



Standard Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency¹

This standard is issued under the fixed designation C 305; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

^{ε1} NOTE—Footnote 3 was editorially updated January 2002.

1. Scope

1.1 This practice covers the mechanical mixing of hydraulic cement pastes and mortars of plastic consistency.

1.2 *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 778 Specification for Standard Sand²

3. Significance and Use

3.1 This practice is intended for use in the mechanical mixing of pastes and mortars for the testing of hydraulic cements.

4. Apparatus

4.1 *Mixer*—The mixer shall be an electrically driven mechanical mixer of the epicyclic type, which imparts both a planetary and a revolving motion to the mixer paddle. The mixer shall have a minimum of two speeds, controlled by definite mechanical means. (Rheostat adjustment of speed will not be acceptable.) The first, or slow speed shall revolve the paddle at a rate of 140 ± 5 r/min, with a planetary motion of approximately 62 r/min. The second speed shall revolve the paddle at a rate of 285 ± 10 r/min, with a planetary motion of approximately 125 r/min. The electric motor shall be at least 124 W ($\frac{1}{2}$ hp).³ The mixer shall be equipped with either an adjustment screw which is an integral part of the mixer or a clearance adjustment bracket such as the one shown in Fig. 1 (Note 1) to provide clearance between the lower end of the

paddle and the bottom of the bowl that is not greater than 2.5 mm but not less than 0.8 mm (Note 2) when the bowl is in the mixing position.

NOTE 1—When the bracket is in the proper position beneath the motor housing, the lugs are to the front and facing upward and the heads of the adjustment screws are to the rear and facing downward in the path of the sliding frame that holds the bowl. It is intended that the bracket be fastened at the front housing connection by inserting replacement screws on an appropriate size upward through the opening in each lug and into the existing threaded holes in the bottom of the motor housing. The original stops for the sliding frame are to be filed down if they prevent the frame from coming in contact with the adjustment screws.

NOTE 2—This is the approximate diameter of a grain of 20-30 sand as described in Specification C 778.

4.2 *Paddle*—The paddle shall be readily removable, made of stainless steel, and shall conform to the basic design shown in Fig. 2.² The dimensions of the paddle shall be such that when in the mixing position the paddle outline conforms to the contour of the bowl used with the mixer, and the clearance between corresponding points on the edge of the paddle and the side of the bowl in the position of closest approach shall be approximately 4.0 mm but not less than 0.8 mm.

4.3 *Mixing Bowl*—The removable mixing bowl shall have a nominal capacity of 4.73 L, shall be of the general shape and comply with the limiting dimensions shown in Fig. 3,³ and shall be made of stainless steel. The bowl shall be so equipped that it will be positively held in the mixing apparatus in a fixed position during the mixing procedure. There shall be provided a lid, made of a nonabsorbing material not attacked by the cement.

4.4 *Scraper*—The scraper shall consist of a semirigid rubber blade attached to a handle about 150 mm long. The blade shall be about 75 mm long, 50 mm wide, and tapered to a thin edge about 2 mm thick.

NOTE 3—A kitchen tool known as a plate and bowl scraper conforms to these requirements.

4.5 *Supplementary Apparatus*—The balances, weights, glass graduates, and any other supplementary apparatus used in measuring and preparing the mortar materials prior to mixing shall conform to the respective requirements for such apparatus

¹ This practice is under the jurisdiction of ASTM Committee C01 on Cement and is the direct responsibility of Subcommittee C01.22 on Workability.

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² *Annual Book of ASTM Standards*, Vol 4.01.

³ The Model N-50A Mixer, manufactured by the Hobart Corporation, Troy, OH, is considered to conform to these requirements. This mixer incorporates a stainless steel “B” flat beater, Part No. 62458, and a mixing bowl, Part No. 78575–2.

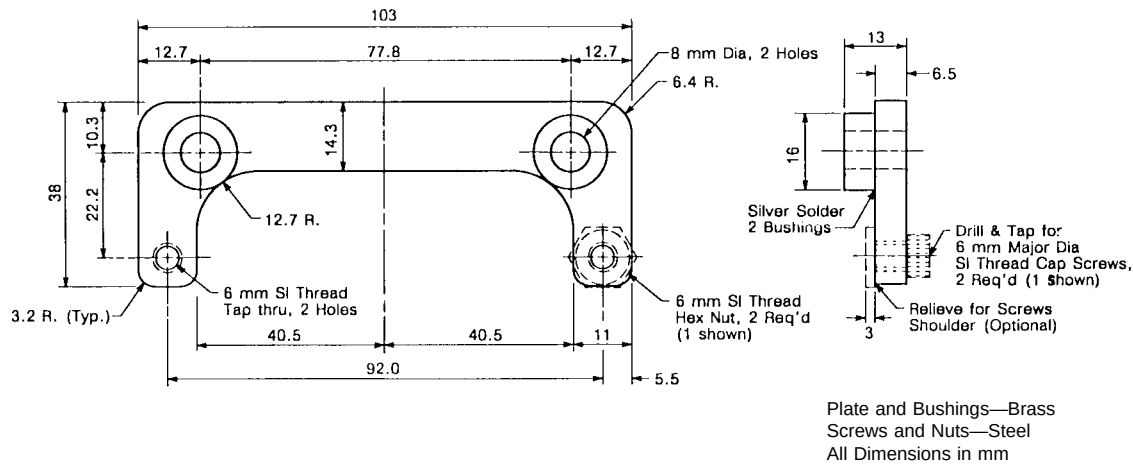


FIG. 1 Clearance Adjustment Bracket

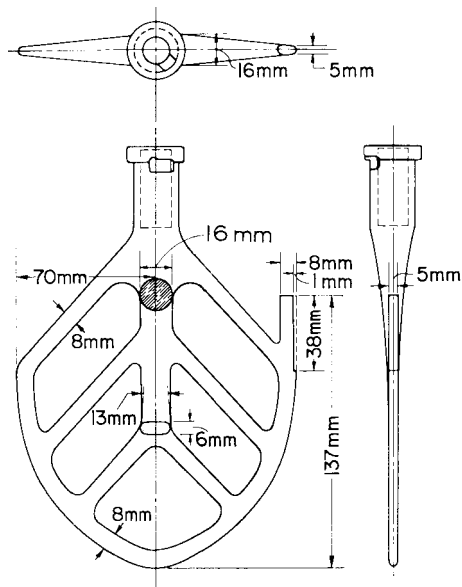


FIG. 2 Paddle

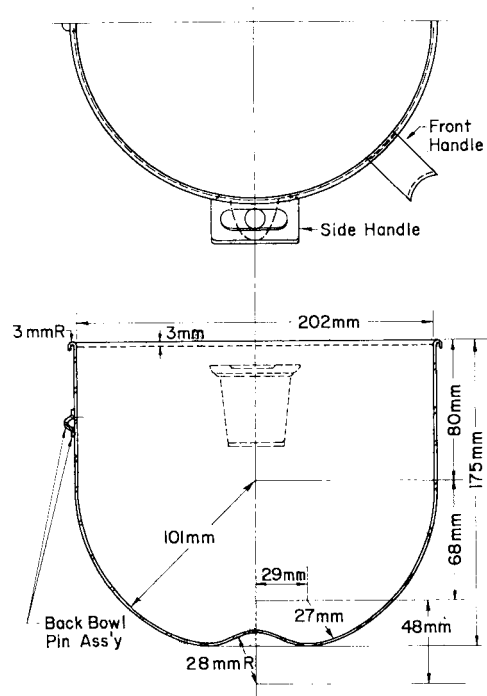


FIG. 3 Mixing Bowl

as specified in the method for the particular test for which the mortar is being prepared.

5. Temperature and Humidity

5.1 The temperature of the room shall be maintained between 20 and 27.5°C (68 and 81.5°F), and the temperature of the dry materials, paddle, and bowl shall be within the above range at the time of test. The temperature of the mixing water shall not vary from 23°C (73.4°F) by more than $\pm 1.7^\circ\text{C}$ (3°F).

5.2 The relative humidity of the laboratory shall be not less than 50 %.

6. Materials, Proportioning, and Consistency

6.1 The materials and their proportions and quantities shall conform to the requirements contained in the particular method for which the paste or mortar is being prepared.

7. Procedure for Mixing Pastes

7.1 Place the dry paddle and the dry bowl in the mixing position in the mixer. Then introduce the materials for a batch into the bowl and mix in the following manner:

7.1.1 Place all the mixing water in the bowl.

7.1.2 Add the cement to the water and allow 30 s for the absorption of the water.

7.1.3 Start the mixer and mix at slow speed (140 ± 5 r/min) for 30 s.

7.1.4 Stop the mixer for 15 s and during this time scrape down into the batch any paste that may have collected on sides of the bowl.

7.1.5 Start the mixer at medium speed (285 ± 10 r/min) and mix for 1 min.

8. Procedure for Mixing Mortars

8.1 Place the dry paddle and the dry bowl in the mixing position in the mixer. Then introduce the materials for a batch into the bowl and mix in the following manner:

8.1.1 Place all the mixing water in the bowl.

8.1.2 Add the cement to the water; then start the mixer and mix at the slow speed (140 ± 5 r/min) for 30 s.

8.1.3 Add the entire quantity of sand slowly over a 30-s period, while mixing at slow speed.

8.1.4 Stop the mixer, change to medium speed (285 ± 10 r/min), and mix for 30 s.

8.1.5 Stop the mixer and let the mortar stand for $1\frac{1}{2}$ min. During the first 15 s of this interval, quickly scrape down into the batch any mortar that may have collected on the side of the bowl; then for the remainder of this interval, cover the bowl with the lid.

8.1.6 Finish by mixing for 1 min at medium speed (285 ± 10 r/min).

8.1.7 In any case requiring a remixing interval, any mortar adhering to the side of the bowl shall be quickly scraped down into the batch with the scraper prior to remixing.

NOTE 4—Caution: The clearances between the paddle and the bowl specified in this practice are suitable when using mortar made with standard sand as described in Specification C 778. To permit the mixer to operate freely and to avoid serious damage to the paddle and bowl when coarser aggregates are used, it may be necessary to set the clearance adjustment bracket to provide greater clearances than those specified in 4.1.

For additional useful information on details of cement test methods, reference may be made to the “Manual of Cement Testing,” which appears in the Annual Book of ASTM Standards, Vol 04.01.

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