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.

Designation: C429 – 21

Standard Test Method for Sieve Analysis of Raw Materials for Glass Manufacture[1]

This standard is issued under the fixed designation C429; 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 sieve analysis of common raw materials for glass manufacture, such as sand, soda-ash, limestone, alkali-alumina silicates, and other granular materials used in glass batch.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

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

1.4 *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]

C92 Test Methods for Sieve Analysis and Water Content of Refractory Materials

C325 Guide for Wet Sieve Analysis of Ceramic Whiteware Clays

C371 Test Method for Wire-Cloth Sieve Analysis of Nonplastic Ceramic Powders

D346/D346M Practice for Collection and Preparation of Coke Samples for Laboratory Analysis

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E105 Guide for Probability Sampling of Materials

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *gross sample, n*—the total number of sample increments taken from the lot.

3.1.2 *laboratory sample, n*—a 0.9 to 1.8 kg (2 to 4 lb) representative fraction of the gross sample.

3.1.3 *sample increment, n*—an individual portion of the gross sample taken from the lot at a definite time or location, or both; increments shall be of nearly equal weight or volume, or both.

3.1.3.1 *Discussion*—A 2.2 to 4.5 kg (5 to 10 lb) increment generally is satisfactory in sampling raw materials for glass manufacture, for determining particle size distribution.

3.1.4 *sub lot, n*—a fraction of a shipment of bagged material, such as 1⁄10 or 1⁄20 of the lot.

3.1.5 *test specimen, n*—a 100 to 150 g representative fraction of the laboratory sample.

3.1.6 *unit for sampling, n*—a carload lot or truckload lot of bulk material, or the entire shipment of bagged material.

4. Significance and Use

4.1 The purpose of this test method is to determine the particle size distribution of the glass raw materials.

5. Apparatus

5.1 *Testing Sieves:*

5.1.1 Sieves shall conform to Specification E11 with particular reference to Table 1 and Section 4 on Frames. Sieves shall be designated by the U. S. Standard Series of sieve numbers and shall vary in opening size by the ratio of the $\sqrt{2}$:1 in accordance with frames 1 in. (25 mm) deep (half height) are recommended for mechanical shaking. The following sieves shall be provided:

Sieve Designation	Opening Size
No. 8	2.36 mm
No. 12	1.70 mm
No. 16	1.18 mm

[1] This test method is under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.02 on Chemical Properties and Analysis.

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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.

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Sieve Designation	Opening Size
No. 20	850 µm
No. 30	600 µm
No. 40	425 µm
No. 50	300 µm
No. 70	212 µm
No. 100	150 µm
No. 140	106 µm
No. 200	75 µm

5.1.2 *Standard Matched Sieves*—A reference set of standard matched sieves shall be provided for use in checking the set of sieves used in the actual sieve analysis of samples. The sieves for use in sieve analysis of samples may also be standard matched sieves or may be unmatched sieves conforming to 5.1.1, provided that such sieves will give results that differ by not more than 5 % from those obtained with the reference set when the two sets are compared in accordance with Section 6.

5.2 *Sieve Shaker*—A mechanically operated sieve shaker that imparts to the set of sieves a rotary motion and tapping action of uniform speed shall be provided. The number of taps per minute shall be between 140 and 150. The sieve shaker shall be fitted with a wooden plug or rubber stopper to receive the impact of the tapper. Other types of mechanical shakers may be used, provided they can be adjusted to duplicate within 5 % results obtained by the type specified above, when tested with the same sample and standard matched sieves. The shaker shall be equipped with an automatic timer accurate to ±½ min.

5.3 *Sample Splitters:*

5.3.1 For the reduction of the gross sample to laboratory size, either a large riffle with 25 mm (1 in.) openings or a sample splitter of the type that cuts out a fractional part (for example, a twelfth or a sixteenth) of the gross sample may be used. Sample splitters are available commercially or may be constructed by the user. The criterion for their use is that they shall produce a representative sample.

5.3.2 Riffles with openings of 6.4 to 13 mm (¼ to ½ in.) are required for reducing the laboratory sample to test size. The riffle opening must be at least three times the width of the largest particle diameter. This restricts use of a riffle with 6.4 mm openings to materials passing a No. 8 sieve.

5.4 *Balance*—A suitable balance or scale capable of weighing accurately to ±0.1 g shall be used. A more sensitive balance may be used for weighing small fractions when they are considered critical.

6. Testing of Sieves and Sample Splitters

6.1 Since standard matched sieves are specified for the purpose of this test method, calibration as such by the tester is obviated. However, the tester must have a method to check the precision of the sieves. This shall be accomplished by having available at least two sets of sieves: a reference set and a working set. The reference set shall consist of standard matched sieves and shall be reserved for testing the working set. The working set also may consist of standard matched sieves or of sieves the tester has proven to be satisfactory (see 6.2). The testing of the working sieves is necessary because sieves will gradually change their characteristics after long usage from clogging and wear. The working set should be tested after every 100 to 150 sieve analyses. The test shall be made by sieving a suitable test sample through the working set as directed in Section 10, and then sieving the same test sample through the reference set. The results shall be calculated and compared. All testing sieves of the working test set that give results within ±10 % of the reference set shall be considered satisfactory for use. (See Appendix X1 for an example of this test.)

6.2 A new unmatched sieve can be used if it is proven by testing that it will produce results within ±5 % of a standard matched sieve. To test an unmatched sieve, it should be substituted for the equivalent sieve in a standard matched set and a sieve analysis made with a sample previously sieved with the complete matched set. If agreement is satisfactory, the new unmatched sieve can be used as a working sieve.

6.3 A sample splitter for reducing a gross sample should be tested for reproducibility before it can be considered reliable. A minimum test shall be to take three gross samples of materials, weighing 45 kg (100 lb) or more, with different particle size distribution, and obtain four laboratory-size samples of each by repeated splitting. The laboratory samples shall be riffled to test size and sieved. The same set of sieves shall be used for all tests. Duplication of results within each group should be within ±5 % or better.

7. Care and Cleaning of Testing Sieves

7.1 Testing sieves must be properly cared for if reproducible and reliable results are to be obtained from them. The life of a sieve is materially lengthened by proper care and careful handling. It is inevitable that some particles will become fastened in the sieve cloth, but excessive clogging can be controlled by brushing the underside of the wire cloth with a stiff bristle or bronze wire brush every time the sieve is used in testing. A nylon bristle paint brush 51 mm (2 in.) in width, with the bristles cut back to about 25 mm (1 in.) long, is recommended for brushing, although any short-bristle brush that will not stick in the wire cloth is satisfactory. A bronze wire brush should be used only for sieves No. 60 and coarser. Brushing shall be firm enough to remove the majority of clogging particles but not so vigorous as to distort the sieve cloth. Sieves shall be washed periodically with a mild detergent or soap, brushing on the underside of the cloth. They should be washed immediately after sieving hygroscopic materials, such as alkali carbonates, and dried before storing. They may be dried in a drying oven at 105 to 110 °C. A properly cared for sieve will be clean and free of patina. It will have a minimum of clogged openings. The wire cloth will be taut in the frame and free of distortion. The solder joint will be firm. A loosened joint on an otherwise satisfactory sieve may be repaired by carefully soldering it with resin-core solder. Additional cleaning methods are contained in ASTM STP 447B.[3]

8. Sampling

8.1 *General Considerations*—Follow the principles of probability sampling as given in Practice E105. To estimate the size (mass and number of increments) of the gross sample, follow

[3] *Manual on Test Sieving Methods, ASTM STP 447B,*, ASTM International, 1985.