Standard Test Method for
Wet Adhesion of Thermal Insulating Cements to Metal

This standard is issued under the fixed designation C383; 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 measures the relative adhesion of wet mixed thermal insulating cements to a metal test surface. While this test method is valuable in rating these products generally, the wet adhesion of the cement to one type of surface cannot be construed as being indicative of the wet adhesion to another type of surface.

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:
C 163 Practice for Mixing Thermal Insulating Cement Samples
C 168 Terminology Relating to Thermal Insulating Materials

3. Terminology

3.1 Definitions—Terminology C 168 shall apply to terms used in this test method.

3.2 Description of Term Specific to This Standard:
3.2.1 wet adhesion—of thermal insulating cement to a test surface, the force, expressed in pounds per square foot (or kilograms per square metre) of contact area, that must be applied in a direction parallel with the surface in order to slide the cake of cement from its initial area of contact.

4. Significance and Use

4.1 Where the wet adhesive strength of thermal insulating cement is low, it is difficult to apply it to a desirable thickness or over a large area, particularly on vertical metal surfaces, without having the material slide. The wet adhesion test, which measures the force required to cause a freshly applied test cake of the wet mixed cement to move along a suitable test surface, will indicate the ability of the cement to remain in place during normal application to a vertical metal surface.

4.2 Many factors such as the quality and amount of mixing water used, the method of mixing and applying the cement, the type and condition of the surface to be insulated, and the temperature of the surface will affect the wet adhesion of thermal insulating cement.

5. Apparatus

5.1 Test Plate—A stainless steel test plate 24 by 8 in. by No. 10 gage (610 by 200 by 3.4 mm) or heavier thickness, with at least the test surface being smoothly finished.

5.2 Mold Frames—Three, square, nondemountable mold frames made from No. 12 gage (about 2.7 mm) aluminum having inside dimensions 6 by 6 by 1 in. (152 by 152 by 25 mm).

5.3 Small Pointing Trowel and Plasterer’s Trowel.

5.4 Loading Assembly—A base for holding the test plate in an immovable and level position with a ball bearing or equally frictionless pulley fastened to one end of the base in such a fashion that a cord can be placed around the cement cake under test. The cord shall be extended over the pulley and used to support a container.

6. Sampling, Test Specimens, and Test Units

6.1 Sample at least 3 lb (1.4 kg) of dry cement. The specimen for test is to be taken from the middle of a bag, so as to be representative of material from the entire bag.

6.2 Mix the cement in accordance with Practice C 163. The temperature of the mixing water shall be between 70 and 75°F (21 and 24°C).

6.3 Carefully clean the test plate with soap and water, rinse in boiling water, and air dry. Take care not to touch the cleaned test surface of the plate with the fingers prior to applying test cakes of cement. Arrange the three mold frames symmetrically on the surface of the test plate (see Fig. 1). A jig to hold them in this arrangement during the application of the cement is desirable.

6.4 Form a properly mixed cement into a 3 to 4-in. (76 to 102-mm) high circular mound. Smooth the mound and allow it to set for 1 h after mixing to absorb the water thoroughly. Then mix the cement once more before testing and again form it into a circular mound 3 to 4 in. high.
6.5 Fill each of the three molds with the wet mixed cement by cutting pie-shaped pieces from the mound with a pointing trowel and laying them, cut side down, on the test plate. Pack these wedges into the mold so as to eliminate voids, using only ordinary trowel pressure. When the mold has been slightly overfilled, use the plasterer’s trowel to cut off the excess cement and finish the upper surface flush with the mold top.

7. Procedure

7.1 If a jig is used to hold the mold frames in place during filling, remove it and mount the test plate on the loading assembly. Around the first of the test cakes, adjust a cord with a loop in one end large enough to fit around the outside of the 6 by 6-in. (152 by 152-mm) mold frame, which remains in place during the test. Stretch the cord over the pulley and use it to support the container.

7.2 Fill the container with water at a rate of approximately ½ lb (230 g)/min until the test cake just begins to move. Load applications shall be made within 15 min after molding. At this point determine the total weight of the container and water. Determine the weight of the test cake.

7.3 Test the second and third cakes in a similar fashion and record the weights required to cause movement.

7.4 Retest—If the wet adhesion of any single test cake varies more than 20 % from the average of the three tests, the procedure must be repeated.

8. Report

8.1 Report the following information:

8.1.1 The wet adhesive strength in pounds per square foot (load in pounds required to start the test cake sliding multiplied by 4 when inch-pound units are used) or the wet adhesive strength in kilograms per square metre (load required to start the cake moving multiplied by 43 when metric units are used) for each test cake, and the average of the three tests,

8.1.2 The water-cement ratio used, and

8.1.3 The weight of each cake.

9. Precision and Bias 3

9.1 The precision of this test method is not known because interlaboratory data are not available. This test method may be suitable for use in specifications or in case of disputed results as long as these data are not available.

9.2 Precision—A standard deviation (σ) of 10.4 % of mean (X̄) was determined with a sample size of six data points and a statistical participation of one laboratory.

9.3 Bias—There is currently no estimate of bias because no standards are available and statistical input was received from only one laboratory.

10. Keywords

10.1 thermal insulating cements; wet adhesion

3 Supporting data are available from ASTM Headquarters. Request RR: C16-1002.