



Designation: ~~C 577–99~~ Designation: C 577 – 07^{ε1}

Standard Test Method for Permeability of Refractories¹

This standard is issued under the fixed designation C 577; 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.

^{ε1} NOTE—Units of measure statement was added editorially in March 2009.

1. Scope

1.1 This test method covers determination of the permeability of refractory brick and monoliths, from which suitable specimens can be cut, at room temperature.

1.2 Units—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.2.1 Exceptions—The apparatus used in this standard is only available in SI units (Section 4). Also, some of the calculations must use SI units only.

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

2. Referenced Documents

2.1 *ASTM Standards*:²

C1095 [Practice for Calculating Precision Data on Refractories \(C08\) from Interlaboratory Test Results](#)³

3. Significance and Use

3.1 This test method is used to measure the rate of flow of air or nitrogen through refractory brick and monoliths and to thus determine the permeability of tested products.

3.2 This test method is useful in research and development for establishing the relative permeability of products within comparable classes. It may also be used to identify acceptable products for design purposes and to establish permeability criteria for specification acceptance.

3.3 It must be recognized that permeability can vary in different directions and different parts of a refractory due to factors such as forming procedure, grain size and distribution, and heat treatment.⁴

4. Apparatus

4.1 The apparatus shall provide a leakproof system for testing 2 in. (51 mm) cubes held in a pressurized rubber gasket, with means for controlling gas pressure and measuring gas flow. ~~Fig. 1, Fig. 2~~~~Figs. 1-, and Fig. 33~~ illustrate a suitable apparatus.⁴ The apparatus consists of the following components:

4.1.1 *Permeating Medium*, air or nitrogen with regulator-controlled inlet pressure.

4.1.2 *Drier Tubes*, each filled with a desiccant and strainer; used to remove any water or dirt from the gas before entering the flowmeters.

4.1.3 *Flowmeters*—They will measure the flow of permeating media in the range from 0 to 9000 cm³/min. The flowmeters may be calibrated to read the flow directly of either air or nitrogen. The range for each flowmeter is shown in Fig. 1.

¹ This test method is under the jurisdiction of ASTM Committee C-8 on Refractories and is the direct responsibility of Subcommittee C08.03 on Physical Properties. Current edition approved October 10, 1999. Published November 1999. Originally published as C577–65T. Last previous edition C577–96.

² This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.03 on Physical Properties. Current edition approved June 1, 2007. Published July 2007. Originally approved in 1965. Last previous edition approved in 1999 as C 577 – 99.

³ 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*, Vol 15.01, volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ The apparatus is described in Eusner, G. R., and Shapland, J. T., "Permeability of Blast-Furnace Refractories," *Journal*, Am. Ceramic Soc., Vol 42, No. 10, 1959, pp. 459–464.

⁵ C08

⁶ Supporting data are available from ASTM Headquarters. Request RR:C8–1378.

⁷ The apparatus is described in Eusner, G. R., and Shapland, J. T., "Permeability of Blast-Furnace Refractories," *Journal*, Am. Ceramic Soc., Vol. 42, No. 10, 1959, pp. 459–464.



A—Flowmeter (3 to 80 cm³/min)
 B—Flowmeter (10 to 180 cm³/min)
 C—Flowmeters (100 to 1500 cm³/min)
 D—Flowmeters (500 to 9000 cm³/min)
 E—Drying Tubes
 F—Water Manometer

N—Gas Supply (Permeating Medium)

G—Mercury Manometer
 H—Needle Valve
 J—Pressure-Release Valve
 K—Gasket Holder
 L—Hydraulic Jack
 M—Pressure Regulator

FIG. 1 Permeability Apparatus

4.1.4 *Manometers*—One of the manometers, mercury or water, shall be used to measure the differential pressure across the specimen. Manometer—A multiple scale digital manometer shall be used to measure the differential pressure across the specimen.

4.1.5 *Rubber Specimen-Sealing Gasket*—The gasket (Fig. 2) is made to fit tightly around a 2 by 2 by 2 in. (51 by 51 by 51 mm) test specimen. The two tapered metal-gasket holders (Fig. 3) enclose the rubber gasket, and are compressed with a hydraulic jack (Fig. 4) to seal the gasket tightly against the test specimen.

- A - Gasket Holder
- B - Drying Tubes
- C - Digital Manometer
- D - Flowmeter Assembly
- E - Hydraulic Jack & Press
- F - Air Valve
- G - Pressure Relief Valve

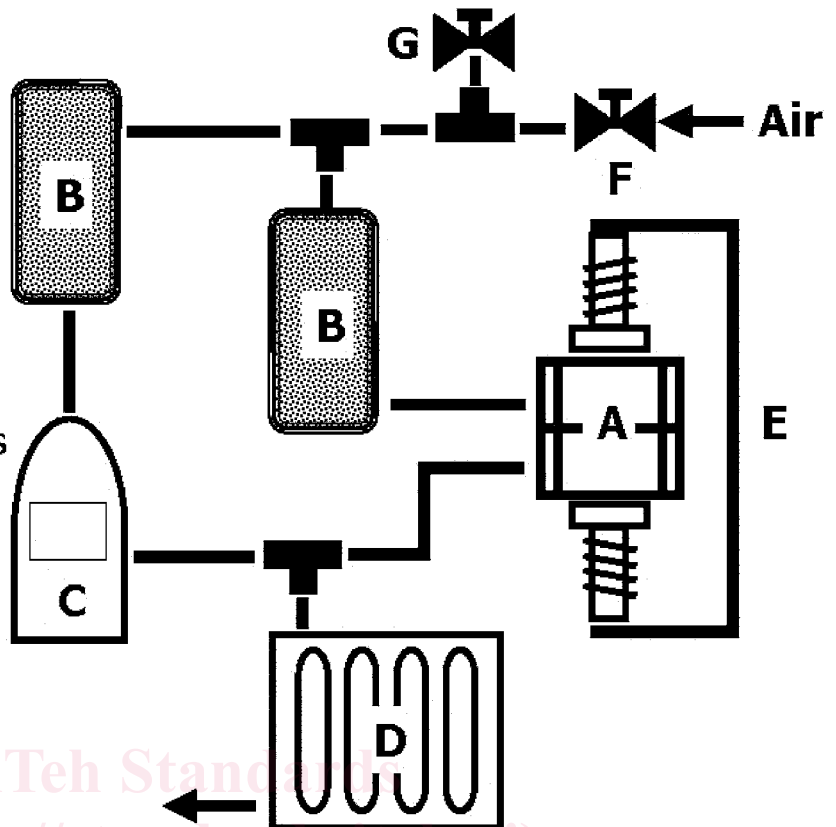
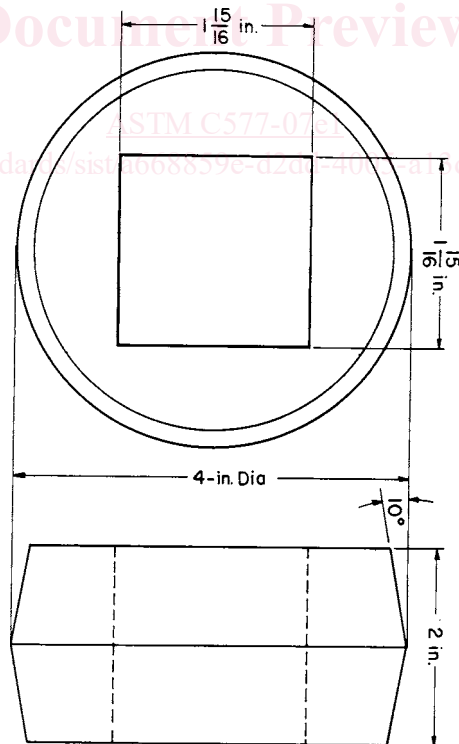


FIG. 1 Permeability Apparatus (continued)



SI Equivalents	1 15/16	2	4
in.	1 15/16	2	4
mm	49	51	102

FIG. 2 Rubber Specimen-Sealing Gasket