Designation: C 862 – 01

Standard Practice for Preparing Refractory Concrete Specimens by Casting[1]

This standard is issued under the fixed designation C 862; 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 mixing, casting and curing of monolithic refractory concrete specimens for use in further testing. It does not apply to monolithic castable refractories intended primarily for gunning applications.

1.2 The values given in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 Various specimen sizes are required for specific test methods. Refer to these test methods to determine the size and number of specimens, which will be required from the sample.

1.4 *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 133 Test Methods for Cold Crushing Strength and Modulus of Rupture of Refractories[2]

C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory[3]

3. Significance and Use

3.1 This practice is used to standardize mixing, mold conditions, placement and curing of refractory concrete specimens to be used for testing and evaluation under other test methods.

3.2 This practice standardizes laboratory conditions for producing refractory concrete specimens to minimize laboratory-to-laboratory variation and does not attempt to duplicate the conditions of field installations.

3.3 This practice can be used for the preparation of specimens used in referee testing.

4. Apparatus and Conditions

4.1 *Laboratory Conditions*—The laboratory ambient should be controlled between 70 and 80°F (20 and 27°C) and from 40 to 60 % relative humidity for preconditioning materials and equipment, batching and mixing casting test specimens, stripping molds, and testing specimens. Report laboratory temperature and relative humidity with physical test results if other than specified.

4.2 *Balances*—Appropriately sized scales having a sensitivity of 0.2 % of the related batch size.

4.3 *Castable Mixers*—An electrically operated mechanical mixer[4] (Fig. 1) may be used for preparing castable batches for casting specimens. A 2-ft^3 (56.6-dm^3) mixing bowl or a 2½-ft^3 (70.8-dm^3) concrete mixer has sufficient capacity to mix about 1 ft^3 of refractory castable. The smallest batches required for casting 1-in. (25-mm) square bars can be mixed in a 0.10-ft ^{3} (2.83-dm^3) bowl available with bench mixers. Size mixing bowl to contain from 50 to 75 % volume loading with the dry batch.

NOTE 1—Castable water requirement variation becomes more significant as dry volume loadings drop below 40 % because the water required to wet the bowl surfaces changes more rapidly with decreasing volume loadings.

4.4 *Gang Molds*—Metal, two or more sets, as shown in Figs. 2 and 3, for casting specimens to the size required for specific physical property testing (see Note 8). The front plate of the mold illustrated is held in place by quick-release clamps (50-lbf (222-N) pull exerted by each clamp) that permit emptying the mold by releasing the clamps and tapping the left end of the front plate, thereby parting all of the separator plates and loosening the cast-test specimens.[5]

4.4.1 As an alternative design for 1 in. (25-mm) square bars, individual molds may be constructed out of 16-gage (1.588-mm) stainless-steel sheet and ganged in groups of five with a large rubber band on a glass base-plate.

4.4.2 There are commercially available molds from concrete testing suppliers and other sources. Molds may be reusable or for single use. Molds must be water tight, rigid, and removable.

4.5 *Calipers*—Suitable for measuring internal longitudinal mold dimensions and subsequent specimen length size to the nearest 0.01 in. (0.25 mm).

4.6 *Mold Lubricant*—Either paraffin or silicone-based oils

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

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

[3] *Annual Book of ASTM Standards,* Vol 04.02.

[4] Mixers having various capacities are available from the Hobart Manufacturing Co., Troy, OH and have been found to be suitable for this purpose.

[5] A list of materials and notes on construction of the 9-in. (230 mm) straight-brick gang molds are available at a nominal charge from the Orton Refractory Research Center, Westerville, Ohio.

FIG. 1 Five Quart Hobart Mixer

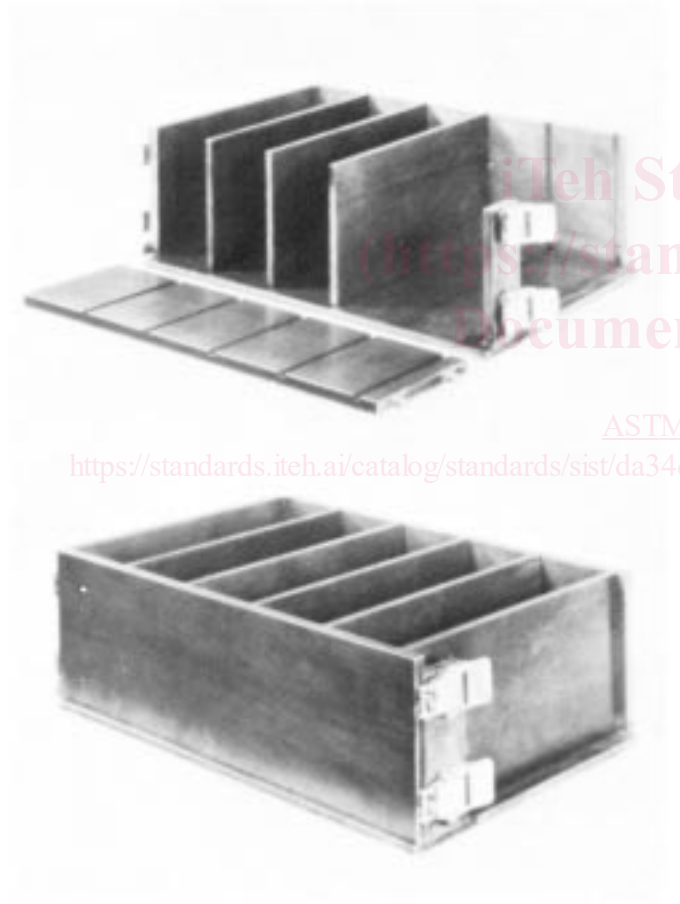

FIG. 2 Five-Brick Gang Mold for Castable Refractories

can be used as a release or parting agent for coating molds. Other mold lubricants such as vegetable oils and petroleum-based oils can be used.

4.7 *Strike-Off Bar*—20-in. (510-mm) length of steel bar stock, 1½ by 3⁄16 in. (38 by 5 mm).

4.8 *Thermometer*—Digital or dial-type, metal, with a range from 0 to 180°F (−18 to 80°C).

4.9 *Timer*—Signal-type, for periods up to 5 min. (A stop watch may be used.)

4.10 *Trowels*—6 in. pointing and 2 by 6 in. (51 by 152 mm) square, and a 10-in. (254-mm) stainless-steel spatula.

4.11 *Oven*—For curing and drying, preferably forced draft rather than natural convection, with a capacity to hold a minimum of one sample group of specimens (12 by 12 by 12 in.) (30 by 30 by 30-mm.).

4.12 *Heavy Rubber Gloves*—For castables containing metal fibers.

4.13 *Scoop*—For transferring the castable from the mixer to the mold more easily.

4.14 *Vibration Table*—For use in 6.4.2.[6]

4.15 *Sample Splitters*—The sample splitter opening shall be a minimum of 3 times the maximum grain size.

4.16 *Mixing Box*—Box of suitable size and strength to hand mix lightweight castable. Inside surface of box should not be water absorbent. Fig. 4 is a possible solution.

4.17 *Hoe*—Hand-held hoe for mixing lightweight castable.

4.18 *Humidity Cabinet*—A cabinet capable maintaining a relative humidity of greater then 95 % within 90-95°F (32-35°C) is optional.

5. Sampling

5.1 A sufficient amount of dry castable should be batched to overfill the gang molds by at least a 10 %. This should eliminate the use of both trailings and scrapings of wet castable.

5.2 At the time of use, the dry sample should be between 70 and 80°F (20 and 27°C). Measure the temperature (Note 2) by inserting the full length of the thermometer stem into the material until the reading is constant. Record and report with physical test results.

NOTE 2—It is recommended that in referee tests involving more than one laboratory, the temperature of the dry refractory concrete mix and mixing water be within the specified range, in all laboratories.

5.3 The contents of the container should be thoroughly mixed dry prior to water addition. When less than a full bag is required, reduce the contents of the sample container with a sample splitter to obtain a representative sample of the desired size. Take precautions to prevent segregation.

NOTE 3—When the castable mix consists of more than one bag or container, the contents should be combined and mixed thoroughly before being quartered.

6. Molding Test Specimens

6.1 *Water Addition*—Determine the amount of water to be used in the mix for casting test specimens in accordance with the manufacturers or referee's recommendations. Use potable water (Note 4) having temperature between 70 and 80°F (20 and 27°C). Report the temperature with any physical test results. Measure the water addition to the nearest 0.1 % by weight.

[6] While there is no current specification for vibration table, ASTM C08 recognizes that the frequency and amplitude of the vibration table can affect the degree of consolidation of the sample. Current practice is to use an electric vibration table, which at least has a generally fixed frequency by the electric motor and the AC current.