Designation: C1054 – 13

Standard Practice for Pressing and Drying Refractory Plastic and Ramming Mix Specimens[1]

This standard is issued under the fixed designation C1054; 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 practice covers the pressing and drying of chemically and non-chemically bonded alumin-silicate and high alumina plastic and ramming mix refractory specimens classified in accordance with Classification C673.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are 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:*[2]

C179 Test Method for Drying and Firing Linear Change of Refractory Plastic and Ramming Mix Specimens

C181 Test Method for Workability Index of Fireclay and High-Alumina Refractory Plastics

C673 Classification of Fireclay and High-Alumina Plastic Refractories and Ramming Mixes

3. Significance and Use

3.1 This practice is useful for producing uniform specimens of refractory plastics and ramming mixes for use in standard ASTM tests. Samples thus formed may be used for referee testing when setting specifications between producer and user. Establish by mutual agreement and specify in the report the forming parameters such as sample size, workability, and forming pressure when referee testing.

3.2 This practice is applicable for preparing test specimens of various sizes. Note that 9 by 4½ by 2½ in. (228 by 114 by 64-mm) samples, because of their large cross-section, have a greater tendency to form flaws during pressing, handling, and drying than smaller cross-sectional samples.

3.3 The purpose of this practice is to minimize flaws in pressed specimens. It is not intended to duplicate all field installation conditions.

3.4 Variations in workability as determined by Test Method C181 can significantly affect the number of flaws contained in a specimen. Establish by mutual agreement the workability level when comparing tests between two laboratories.

3.5 This practice is not intended for preparing specimens of basic ramming mixes, anhydrous tap-hole mixes, nor resin bonded mixes.

4. Apparatus

4.1 *Power Press,* preferably of the hydraulic type, equipped with suitable molds for forming specimens of the required size (Note 1) and capable of pressing to a minimum of 1500 psi (10.34 MPa) pressure when forming the largest cross-sectional area specimen.

NOTE 1—It may be advisable to have the molds slightly oversized so that, after drying, the specimens will be close to the required size for the specific test.

4.2 *Drying Oven,* preferably forced-draft rather than natural convection, capable of maintaining 230°F (110°C) with a capacity to hold the specimens.

4.3 *Balance,* sufficient capacity to measure specimens with sensitivity of 0.02 lb (9 g).

4.4 *Thermometer,* with a range of 0° to 180 ± 0.1°F (–18° to 80°C ± 0.05°C).

4.5 *Linear Measuring Device,* capable of being read to 0.02-in. (0.5-mm) .

4.6 *Mold Lubricant*—Either paraffin or silicone-based oils can be used as a parting agent for coating mold and die surfaces.

4.7 *Two Non-Porous Blocks,* approximately ½-in. (13-mm) thick. The cross-sectional dimensions of these pieces will vary, depending on the side dimensions of the bar being pressed.

[1] This practice is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.09 on Monolithics.

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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.

5. Sampling

5.1 Keep the container or package unopened until testing to ensure the sample does not dry out.

5.2 The ideal sample test temperature is between 65 and 75°F (18 and 24°C). Measure the temperature by inserting the full length of the thermometer stem into the material. Note and record temperature when the reading is constant.

6. Procedure

6.1 *Workability Index Measurement* (Note 2)—Determine and report workability of plastics at the time of pressing in accordance with the procedure described in Test Method C181 (Note 3).

NOTE 2—A workability index between 17 and 23 is the optimum range for pressing samples with a minimum amount of flaws. If higher workability material is used in referee tests between two or more laboratories, the workability should be the same, (±3 %), for the material being tested.

NOTE 3—Since no suitable standard test exists for gaging the workability of ramming mixes, participants in a referee test should agree that samples of similar formability are being tested.

6.2 *Filling the Mold Specimens*—Use the power press to form the test specimens. In order to facilitate filling the mold, break the material into pieces that vary in size, the largest dimension being 1-in. (25-mm). Carefully pack these pieces into the mold, in order to achieve uniform distribution of material.

6.2.1 Do not expose the material being pressed to the atmosphere for periods longer than 15 min. *Cover with an impermeable material if longer periods of air exposure are expected* (Note 4).

NOTE 4—Exposure in air may lead to a change in workability.

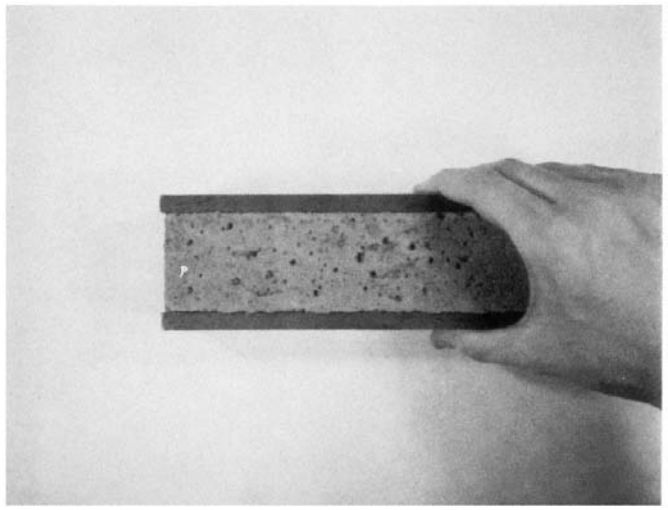
6.3 *Pressing of Specimens*—Apply a pressure sufficient to achieve a well-consolidated specimen (typically 750 to 1250 psi (5.17 to 8.62 MPa) for plastics, higher pressures may be necessary for ramming mixes) (Note 5). Avoid excessive pressure which forces a portion of the mix out of the mold by extrusion through the clearance space located between the plunger of the mold and the walls of the die cavity (Note 6). To eliminate possible entrapped air, apply an initial load of approximately 250 psi (1.72 MPa). *Relieve this pressure, and then increase to the selected pressure.*

NOTE 5—Single- and double-action presses may produce differing degrees of consolidation when pressing some ramming mixes.

NOTE 6—The total clearance space between the plunger and the walls should not exceed 1/16 in. (1.6 mm).

6.4 *Removal of Specimens from Mold*—When removing the specimen from the mold, use the two support pieces against the sides of the specimen (as shown in Fig. 1) in order to pick up the bar and move it subsequently for measuring, weighing, and drying (Note 7).

NOTE 7—Use of the supports uniformly distributes the force of gripping the bar and prevents the specimen from flexing during the critical handling stage. This prevents a major source of induced flaws (cracks) that cause damage to the specimen. Specimens made from high workability plastics are especially susceptible to this damage. Distortion of the specimen may also be caused by handling.



Two support pieces are used against the sides of the bar during the lifting and moving operation to prevent flexing.

FIG. 1 Removal of Specimen from Mold

6.5 *Measurement of Weight and Dimensions*—Immediately upon removal from the mold, place each bar on the balance (using waxed paper to prevent sticking to the pan surface) and weigh to the nearest 0.02 lb (9 g). With the linear measuring device, measure the specimen (5.2 of Test Method C179) for all dimensions to the nearest 0.02 in. (0.5 mm) and record the results. Label and make reference marks to indicate the exact length measurement points.

6.6 *Drying of Specimens:*

6.6.1 *Standard Drying Schedule*—Immediately after measuring, use the handling procedure described in 6.4, to move the bars to a non-stick ventilated surface (Note 8) and allow the specimen to air dry for a minimum of 15 h. The drying surface will be of sufficient strength and supported so as to not bend or sag under the weight of the specimens. If using a wire or metal mesh grid, support it a minimum of 1-in. (25-mm) above the table top to allow air circulation. After the air drying is complete, place in dryer and raise the temperature of the drying oven to 230°F (110°C) in 1 h. Hold for at least 15 h.

NOTE 8—Plastic film or waterproof paper is not recommended for this surface. They inhibit movement of moisture out of the bottom of the bar. Flat expanded metal grids, ceramic fiber paper, or similar materials are preferred because they do not act as vapor barriers.

6.6.2 *Alternate Drying Procedures*—Immediately after measuring the specimen, place in the oven and raise the temperature of the drying oven from ambient to 170°F (75°C) in 1 h. Hold at least 12 h. Raise the temperature of the drying oven to 230°F (110°C) in 1 h. Hold for at least 15 h.

6.6.3 *Cooling*—Cool the bars to room temperature.

6.7 *Measurement of Weight and Dimensions of the Dried Specimens*—Remeasure and reweigh the specimens at room temperature as described in 6.5 and record the data.

NOTE 9—*Storage of Specimen*— If more than 8 h will elapse before tests are performed on the bars, keep them dry by replacing them in a

drying oven, sealing them in plastic bags, or some other suitable procedure.

7. Report

7.1 Report the workability and material temperature at time of test, pressing pressure used, drying schedule used, green and dried specimen size and weight.

7.2 Identify by a suitable marking the original pressed surface of the specimen.

7.3 Referee testing specifying the exact procedure used by both parties.

8. Precision and Bias

8.1 This practice is intended to prepare test specimens for testing under other procedures. Therefore, no statement is required regarding test results, only information on the specimen preparation parameters used.

9. Keywords

9.1 drying; forming; pressing; refractory plastics; refractory ramming mixes