Designation: C 405 – 82 (Reapproved 1997)

Standard Practice for Estimating Consistency of Wet-Mixed Thermal Insulating Cement[1]

This standard is issued under the fixed designation C 405; 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 estimating the consistency of thermal insulating cements, after mixing with a known amount of water. The consistency of a wet cement affects such properties as ease of trowelling, wet adhesion, drying shrinkage, dry density, and thermal conductivity.

1.2 This practice estimates consistency of thermal insulating cements in terms of either percentage of deformation as described in Method A or inches of penetration as described in Method B.

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

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 163 Practice for Mixing Thermal Insulating Cement Samples[2]

C 168 Terminology Relating to Thermal Insulating Materials[2]

3. Terminology

3.1 *Definitions*—Except for 3.2, Terminology C 168 shall apply to the terms used in this standard.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *consistency*—the degree to which wet-mixed thermal insulating cement resists deformation due to the application of outside forces such as trowel pressure.

METHOD A—DEFORMATION METHOD

4. Apparatus

4.1 *Dead Load Tester* (Fig. 1), equipped with two clamps, one of which permits the loading member arm to swivel out of the way while the sample is put in position, while the other keeps the loading member from sliding until it is released. The total weight of the loading member (sliding vertical bar plus 8-in. (203-mm) diameter disk) is adjusted to exactly 5 lb (2.27 kg) by adding weights as necessary at the top of the bar. A cylindrical brass mold, 3 in. (76.2 mm) in inside diameter by 6 in. (152.4 mm) in height, is used to prepare the sample.

5. Sample Preparation

5.1 Sample at least 3 lb (1.4 kg) of dry cement and mix with a weighed amount of water at a temperature of 70 to 75°F (21 to 24°C) in accordance with Practice C 163. When thoroughly mixed, smooth the cement into a circular mound 3 to 4 in. high (75 to 100 mm) and allowed to sit for 1 h. Then mix once again before testing (hydraulic setting cements shall be tested 15 min after mixing).

NOTE 1—All the water to be mixed with the dry cement shall be added at one time: tests at other water-cement ratios shall be performed using entirely new batches of cement mixed in accordance with 5.1.

6. Procedure

6.1 Oil the inside of the cylindrical mold lightly. Fill the mold by throwing 25 to 30 small pieces of wet cement into it with just enough force to eliminate voids. When the mold is slightly over full, strike off the excess cement level with the top of the mold, with a trowel or spatula; take care not to compress the cement when this is done.

6.2 Center the filled mold under the load member of the apparatus, remove the mold, and place the load member flush on the sample. If the sample deforms (sags) when it is free standing, still place the load member flush on the sample, and include the amount of sag as part of the measured deformation. Release the load member, and measure the deformation 30 s later.

[1] This practice is under the jurisdiction of ASTM Committee C-16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.31 on Chemical and Physical Properties.

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[2] *Annual Book of ASTM Standards*, Vol 04.06.

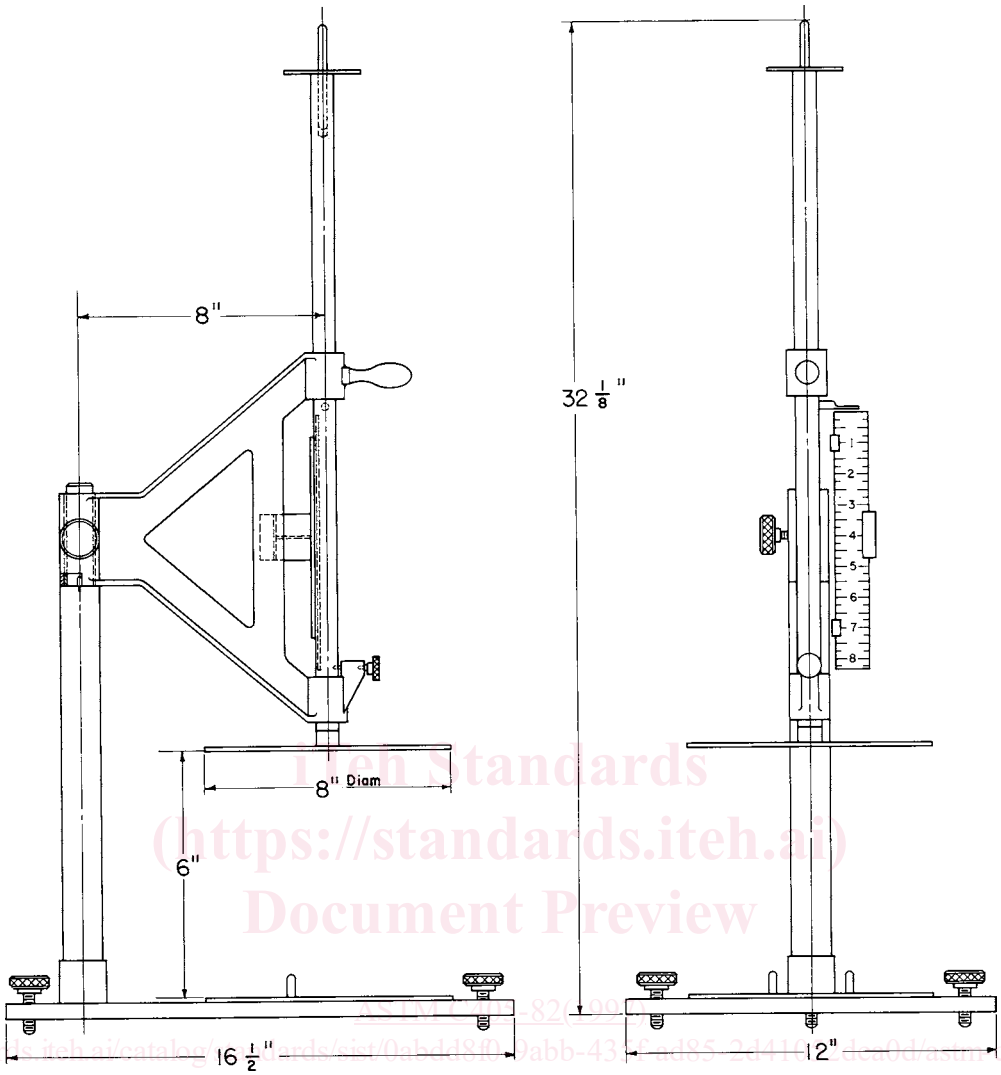

FIG. 1 Apparatus for Measuring Consistency by Deformation of Wet-Mixed Thermal Insulating Cements

6.3 Obtain at least three tests from each batch of wet-mixed cement prepared in accordance with 5.1.

7. Calculation

7.1 Calculate the percentage deformation for each test as follows:

7.1.1 *Inch-Pound Units*:

$$\text{Deformation, \%} = [(6 - A)/6] \times 100 \quad (1)$$

where:

A = height after deformation, in.

7.1.2 *Metric Units*:

$$\text{Deformation, \%} = [(152.4 - A)/152.4] \times 100 \quad (2)$$

where:

A = height after deformation, mm.

8. Report

8.1 Average the percentage deformations for all tests and report the average, along with the water-cement ratio used. If any single test value differs from the average by more than ± 5 % deformation, discard it and repeat the determination.

METHOD B—PENETRATION METHOD

9. Apparatus

9.1 *Penetration Tester (*Fig. 2*)*—The three pointed steel rods or spears have a loose sliding fit in their guides, which are 22 in. (559 mm) long. The rods are held up by three electromagnets connected to a switch; when the switch is thrown, the three spears are released and drop simultaneously. A ruler is attached to one of the supports so that the penetrations of the spears can be read directly.