Designation: E161 – 17 (Reapproved 2021)

Standard Specification for Electroformed Material and Test Sieves[1]

This standard is issued under the fixed designation E161; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers the technical requirements for design and construction of electroformed sieves and sieve material. These sieves are used to perform particle-size analysis and in preparing narrowly designated particle -size fractions. They may also be used as reference standards when suitably certified. The method of certifying these sieves is included in Annex A1.

1.2 The values stated in SI units shall be considered standard for the dimensions of the electroformed mesh openings and the size of the line width in the electroformed mesh. The values stated in inch-pound units shall be considered standard with regard to the sieve frames and to lines per unit length, as in Table 1. The values given in parentheses are mathematical conversions that are provided for informational purposes 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]

C430 Test Method for Fineness of Hydraulic Cement by the 45-µm (No. 325) Sieve

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E323 Specification for Perforated-Plate Sieves for Testing Purposes

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

3. Terminology

3.1 *Definitions*—For definitions of related terms, refer to Terminology E1638.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *electroformed material, n*—electrodeposited grid material consisting of precision openings used as the separation media for electroformed sieves.

3.2.2 *electroformed sieves, n*—see *test sieve (electroformed)*.

3.2.3 *non-standard frames (electroformed), n*—sieve frames other than as specified in accordance with Table 2 that may be circular, square, rectangular, or non-metal.

3.2.3.1 *Discussion*—The frame shall have the electroformed material permanently attached.

3.2.4 *support grid, n*—conductive metal screen fused to the sieve material.

3.2.5 *test sieve (electroformed), n*—a sieve manufactured by mounting electroformed material in a frame, designed for use in particle size analysis by sieving.

4. Ordering Information

4.1 Orders for items under this specification include the following information as necessary:

4.1.1 Name of material (electroformed sieve or electroformed sieve material),

[1] This specification 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 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.

TABLE 1 Sample Dimensions, Permissible Variations and Limits for Precision Electroformed Sieves

Nominal Opening Size, μm[A]	Tolerance on Sieve Openings, ±μm	Limits, Lines per Linear in.	
		Min	Max
300–500	2.0	39	62
15.0–299	2.0	58	117
90–149	2.0	105	200
50–89	2.0	140	280
30–49	2.0	200	400
20–29	2.0	280[B]	750[B]
15–19	2.0	400[B]	750[B]
3–14	2.0	500[B]	1500[B]

[A] These nominal size openings are from the preferred number series R40/3 and R10. (Openings on apertures 32 μm and less are series R10.) These standard designations correspond to the values for test sieve apertures recommended by the International Organization for Standardization (ISO). These sizes are typical, other opening sizes are available.

[B] Because of their greater durability in routine testing, sieves made close to the minimum limit are normally supplied. Sieves made close to the maximum limit may be obtained only on special order but are preferable from the standpoint of logical progression and better test completion time.

4.1.2 ASTM designation (Specification E161),

4.1.3 Quantity of each item, and

4.1.4 Standard sieve designation.

4.1.4.1 Nominal opening size in micrometres (Table 1, Column 1), and

4.1.4.2 Aperture geometry.

4.1.5 For testing sieves in standard circular frames:

4.1.5.1 Nominal sieve frame diameter, and

4.1.5.2 Nominal sieve frame height.

4.1.6 For sieve cloth not in frames or in non-standard frames:

4.1.6.1 Lateral dimension of sieve mesh, or

4.1.6.2 Description of non-standard frame, or both.

4.1.7 For sieves requiring supporting grid:

4.1.7.1 Support grid desired, and

4.1.7.2 Support grid mounted up or down, as assembled in frame.

5. Electroformed Material Requirements

5.1 The material used in the manufacture of the sieve material shall be nickel or a metal suitable for electrodeposition with a firm crystalline structure.

5.2 The material shall have square, round, or slotted openings with straight uniform sides and smooth, flat surfaces except for a slight bevel along the edges of the openings. The nominal dimension of these openings establishes the designated size of the sieve.

5.3 The thickness of the material (exclusive of the support grid, see 5.4), is governed by the method of manufacture, the size of the openings and the line width of material between openings, but in no case shall the thickness of material between the openings be less than 10 μm (0.0004 in.).

5.4 If a support grid is required, the sieve material shall be mounted to the support material grid in such a manner that the material is firmly bonded to the grid. The sieve material shall be mounted on the support grid with the openings running in the same direction as those of the support grid.

NOTE 1—In instances where a support grid is required, opening sizes smaller than the allowable tolerances will be observed. This occurs where the support grid overlaps the sieve openings in such a way as to either block a portion of the opening or to create several smaller openings.

5.5 The finished and mounted sieve material from which the sieves are constructed shall conform to the requirements for opening size and spacing as outlined in Table 1.

5.6 Extraneous metal formed in or near the corners which does not restrict the passage of a spheroidal particle shall be disregarded. Limitations on extraneous metal/repaired areas shall not exceed 10 per 8-in. square area for ≤400 lines per inch base material, and 20 per 8-in. square area for >400 lines per inch base material.

5.6.1 In the sieve material, there shall be no punctures, missing areas, or surface discoloration as caused by a foreign material.

6. Test Sieve Frames

6.1 *General Requirements*—Frames for electroformed sieves shall be made from non-corrosive material such as stainless or non-metal and constructed in such a manner as to be rigid.

6.1.1 The sieve material shall be mounted on the frame without distortion, looseness, or waviness.

6.1.2 To prevent the material being sieved from catching in the joint between the sieve material and the frame, the joint shall be filled smoothly or constructed in order to not trap particle material.

6.2 *Standard Frames*—Sieve frames shall be circular, of seamless construction, with nominal diameters of 3, 8, and 12 in. as may be specified. The dimensions shall conform to the requirements in Table 2.

6.2.1 The bottom of the frames shall be constructed so as to provide an easy sliding fit with any sieve frames of the same nominal diameter conforming to the specified dimensions.

6.2.2 The joint or fillet at the connection of the sieve material to the frames will provide a minimum clear sieving surface with a diameter equal to the nominal diameter less 0.5 in. (13 mm).

6.3 *Non-Standard Frames*—Other sieve frames may be either square, rectangular, or circular.

6.3.1 The frame shall have the sieve material permanently installed.

NOTE 2—Refer to Test Method C430, which contains requirements for 3-in. (76.2-mm) diameter by 3-in. (76.2-mm) high sieves used in the mineral industries, especially the cement group.

7. Product Marking

7.1 *Standard Sieves*—Each sieve shall bear a label marked with the following information:

7.1.1 This ASTM designation,

7.1.2 The nominal size of the openings in micrometres (μm),

7.1.3 The mean size in micrometres (μm) is optional,

7.1.4 The name of the manufacturer or the responsible distributor, and

7.1.5 Serial number.

TABLE 2 Dimensions of Standard Circular Frames

Nominal Diameter, in.	Proposed Revision Mean Diameter Inside at Top[C]	Typical Frame[A] Nominal Height[B]
3	3.000 in. + 0.030/–0.000 (76.20 mm + 0.76/–0.00)	1 in. (25.4 mm)
8	8.000 in. + 0.030/–0.000 (203.20 mm + 0.76/–0.00)	2 in. (50.8 mm) FH[D] 1 in. (25.4 mm) HH[E]
12	12.000 in. + 0.030/–0.000 (304.80 mm + 0.76/–0.00)	2 in. (50.8 mm) FH

[A] Other frame heights are not precluded.
[B] Distance from the top of the frame to the sieve cloth surface.
[C] Measured 0.2 in. (5 mm) below the top of the frame.
[D] FH = Full height.
[E] HH = Half height.

7.2 *Non-Standard Sieves*—Each sieve shall bear a label marked with the following information:

7.2.1 This ASTM designation, and

7.2.2 The nominal size of the openings in micrometres (μm).

8. Keywords

8.1 electroformed sieve; micro sieve; opening; particle size; sieve; sieve analysis; test sieve

ANNEXES

(Mandatory Information)

A1. METHOD OF CERTIFYING PRECISION ELECTROFORMED SIEVES

INTRODUCTION

The sieve analysis results from two testing sieves of the same sieve designation may not be the same because of the variances in sieve openings permitted by this specification.

NOTE A1.1—To minimize the difference in sieve analysis results, the use of testing sieves matched on a performance basis is suggested.

Accompanied by Opening Analysis (Histogram)

The unique manner of forming the sieve sheet makes it easier and more precise to measure the openings rather than the nominal width of metal between adjacent openings as is frequently done in the case of wire -cloth sieves. In some cases, electrodeposition produces small spurs or bulges of metal which project several μm into the open area in the plane of the sheet, thereby restricting the passage of spheroidal particles which would go through a normally perfect opening. These openings should be excluded from the certification process. Openings that are blocked or partially blocked as a result of the support grid should also be excluded from the certification process.

A1.1 Scan the entire area with a microscope having a magnifying power of approximately 50× to determine if the sheet conforms to the specifications given in 5.6.1, and if the edges between the sheet and frame are sealed completely.

A1.1.1 Certification equipment should be an optical measuring device that allows a magnification that produces aperture edges that are distinguishable and clearly defined. A measurement accuracy of ±0.5 μm for the device is suggested.

A1.1.2 Minimum certification is accomplished by measuring in a standard grid pattern across the material. This accounts for the nature of the plating process and its consistency from center to outer edges. Nine measurements in twelve locations, for a total of 108 readings, in each the X and Y direction, are taken. The data is collected, and documented on a histogram/certification that includes information such as customer name, serial number, nominal holesize, and holesize distribution.