Designation: C 1090 – 96

Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout[1]

This standard is issued under the fixed designation C 1090; 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 measurement of the changes in height of hydraulic-cement grout by the use of 3 by 6-in. (76 by 152-mm) cylinders, when the cylinders are protected so that the tendency to change in height does not include evaporation so as to cause drying, uptake of moisture, carbonation, or exposure to temperatures outside the range 73.4 ± 3°F (23 ± 1.7°C) or, optionally, to another specified temperature controlled within ± 5°F (± 2.9°C).

1.2 If desired, this test method can be adapted to studies of changes in height involving either schedules or environmental treatment different from the standard procedures prescribed by this test method.

1.3 The values stated in inch-pound units are to be regarded as the standard.

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 172 Practice for Sampling Freshly Mixed Concrete[2]

C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency[3]

C 511 Specification for Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes[2,3]

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials[3]

C 827 Test Method for Early Volume Change of Cementitious Mixtures[2]

C 939 Test Method for Flow of Grout for Preplaced-Aggregate Concrete[2]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *change in height*—either an increase or decrease in the vertical dimension of a test specimen, provided the change has been caused by factors other than externally applied forces, changes in ambient temperature not conforming to the specified range, drying caused by evaporation, carbonation, or uptake of moisture.

4. Significance and Use

4.1 This test method is intended to provide a means of assessing the ability of a hydraulic-cement grout to retain a stable volume during the stipulated testing period of 28 days, provided that the tendency to change height does not include the effects of drying caused by evaporation, uptake of moisture, carbonation, or exposure to temperatures outside the range 73.4 ± 3°F (23 ± 1.7°C) (Note 1). An exception is made when the options described in the section on test conditions are exercised. The test method is primarily intended for use in evaluating mixtures of materials intended to be used in producing" nonshrink grouts'' for use either under machine bases or column bases, for bolt anchorages, and for similar applications where the portion of the grout providing either the bearing support or bolt anchorage, or both, will set and harden under confinement.

NOTE 1—This test method does not measure the change in height before hardening (see Test Method C 827).

5. Apparatus

5.1 *Cylinder Molds* [4] shall be steel, of a minimum wall thickness of ¼ in. (6 mm) fitted with clamp assemblies for closing, and 3 in. (76 mm) ± 1 % in inside diameter by 6 in. (152 mm) ± 2 % in height (Note 2). Each mold shall be fitted with a removable ¼-in. (6-mm) steel base plate that can be clamped in place. The cylinder molds shall have had the top edge machined to a narrow rim as shown in Fig. 1.

NOTE 2—Satisfactory molds can be made from lengths of steel tubing or pipe that is slit on one side parallel to the longitudinal axis and fitted

[1] This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregatesand is the direct responsibility of Subcommittee C09.68on Volume Change of Concrete.

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

[3] *Annual Book of ASTM Standards*, Vol 04.01.

[4] Humboldt Mfg. Co., 7302 Agatite Ave., Chicago, IL 60656, Catalog number H-2902 Depth Micrometer, H-2904 Tapered Cylinder Mold, H-2931.2 Glass Plate, H-2931.3 Weight, and H-2903 Set (including all the above items) have been found satisfactory.

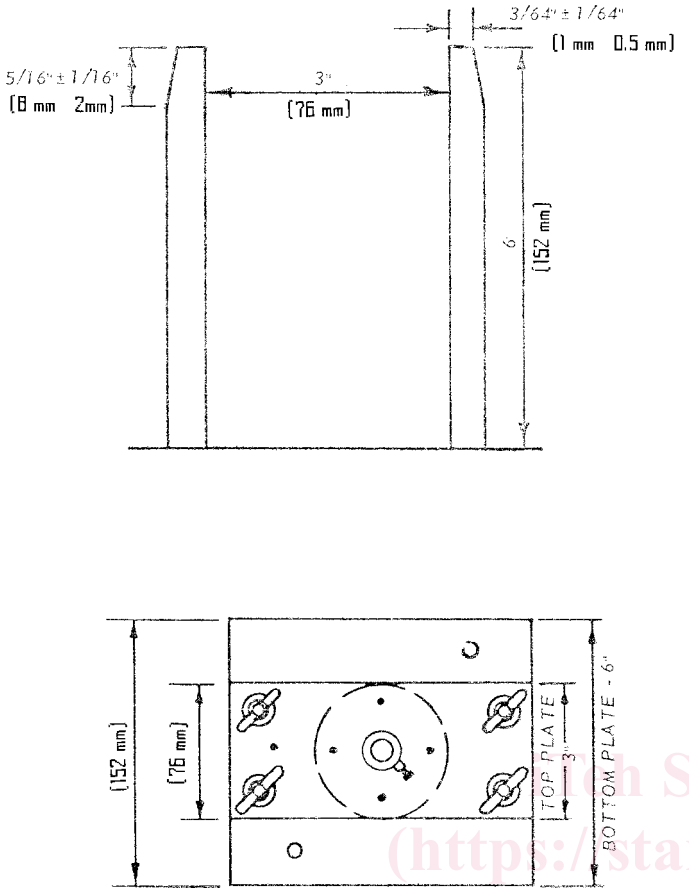


FIG. 1 Cylinder Mold with Machined (Tapered) Top Edge

with a means of closing the vertical slit as well as a means of attaching a base plate.

5.2 *Glass Plate* [4] shall be approximately 4 in. (100 mm) square by ¼ in. (6 mm) thick, coated as thinly as possible on one surface with a silicone base spray[5] or other inert material such as mineral oil, and permitted to dry before use.

5.3 *Hold-Down Weight*, [4] having a mass of 3 lb. (1.4 kg) ± 1 %.

5.4 *Micrometer Bridge*, [4] designed to support and hold one cylinder in a level, firm position (Fig. 2). The rods shall be made of steel; the top shall be made of noncorroding metal. The diameter of the four holes in the bridge top shall not be more than 3⁄64 in. (1.2 mm) larger than the diameter of the measuring shaft of the micrometer depth gage (Note 3). Numbering these holes will help in recording repeated measurements.

NOTE 3—The four holes should be 1¼ ± 1⁄16 in. (32 ± 2 mm) from the center of the hold down device.

5.5 *Micrometer Depth Gage*, [4] having a range from 1.000 to 2.000 in. (25.40 to 50.80 mm) graduated in units not larger than 0.001 in. (0.02 mm) (Note 4).

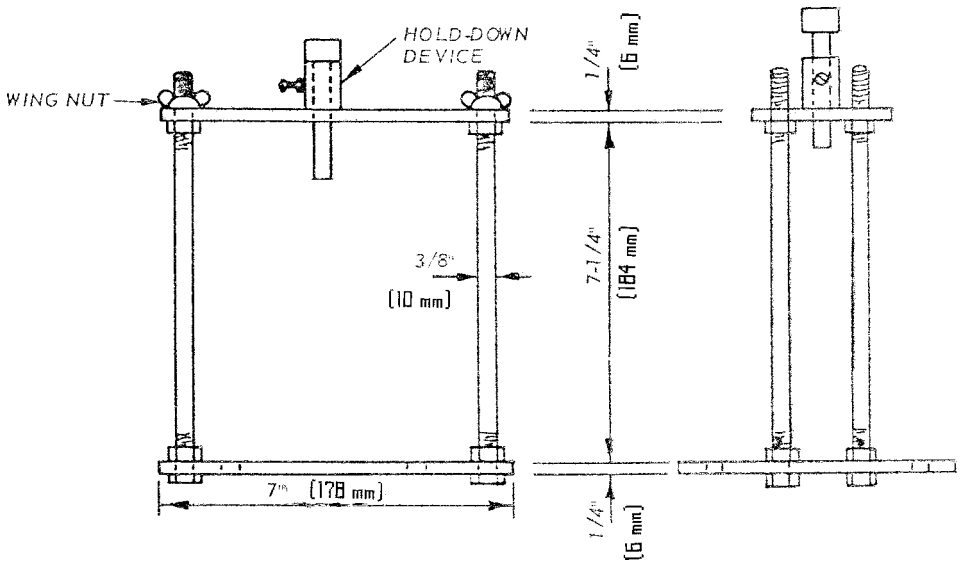
NOTE 4—The diameter of the shaft of the depth micrometer should be ⅛ ± 1⁄64 in. (32 ± 0.4 mm).

5.6 *Outside Micrometer Caliper*, used to measure the thickness of the plate, shall have a capacity of at least ½ in. (12 mm) and be graduated in units not larger than 0.001 in. (0.02 mm). The minimum throat depth of the micrometer shall be 2.0 in. (51 mm).

5.7 *Tamping Rod*, a straight steel rod with at least the tamping end rounded to a hemispherical tip of the same diameter as the rod. The rod shall be ⅜ in. (10 mm) in diameter and not less than 10 in. (250 mm) long.

5.8 *Mechanical Mixer*, as described in Practice C 305. This mixer has clearances between paddle and bowl that are suitable

[5] Borden Chemical Company's No. 1325 Silicone Spray in aerosol cans has been found satisfactory.



NOTE 1—All Parts of this bridge shall be made of a light-weight noncorroding metal.

NOTE 2—The diameter of the measuring shaft of the depth micrometer should be 13⁄64 in. ± 1⁄64 in. The four holes should be 1 in ± 1⁄16 in. from the center of the cylinder as shown in Fig. 1.

FIG. 2 Dimensions of Micrometer Bridge