Designation: C 704 – 01

Standard Test Method for Abrasion Resistance of Refractory Materials at Room Temperature[1]

This standard is issued under the fixed designation C 704; 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.

1. Scope

1.1 This test method covers the determination of relative abrasion resistance of refractory brick at room temperature. This test method can also be applied to castable refractories (see Metric Dimensions C 861 and Practice C 865) and plastic refractories (see Practice C 1054).

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information 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:*

C 134 Test Methods for Size, Dimensional Measurements, and Bulk Density of Refractory Brick and Insulating Firebrick[2]

C 179 Test Method for Drying and Firing Linear Change of Refractory Plastic and Ramming Mix Specimens[2]

C 861 Practice for Determining Metric Dimensions of Standard Series Refractory Brick and Shapes[2]

C 862 Practice for Preparing Refractory Concrete Specimens by Casting[2]

C 865 Practice for Firing Refractory Concrete Specimens[2]

C 1054 Practice for Pressing and Drying Refractory Plastic and Ramming Mix Specimens[2]

3. Summary of Test Method

3.1 This test method measures the volume of material in cubic centimetres abraded from a flat surface at a right angle to a nozzle through which 1000 g of size-graded silicon carbide grain is blasted by air at 448 kPa (65 psi).

4. Significance and Use

4.1 This test method measures the relative abrasion resistance of various refractory samples under standard conditions at room temperature.

4.2 The abrasion resistance of a refractory material provides an indication of its suitability for service in abrasion or erosive environments.

4.3 The results obtained by this test method could be different than those obtained in service because of the different conditions encountered.

5. Apparatus

5.1 *Abrasion Tester*, used for measuring the abrasion resistance of refractory specimens, consisting of the following (Fig. 1 and Fig. 2):

5.1.1 *Blast Gun*[3], modified for this equipment as shown in Fig. 3.

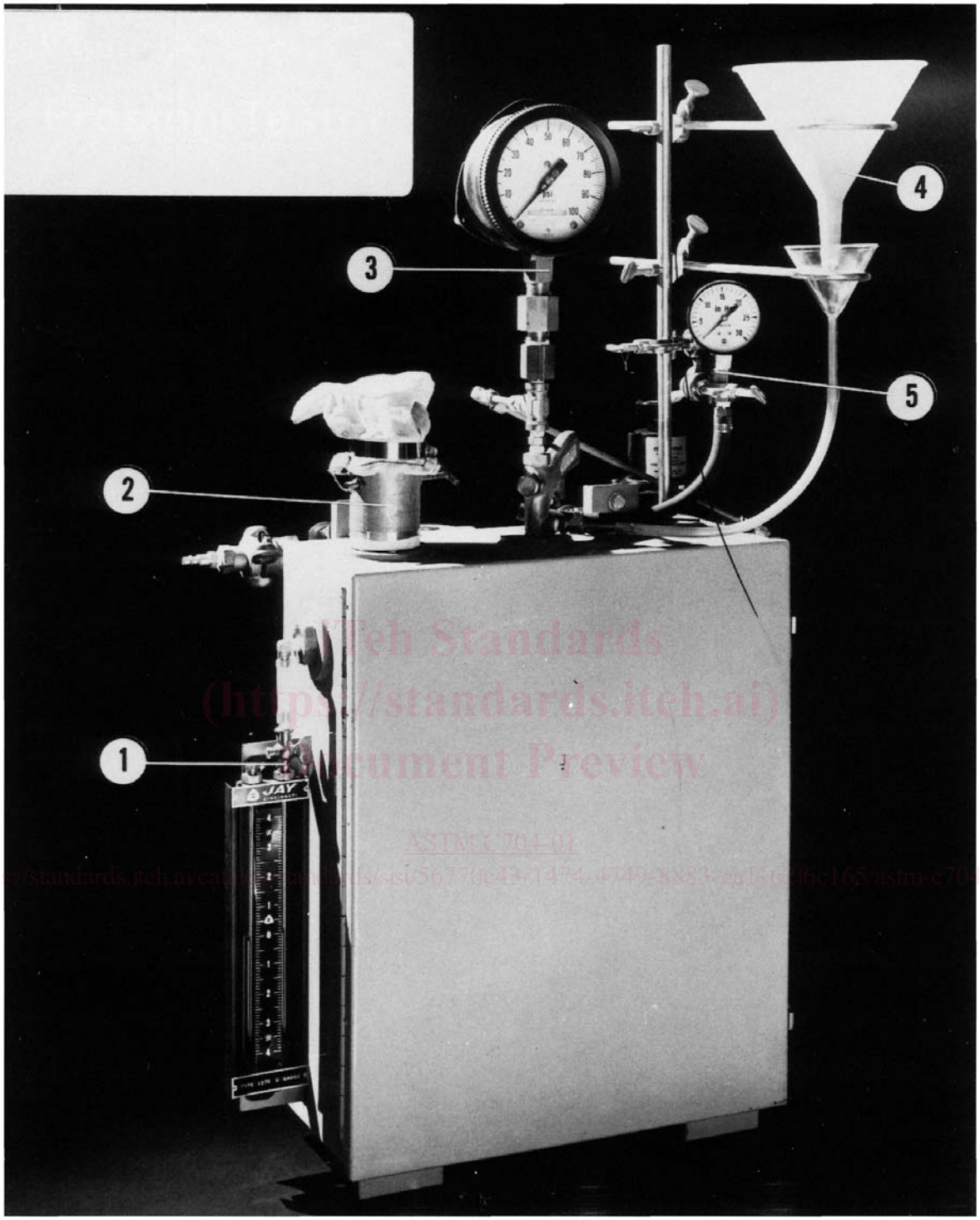
5.1.2 *Nozzle*—A piece of glass tubing is used to replace the steel nozzle supplied with the sand-blast gun to permit control of nozzle size through nozzle replacement after each determination. Flint-glass tubing, 115 mm (4½in.) long, 7 mm (¼in.) in outside diameter, with a nominal 1.1 mm (1⁄16in.) wall, is used. This piece of glass tubing is held in place by a 70 mm (2¾ in.) long piece of stainless steel tubing. The I.D. (inside diameter) of this tubing, which should be flared at one end to sit snugly inside a 9.53 mm (⅜in.) tubing nut, should be 7.15 mm (9⁄32in.). The O.D. (outside diameter) should be 9.53 mm (⅜ in.). This sleeve is glued in place along with a rubber grommet of proper size, inside the 9.53 mm (⅜ in.) tubing nut, and is used primarily to hold the glass tubing perpendicular to the test sample, assuring a proper vacuum within the gun. The end of the glass tube, through which the abrading media enters the nozzle in the venturi chamber, is placed at a distance of 2 mm (0.08 in.) from the air-generator nozzle. This is done by placing the glass tubing on a brass rod, 4.5 mm (0.175 in.) in diameter with a shoulder 7.9 mm (5⁄16 in.) in diameter, 117 mm (4.68 in.) from the tip. This will allow the operator to push the glass tubing up through the rubber grommet until the rod

[1] This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.03 on Physical Tests and Properties.

Current edition approved Dec. 10, 2001. Published January 2002. Originally published as C 704 – 72. Last previous edition C 704 – 99.

[2] *Annual Book of ASTM Standards*, Vol 15.01.

[3] The sand blast gun shown in Fig. 3, available from Leitch and Company, 971 Howard St., San Francisco, CA, has been found suitable for use in this test method.

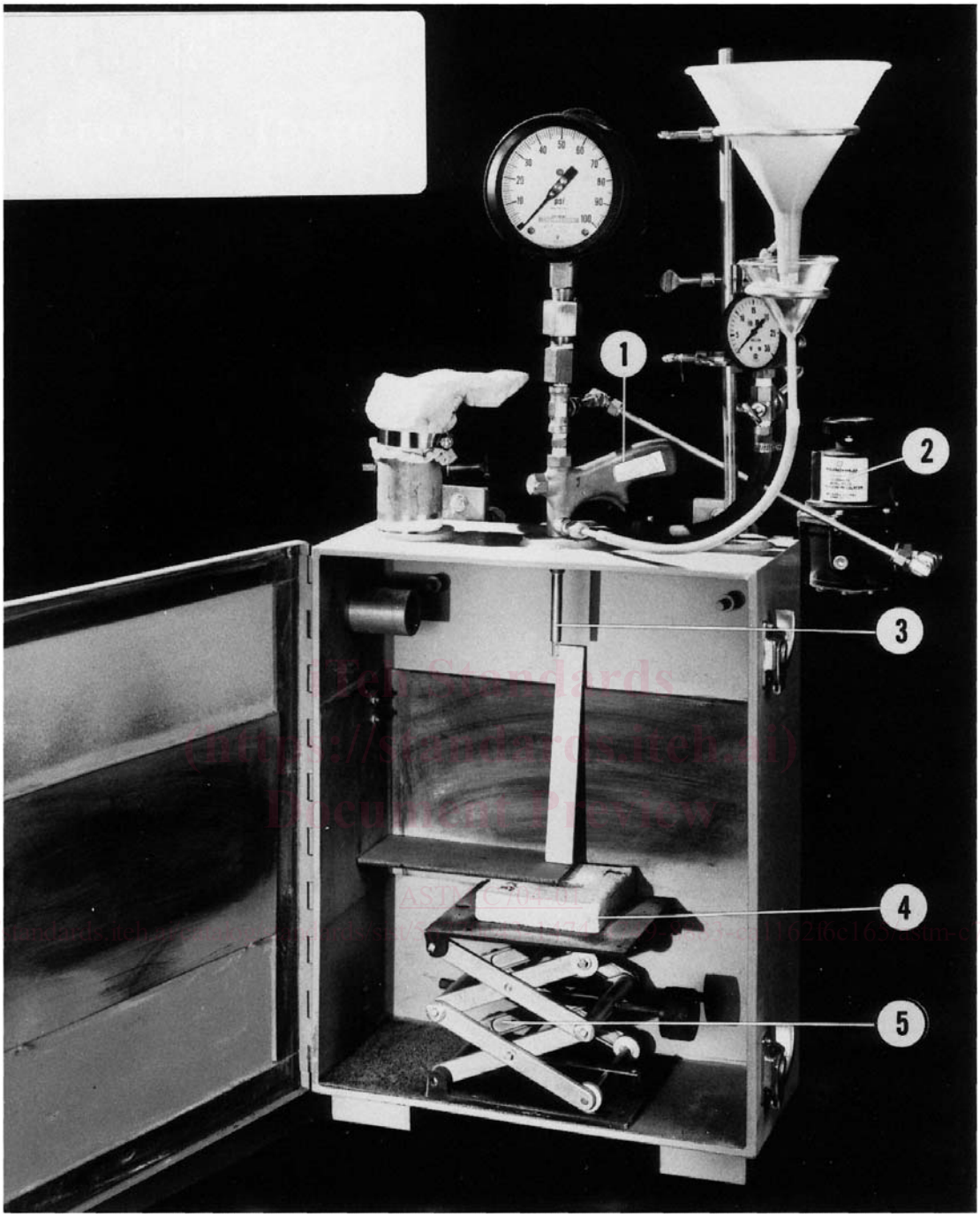


NOTE 1—Identified by number in this figure are: (1) cabinet pressure manometer, (2) dust collector vent, (3) test pressure gage, (4) grit feed tunnel, and (5) vacuum gage.

FIG. 1 Abrasion Tester

touches the nozzle, assuring a 2 mm (0.08 in.) gap between the nozzle and the glass tubing.

5.1.3 *Venturi*—The air-generator nozzle should have an inlet inside diameter of from 2.84 to 2.92 mm (0.112 to 0.115 in.) and an outlet inside diameter of from 2.36 to 2.44 mm (0.093 to 0.096 in.). The surface of the air-generator nozzle within the venturi chamber of the gun is protected from the abrading media with a 9.4 mm (⅜ in.) long piece of vinyl tubing 4.7 mm (3⁄16 in.) inside diameter with a 1.5 mm (1⁄16 in.) wall thickness. The inside diameter of the venturi chamber should not exceed 10 mm (⅜ in.) and should be checked periodically for wear.



NOTE 1—Identified by number in this figure are: (1) sand blast gun, (2) air pressure regulator, (3) glass tube and metal stabilizing sleeve, (4) test sample, and (5) adjustable platform.

FIG. 2 Abrasion Tester

5.1.4 *Air Supply*—The air line pressure shall be maintained at the desired pressure at the gun through the use of a standard suppressed range air gage indicating 6.9 kPa (±1 psi) mounted as close to the gun as possible. Only clean dry air should be used.

5.1.5 *Abrading Media*—No. 36 grit silicon carbide having a screen analysis as shown in Table 1.

5.1.6 *Feeding Mechanism*—Two acceptable mechanisms for feeding the abrading media are shown in Fig. 4. The feed funnel must contain a suitable orifice to obtain a flow time of 450± 15 s while delivering 1000 g of abrading media into the gun supply funnel. Metal, glass, or plastic orifices can be used to regulate the flow. There must be an air gap between the orifice and the gun supply funnel to allow secondary air to enter with the abrading media.

5.1.7 *Test Chamber*, consisting of a tightly sealed closure with a door to permit ready access for mounting and removing the test specimens. A 13-mm (½-in.) hole shall be cut in the top