



## Standard Specification for Precision Electroformed Sieves<sup>1</sup>

This standard is issued under the fixed designation E 161; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers the requirements for design and construction of electroformed sieves. These sieves are used to perform particle-size distribution analysis and in preparing narrowly designated particle-size fractions. They may also be used as reference standards when suitably calibrated. A method of calibrating these sieves is included in the Annex.

NOTE 1—Complete instructions and procedures on the use and calibration of testing sieves are contained in ASTM Special Technical Publication STP447B<sup>2</sup>. This publication also contains a list of all published ASTM Standards on sieve analysis procedures for specific materials or industries.

1.2 The sieve analysis results from two testing sieves of the same sieve designation may not be the same because of the variances in sieve opening permitted by this specification. To minimize the differences in sieve analysis results, the use of testing sieves matched on a performance basis is suggested.

NOTE 2—For other types of sieves, see Specifications E 11 and E 323.

1.3 The values stated in SI units shall be considered standard for the dimensions of the electroformed mesh openings and the size of the wires in the electroformed mesh. The values stated in inch units shall be considered standard with regard to the sieve frames.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

C 430 Test Method for Fineness of Hydraulic Cement by the No. 325 (45 $\mu$  m) Sieve<sup>3</sup>

E 11 Specification for Wire-Cloth Sieves for Testing Purposes<sup>4</sup>

E 323 Specification for Perforated-Plate Sieves for Testing Purposes<sup>4</sup>

#### 2.2 ISO Standard:

ISO 565 Test sieves—Metal wire cloth, perforated plate and electroformed sheet-nominal aperture sizes<sup>5</sup>

### 3. Ordering Information

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

3.1.1 Name of material (Electroformed Sieve),

3.1.2 ASTM designation and year of issue (ASTM E 161 – XX),

3.1.3 Quantity of each item, and

3.1.4 Standard sieve designation (Table 1, Column 1).

3.1.5 For testing sieves in standard circular frames:

3.1.5.1 Nominal sieve frame diameter, and

3.1.5.2 Nominal sieve frame height.

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

3.1.6.1 Lateral dimension of sieve mesh, and

3.1.6.2 Description of non-standard frame.

3.1.7 For sieves requiring supporting grid:

3.1.7.1 Support grid desired,

3.1.7.2 Support grid mounted up or down, and

3.1.8 Compatible sieve pans and covers.

### 4. Sieve Sheet Requirements

4.1 The material used in the manufacture of the sieve sheet shall be nickel or a metal suitable for electrodeposition in a firm crystalline structure. The sheet shall have square or round openings with straight uniform sides and smooth, flat surfaces except for a slight bevel along the edges of the openings. The thickness of the sheet (exclusive of the supporting grid, see 4.2), is governed by the method of manufacture, the size of the openings and the width of material between openings, but in no case shall the thickness of material between the openings be less than 10  $\mu$ m (0.0004 in.).

4.2 If a supporting grid is required for durability, the sieve sheet shall be mounted to the supporting metal grid in such a manner that the sheet is firmly bonded to the grid. The supporting grid shall be of suitable thickness and strand width to provide adequate support to the sheet. The sheet shall be mounted on the supporting grid with the openings running in the same direction as those of the supporting grid.

4.3 The finished and mounted sieve sheet from which the sieves are constructed, shall conform to the requirements for opening size and spacing as outlined in Table 1. Extraneous metal formed in or near the corners which does not restrict the passage of a spheroidal particle shall be disregarded. The mean dimension of these openings as defined in Table 1 establishes the designated size of the sieve.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E-29 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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<sup>2</sup> ASTM STP 447B, Manual on Test Sieving Methods, Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

<sup>3</sup> Annual Book of ASTM Standards, Vol 4.01.

<sup>4</sup> Annual Book of ASTM Standards, Vol 14.02.

<sup>5</sup> International Organization for Standardization, Geneva, Switzerland.

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

Nominal Opening Size, $\mu\text{m}^A$	Tolerance on Sieve Openings, $\pm\ \mu\text{m}$	Limits, Openings per Linear $\text{cm}^B$		Limits, Openings per Linear in.	
		Minimum	Maximum	Minimum	Maximum
500	2.0	15.35	16.14	39	41
425	2.0	17.32	18.11	44	46
355	2.0	19.29	20.87	49	53
300	2.0	22.83	24.41	58	62
250	2.0	25.20	26.77	64	68
212	2.0	31.89	33.46	81	85
180	2.0	35.04	36.61	89	93
150	2.0	41.34	46.06	105	117
125	2.0	46.06	51.18	117	130
106	2.0	47.24	59.06	120	150
90	2.0	55.12	78.74	140	200
75	2.0	59.06	78.74	150	200
63	2.0	66.93	98.43	170	250
53	2.0	78.74	110.24	200	280
45	2.0	90.55	118.11	230	300
38	2.0	98.43	137.80	250	350
32	2.0	110.24	157.48	280	400
25	2.0	118.11 <sup>C</sup>	196.85 <sup>C</sup>	300 <sup>C</sup>	500 <sup>C</sup>
20	2.0	157.48 <sup>C</sup>	295.28 <sup>C</sup>	400 <sup>C</sup>	750 <sup>C</sup>
15	2.0	157.48 <sup>C</sup>	295.28 <sup>C</sup>	400 <sup>C</sup>	750 <sup>C</sup>
10	2.0	196.85 <sup>C</sup>	393.70 <sup>C</sup>	500 <sup>C</sup>	1000 <sup>C</sup>
5	2.0	196.85 <sup>C</sup>	590.55 <sup>C</sup>	500 <sup>C</sup>	1500 <sup>C</sup>

<sup>A</sup> These nominal size openings are from the preferred number series R40/3 and R10 (Openings on apertures 32  $\mu\text{m}$  and less are series R10.) These standard designations correspond to the values for test sieve apertures recommended by the International Standards Organization, Geneva, Switzerland in ISO/565. Other opening sizes are not precluded.

<sup>B</sup> These limits permit at least two adjacent sieves to be formed with the same number of openings per cm. The percent open area must in no case be so great that the width of metal between openings is less than 18  $\mu\text{m}$ .

<sup>C</sup> 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.

NOTE 3—In instances where a support grid is required for durability, 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. This is an unavoidable situation and has been determined to have little measureable effect on the sieving open area or sieve performance.

4.3.1 There shall be no punctures, missing or deformed areas, or other obvious defects in the sieve sheet.

**5. Test Sieve Frames**

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

5.1.1 The sieve sheet shall be mounted on the frame without distortion, looseness, or waviness.

5.1.2 To prevent the material being sieved from catching in the joint between the sieve sheet and the frame, the joint shall be filled smoothly or constructed so that the material will not be trapped.

5.2 *Standard Circular Frames*—Sieve frames shall be circular, of seamless construction, with nominal diameters of 3, 3.94, 7.87, 8, 12 in. (76.2, 100, 200, 203.2, 304.8 mm) as may be specified. The dimensions shall conform to the requirements in Table 2.

5.2.1 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.

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

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

5.3.1 The frame may have the sieve sheet permanently installed or may be designed to permit replacement.

NOTE 4—Refer to Test Method C 430, 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.

5.3.2 The provisions of 5.1 apply, except that the frames may also be made of other materials.

NOTE 5—Exercise care to prevent loss of material when using non-standard sieve frames.

5.4 *Pans and Covers*—Pans and covers for use with sieves shall be made so as to nest with the sieves. Pans with extended rims (stacking skirts) shall be furnished when specified. The pans and covers shall conform to the dimensions in Table 2.

**6. Product Marking**

6.1 Each sieve shall bear a label marked with the following information:

- 6.1.1 This ASTM designation,
- 6.1.2 The nominal size of the openings in micrometers,
- 6.1.3 The mean size in  $\mu\text{m}$ , and
- 6.1.4 The name of the manufacturer or the responsible distributor.

**7. Keywords**

7.1 opening; particle size; sieve; sieve analysis; sieve sheet; sieve designation; test sieve

**TABLE 2 Dimensions of Standard Circular Frames**

Current Nominal Diameter, In.	Proposed Revision Mean Diameter		Comments Typical Frame <sup>A</sup> Nominal Height <sup>B</sup>
	Inside at Top <sup>C</sup>	Outside on Skirt	
3	3.000 in. + 0.030/−0.000 (76.20 mm + 0.76/−0.00)	3.000 in. + 0.000/−0.030 (76.20 mm + 0.00/−0.76)	1 in. (25.4 mm)
8	8.000 in. + 0.030/−0.000 (203.20 mm + 0.76/−0.00)	8.000 in. + 0.000/−0.030 (203.20 mm + 0.00/−0.76)	2 in. (50.8 mm) FH <sup>D</sup> 1 in. (25.4 mm) HH <sup>E</sup>
12	12.00 in. + 0.030/−0.000 (304.80 mm + 0.76/−0.00)	12.00 in. + 0.000/−0.030 (304.80 mm + 0.00/−0.76)	2 in. (50.8 mm) FH

<sup>A</sup> Other frame heights are not precluded.

<sup>B</sup> Distance from the top of the frame to the sieve cloth surface.

<sup>C</sup> Measured 0.2 in. (5 mm) below the top of the frame.

<sup>D</sup> FH = Full height.

<sup>E</sup> HH = Half height.