



Designation: E2427 – 05

Standard Test Method for Acceptance by Performance Testing of U.S. Standard Test Sieves¹

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1. Scope

1.1 This test method is a performance test for acceptance of U.S. Standard test sieves. It is an alternative method for checking the accuracy and long term reliability of test sieves by other than the use of Specification E11 inspection methods. Since it is not possible to adjust the measuring capability of a test sieve, the method is designed to offer a verification procedure based on sieving performance, by comparison to a standard reference. This method is not proposed as an alternative to the inspection methods in accordance with Specifications E11, E323, E454, E674 or the procedures in Manual 32 to confirm sieve compliance thereto.

1.2 This test method compares the performance of a sieve against a calibration sieve, using a known quantity of reference material such that the long-term stability of sieves can be measured.

1.3 *This test method 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

E323 Specification for Perforated-Plate Sieves for Testing Purposes

E454 Specification for Industrial Perforated Plate and Screens (Square Opening Series)

E674 Specification for Industrial Perforated Plate and

Screens (Round Opening Series)

E1638 Terminology Relating to Sieves, Sieving Methods, and Screening Media

Manual 32 Manual on Test Sieving Methods

3. Terminology

3.1 Definitions of terms relating to sieve analysis can be found in Terminology E1638.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *Calibration Sieves, n*—Sieves used solely for the purpose of comparison to other sieves. Calibration sieves shall be certified as such by the manufacturer in accordance with Specification E11 tolerances.

3.2.2 *Sieves, n*—Sieves used for normal sieving, and in accordance with normal Specification E11 tolerances.

3.2.3 *Sieve shaker, n*—A mechanical device or method used to shake the sieves

3.2.4 *Reference material, n*—The material used to perform the sieve performance test. This material may be either purchased, or can be prepared by the user.

3.2.5 *Percent retained, n*—The mass fraction percentage of material that is left upon or retained by the sieve after the test has been performed.

3.2.6 *Endpoint, n*—The point at which no material falls through the sieve concluding the sieving.

4. Significance and Use

4.1 This test method may be used by producers, users, and general interest parties for research and development or quality control work, and is useful for the comparison of sieves.

4.2 Because the reference material's particle size distribution will affect the acceptance tolerance, the user should determine an acceptance tolerance based on their specific reference material.

5. Interferences

5.1 The long-term use of sieves can compromise the reliability of test results. Depending on the type of materials being measured, wear can occur on the diameter of the wires, causing opening sizes to change and measuring capability to drift.

¹ This test method is under the jurisdiction of ASTM Committee E29 on Particle and Spray Characterization and is the direct responsibility of Subcommittee E29.01 on Sieves, Sieving Methods, and Screening Media.

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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.

5.2 The specific particle size distribution of the reference material will affect the acceptance tolerance, which therefore must be developed based on the specific particle size distribution of the chosen reference material and the point on the distribution curve of the reference material where the sieve aperture lies.

5.3 Sieves should be cleaned prior to the test. The apertures should not be blocked by test material as this may contaminate the reference material and produce unreliable measurements. Most particles that block the sieve apertures can usually be removed by inverting the sieve and gently tapping the frame. Alternately, the underside of the sieve may be stroked gently with a soft brush. Washing in warm water or using an ultrasonic cleaner containing a synthetic detergent may also clean sieves. The sieve should be rinsed thoroughly in clean water and dried in a warm atmosphere. To avoid distortion, the sieve should not be heated above 80 degrees Centigrade (176 degrees Fahrenheit). Sieves that have been used for wet sieving should not be allowed to dry-out before attempting to clean, as material caught in the sieve may become permanently trapped. Acid or alkaline cleaning treatment is not generally recommended.

5.4 Care should be taken with the use of the reference materials. Since the same batch of material may be used more than one time, it must not be contaminated as variation in the material could affect the test results.

6. Apparatus

6.1 *Calibration Sieve*—certified as such by the manufacturer in accordance with Specification **E11** tolerances.

6.2 *Sieve*—in accordance with normal Specification **E11** tolerances.

6.3 *A Sieve Shaker*, capable of holding a stack of at least two test sieves and a collection pan, is recommended. It must have the capability to shake the sieves in both a rotating and vertical motion. Ideally, the shaker will be designed to operate in a manner that will minimize blinding of the apertures. If the shaker does not have an integral timer, a separate timer is required. Alternatively, the sieving operation may be performed manually by experienced technicians, but care must be exercised to ensure that the test is carried to completion. The use of forced sieving methods, such as air jets, vacuum and water, is not recommended.

6.4 *Balance*—having the capacity to weigh the appropriate sample sizes per **Annex A1**, with a sensitivity of one part in a hundred, or better.

7. Hazards

7.1 Manufacturers' procedures should be followed when operating machinery such as sieve shaking devices. The testing of some materials may produce dust. Proper procedures for minimizing dust inhalation and working with hazardous materials should be followed at all times. Materials likely to produce high levels of dust may not be appropriate for use without special precautions.

8. Preparation of Apparatus

8.1 *Calibration Sieve*: A calibration sieve of the same nominal aperture size as the sieve to be tested for acceptance is required.

8.2 *Sieve*: The sieve to be tested must be physically sound. The sieve cloth must be taut and free of broken or distorted wires. Solder joints must be intact. Sieve frames must be cylindrical and nest easily with other sieves.

8.3 *Reference material*: Used to conduct the test, reference materials can be either certified standard test materials that are purchased or can be prepared by the user. It may be desirable to prepare reference material of the same composition as the production material. If less than the entire batch is used, acquire a representative sample. If possible, the batch should be homogenized prior to sampling.

The recommended quantity (grams) of reference material may be determined using **Annex A1** or calculated based on the actual sieving area (mm²) and aperture size (mm), per the following calculation:

$$\text{Quantity} = (\text{Area} * (\text{aperture})^{1/2}) / 200 \quad (1)$$

9. Preparation of Reference Material

9.1 *User Prepared Reference Material*: The reference material may be prepared from the production material being tested, provided that the material will not blind or adhere to the sieve apertures, nor break down during the test procedure. It should be noted that user prepared reference material will not be traceable, and is only to be used internally for this comparative test. If certified reference material is to be used, no preparation of reference material is required.

9.2 In accordance with the size of the reference material to be produced, a calibration sieve of the same size, and a sieve that is one size coarser and collection pan are required. For example, if 125 micrometer reference material is to be produced a No. 120 sieve (125 micrometer), a No. 100 sieve (150 micrometer) and collection pan are used.

9.3 Nest the sieves in the shaker with the coarser sieve in the top position, the finer sieve in the second position, and the collection pan in the bottom position. Any additional shaker positions are not used.

9.4 In this example add all the material to the coarser sieve. Continue sieving raw material until at least half the total amount of reference material required is retained on the finer sieve, and at least half is in the collection pan. In this example used above, all the material retained on the finer No.120 sieve will become reference material, as well as an equal amount by weight of the material in the collection pan. The material retained on the larger No.100 sieve (150 micrometer) is discarded. Combine the materials from the finer sieve and the collection pan in equal proportions to produce the amount of reference material required per **Annex A1** for the performance testing.

10. Calibration and Standardization

10.1 A sieve may be evaluated for acceptance based on this standard comparative test method. The test is a comparison