



## Standard Specification for Interchangeable Taper-Ground Joints<sup>1</sup>

This standard is issued under the fixed designation E 676; 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 designations, dimensions, and tolerances for only the ground surfaces of interchangeable taper-ground joints for laboratory and industrial equipment in full-length, medium-length, short-length, and international-length (ISO K-6 series) grindings.

NOTE 1—The dimensions pertaining to full-length, medium-length, and short-length joints, other than for the tolerance on length of grind, were taken directly from the now obsolete Commercial Standard CS 21.

NOTE 2—Tolerances on the diameters of the international-length joints do not agree with those given in ISO Recommendation R383. These tolerances have been established to agree with those of CS 21 in order to prevent the negative projection (large end of inner joint being smaller than large end of outer joint) permitted by ISO.

NOTE 3—Although glass is the most commonly used material for ground joints, other materials may be used as specified. Taper-ground joints constructed from glass should be of suitable chemical and thermal properties in accordance with Specification E 438. Joints should be as free as possible of visible defects and conform to Specification E 671.

1.2 The following precautionary caveat pertains only to the Test Method portion, Section 4, of this specification. *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:

- E 438 Specification for Glasses in Laboratory Apparatus<sup>2</sup>
- E 671 Specification for Maximum Permissible Thermal Residual Stress in Annealed Glass Laboratory Apparatus<sup>2</sup>
- E 920 Specification for Commercially Packaged Laboratory Apparatus<sup>2</sup>
- E 921 Specification for Export Packaged Laboratory Apparatus<sup>2</sup>
- E 1133 Practice for Performance Testing of Packaged Laboratory Apparatus United States Government Procurement<sup>2</sup>
- E 1157 Specification for Sampling and Testing Reusable Laboratory Glassware<sup>2</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E-41 on Laboratory Apparatus and is the direct responsibility of Subcommittee E 41.01 on Glass and Plastic Apparatus.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 14.04.

#### 2.2 U.S. Department of Commerce Standard:

CS 21 Interchangeable Taper-Ground Joints, Stopcocks, Stoppers, and Spherical-Ground Joints<sup>3</sup>

#### 2.3 ISO Standard:

R 383 Interchangeable Conical Ground Glass Joints<sup>4</sup>

### 3. Requirements

3.1 Designations, dimensions, and tolerances shall be as shown in Fig. 1 and in Table 1, Table 2, Table 3, and Table 4.

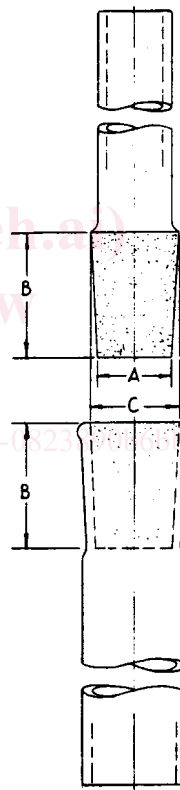


FIG. 1 Taper-Ground Joint

3.2 Surface Finish—The root-mean-square (rms) height of the ground surface shall not exceed 1  $\mu\text{m}$ .

<sup>3</sup> Discontinued 1979—U.S. Department of Commerce, Washington, DC 20234.

<sup>4</sup> Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

**TABLE 1 Full-Length Taper-Ground Joints**

Joint Size Designation	A Approximate Diameter at Small End, mm	B Approximate Length of Ground Zone, mm <sup>A</sup>	C Diameter at Large End of Ground Zone, mm <sup>B</sup>
7/25	5.0	25	7.5
10/30	7.0	30	10.0
12/30	9.5	30	12.5
14/35	11.0	35	14.5
19/38	15.0	38	18.8
24/40	20.0	40	24.0
29/42	25.0	42	29.2
34/45	30.0	45	34.5
40/50	35.0	50	40.0
45/50	40.0	50	45.0
50/50	45.0	50	50.0
55/50	50.0	50	55.0
60/50	55.0	50	60.0
71/60	65.0	60	71.0
103/60	97.0	60	103.0

<sup>A</sup> A tolerance of ±1.5 mm is allowed on both inner and outer members.

<sup>B</sup> A tolerance of +0.15 mm is allowed on inner members, and a tolerance of -0.15 mm on outer members.

**TABLE 2 Medium-Length Taper-Ground Joints**

Joint Size Designation	A Approximate Diameter at Small End, mm	B Approximate Length of Ground Zone, mm <sup>A</sup>	C Diameter at Large End of Ground Zone <sup>B</sup>
5/12	3.8	12	5.0
7/15	6.0	15	7.5
10/18	8.2	18	10.0
12/18	10.7	18	12.5
14/20	12.5	20	14.5
19/22	16.6	22	18.8
24/25	21.5	25	24.0
29/26	26.6	26	29.2
34/28	31.7	28	34.5
40/35	36.5	35	40.0

<sup>A</sup> A tolerance of ±1.5 mm is allowed on both inner and outer members.

<sup>B</sup> A tolerance of +0.15 mm is allowed on inner members, and a tolerance of -0.15 mm on outer members.

3.3 *Taper*—All taper-ground joints shall have a taper of 1 ± 0.006 mm of diameter per 10 mm of length (1 to 10).

3.4 *Leakage*—Using the leak test apparatus illustrated in Fig. 2, or one functionally similar to it, with the average differential pressure during the test kept above 600 mm Hg, the leak rate calculated from the test data (see 4.9) shall not exceed 0.05 torr-litres/s (or Pa-litres/s) when the inner and outer joints are assembled dry.

#### 4. Test Method

4.1 Clean both joints to be tested with distilled water, and then dry them with a clean paper towel. Next, wipe the ground zones with a clean chamois to remove any remaining particles.

4.2 Tightly close the unground end of the joint to be connected to the manometer system, using a rubber stopper containing a concentric hole (or rubber tubing, depending upon the joint size under test) sized to fit snugly on the manometer connection, and mount the joint on the connection in an upright position.

4.3 Firmly plug the unground end of the other type of joint with a solid rubber stopper.

4.4 Carefully mate the ground surfaces of the joints without exerting any pressure on them.

**TABLE 3 Short-Length Taper-Ground Joints**

Joint Size Designation	A Approximate Diameter at Small End, mm	B Approximate Length of Ground Zone, mm <sup>A</sup>	C Diameter at Large End of Ground Zone, mm <sup>B</sup>
5/8	4.2	8	5.0
7/10	6.5	10	7.5
10/7	9.3	7	10.0
10/10	9.0	10	10.0
12/10	11.5	10	12.5
14/10	13.5	10	14.5
19/10	17.8	10	18.8
24/12	22.8	12	24.0
29/12	28.0	12	29.2
34/12	33.3	12	34.5
40/12	38.8	12	40.0
45/12	43.8	12	45.0
50/12	48.8	12	50.0
55/12	53.8	12	55.0
60/12	58.8	12	60.0
71/15	69.5	15	71.0

<sup>A</sup> A tolerance of ±1.5 mm is allowed on both inner and outer members.

<sup>B</sup> A tolerance of +0.15 mm is allowed on inner members, and a tolerance of -0.15 mm on outer members.

**TABLE 4 International-Length Taper-Ground Joints**

Joint Size Designation	A Approximate Diameter at Small End, mm	B Approximate Length of Ground Zone, mm <sup>A</sup>	C Diameter at Large End of Ground Zone, mm <sup>B</sup>
5/13	3.7	13	5.0
7/16	5.9	16	7.5
10/19	8.1	19	10.0
12/21	10.4	21	12.5
14/23	12.2	23	14.5
19/26	16.2	26	18.8
21/28	18.7	28	21.5
24/29	21.1	29	24.0
29/32	26.0	32	29.2
34/35	31.0	35	34.5
40/38	36.2	38	40.0
45/40	41.0	40	45.0
50/42	45.8	42	50.0
60/46	55.4	46	60.0
71/51	65.9	51	71.0
85/55	79.5	55	85.0
100/60	94.0	60	100.0

<sup>A</sup> A tolerance of ±1.5 mm is allowed on both inner and outer members.

<sup>B</sup> A tolerance of +0.15 mm is allowed on inner members, and a tolerance of -0.15 mm on outer members.

4.5 Gently apply a 225-g weight on the upper joint for seating pressure, then rotate the upper joint 90° and remove the weight.

4.6 After ensuring that the stopcock to the vacuum pump is in the closed position, turn on the pump and adjust the stopcock to the pump so that the mercury in the manometer rises to a level such that the average differential pressure will remain above 600 mm at the conclusion of the test.

4.7 Air leakage is now allowed to occur through the mated joints for a timed interval, and the change in differential pressure is noted.

4.8 Repeat 4.1 through 4.7 once, ensuring in 4.5 that the upper joint is rotated 90 deg from its position in the first test.

4.9 Compute the leak rate in torr litres per second or pascal litres per second as follows: