum number of test laboratories were not met. The study involved five different materials (specimens) from five different manufacturing facilities with three replicates of each specimen.

10.2 *Bias*—No statement of bias can be made for this test method since there is no standard reference material.

11. Keywords

11.1 insulation; mineral fiber insulation; rock and slag; shot; shot content

TABLE 1 Precision for Procedure A

5 Specimens 4 Laboratories 3 Replicates		Repeatability		Reproducibility	
Material	Average total % shot	r	% of average	R	% of average
C	15.543	4.213	27.11	4.213	27.11
E	15.704	4.615	29.39	4.615	29.39
B	20.254	0.974	4.81	2.312	11.42
A	22.412	2.521	11.25	3.550	15.84
D	30.952	4.272	13.80	4.272	13.80

TABLE 2 Precision for Procedure B

5 Specimens 4 Laboratories 3 Replicates		Reapeatability		Reproducibility	
Material	Average total % shot	r	% of average	R	% of average
C	14.108	4.389	31.11	5.854	41.50
E	14.990	2.003	13.36	3.339	22.28
B	19.199	2.415	12.58	4.145	21.59
A	20.604	2.984	14.48	2.984	14.48
D	29.534	2.217	7.51	2.825	9.57

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the purchase order or contract.

Elutriation Method for Measuring the Non-Fibrous Content (shot) of a Granulated mineral wool made from man-made rock and slag mineral fiber for the manufacturing of acoustical tile only. The Elutriation Method for Measuring the Non-Fibrous Content is NOT to be an alternate test method for mineral fiber (rock or slag) block, board, blanket, or other uses of granulated wool.

S1.1 Scope

S1.1.1 This annex provides for a custom testing method for non-fibrous (shot) content of man-made rock and slag mineral fiber insulation specific for the material produced for the tile wool industry. The procedure covers a wet analysis method to distinguish between fiberized and non-fiberized (shot) portions of a specimen of man-made rock and slag mineral fiber material.

S1.2 Terminology

elutriate—to separate or remove shot by washing, settling and decanting.

S1.3 Apparatus

S1.3.1 *Furnace*, capable of maintaining 1100 ± 10°F (593 ± 5.6°C) for rock and slag wool.

S1.3.2 *U.S.A. Standard Sieve Shaker Machine*.

S1.3.3 *Balance Scale*, capable of weighing to an accuracy of 0.00035 oz (0.01 g).

S1.3.4 *Sieves*—Four 8 in. (203 mm) diameter U.S.A. Standard Sieves. Nos. 20 (850 µm), 50 (300 µm), 100 (150 µm), and 200 (75 µm) nested in order with bottom receiver pan. All sieve design and construction shall be in accordance with Specification E11.

S1.3.5 *Brush*—Approximately 1 in. (25 mm) diameter plastic bristle brush, and approximately 1 in. (25 mm) wide soft paint brush.

S1.3.6 *Crucible Weighing Dish*, tared.

S1.3.7 *Stoppers*, rubber, No. 12 or 13.

S1.3.8 *Cork Borer*, approximately 0.8 in. (20 mm) diameter.

S1.3.9 *Pressure Gage*— Capable of maintaining a flow 40.6 oz (1200 ml) per minute at 28 psi (193 kPa).

S1.3.10 *Blender*

S1.3.11 *Funnel*

S1.3.12 **Boiling flask and stand** – 100 ml round bottom.

S1.3.13 *Elutriator*

S1.3.13.1 *Flow Meter*

S1.3.13.2 *Glass Tubing* - ¼ in. (6mm) diameter

S1.3.13.3 *Plastic tubing*

S1.3.13.4 Oven-safe dish or pan

S1.3.13.5 *Drying Oven* – capable of maintaining 220 ±10°F (100 ± 5.6°C)

S1.4 Sampling and Preparation of Test Specimen

S1.4.1 For the purposes of standard tests, sampling shall be in accordance with Practice C 390 or agreed upon between the manufacturer and the customer.

S1.4.1.1 *Specimen*—This test method requires approximately a 0.35 oz (10 g) specimen.

S1.4.2 *Specimen Preparation*:

S1.4.2.1 Obtain a representative specimen utilizing a 0.8 in. (20 mm) cork borer for random specimens for granulated mineral wool. Fire the specimen in a tared dish at 1100 ±10°F (593 ±5.6°C) for 15 min. Remove tared dish with specimen and allow cooling for approximately 20 min.

S1.4.2.2 Weigh the crucible weighing dish and fiber on balance scale to the nearest 0.00035 oz (0.01 g), subtract tare dish weight, noting the mass of specimen after firing as WT.

S1.5 Elutriation Method Procedure:

S1.5.1 Weigh approximately a 0.88 oz (25 g) specimen.

S1.5.2 Place the specimen in the blender with a minimum of 450 ml of water and blend for three minutes.

S1.5.3 Rinse the mixture through a funnel and into the flask. Make sure all the fiber and shot has been rinsed into the flask. Place the flask on the washing stand.

S1.5.4 Adjust the water flow to 40.6 oz (1200 ml) per minute at 28 psi (193 kPa).

S1.5.5 Lower the glass tube into the center of the flask, making sure the flask is level so water will flow evenly over the entire lip of the flask.

S1.5.6 Wash for 10 min., then turn the water off and allow the shot to settle.

S1.5.7 Remove the water and decant the flask into an oven-safe dish or pan, being careful not to pour off any of the shot. Rinse the shot into the drying pan. Drain excess water from the pan.

S1.5.8 Dry for one hour at 220°F (104°C). Remove from oven and allow to cool. Weigh the shot.

S1.5.9 Assemble a nest of sieves (Nos. 20, 50, 100, and 200) starting with a cover and the coarsest sieve on the top and a pan on the bottom.

S1.5.10 Deposit a rubber stopper on each sieve screen.

S1.5.11 Place the specimen in the top sieve with receivers in place.

S1.5.12 Put a cover on top of the sieve assembly and place the entire assembly with specimen on the sieve shaker. Shake 5-10 minutes until all shot has been separated or proceed with *Procedure B*.

S1.6 Calculation

S1.6.1 Calculate the percentage of non-fibrous material for one specimen retained on the No. 20 sieve, No. 50 sieve, and No. 100 sieve, respectively.

S1.6.1.1 Add the No. 20 sieve plus No. 50 sieve plus No. 100 sieve plus No. 200 sieve masses together noting as WP and calculate as follows:

$$WC = \frac{WP\,(100)}{WT}$$

where:

WC = % mass of non-fibrous material for one specimen,
WP = mass of material on all sieves, and
WT = mass of specimen before separation.

S1.6.2 Adding the total percentages of all WC (s) (minimum of three specimens/tests) and dividing by the number of WC (s) equals the average total percent of shot (shot content).

S1.7 Report

S1.7.1 Report the following information:

S1.7.1.1 A description of the material being tested, including specimen source (company name and manufacturing location), color, production code, or any other information that will help identify specimen.

S1.7.2 The shot separation method used.

S1.7.3 The percentage by weight retained for each sieve size, as well as the total percent non-fibrous material (shot content) to the nearest tenth of a percent. The total percentage shot content will be reported for the average of at least three separate specimen results in accordance with 6.1.

S1.7.4 The temperature at which the material was fired and the time the U.S.A. Standard Sieve Shaker Machine was operated.

S1.8 Precision and Bias

S1.8.1 *Precision*—At this time no precision for the procedure in this test method has been determined.

S1.8.2 *Bias*—At this time no bias for the procedure in this test method has been determined.

S1.8.3 The Precision and Bias is currently being developed with a targeted completion date of three years from publication of this statement.