Designation: C 661 – 06

Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer[1]

This standard is issued under the fixed designation C 661; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method describes a laboratory procedure for determining indentation hardness of joint sealing compounds, (single- and multicomponent), intended for use in building construction.

1.2 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.3 The committee with jurisdiction over this standard is not aware of any comparable standards published by other organizations.

1.4 *This standard does not purport to address 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:* [2]

C 717 Terminology of Building Seals and Sealants

D 2240 Test Method for Rubber Property—Durometer Hardness

3. Terminology

3.1 *Definitions*—See Terminology C 717 for applicable definitions of the following terms: compound; elastomeric; hardness; joint; sealant, non-sag; sealant, self-levling.

4. Significance and Use

4.1 The results obtained by this test method are simply a measure of the indentation into the sealant material of the indentor under load; they are not generally considered a measure of abrasion or wear resistance of the sealant.

5. Apparatus

5.1 *Durometer, Type A-2*, with a dial graduated in units from 0 to 100. (See Test Method D 2240 for a description of the indentor and a method of calibration of the durometer.)

5.2 *Rectangular Brass Frame*, with inside dimensions 130 by 40 by 6 mm (approximately 5 by 1½ by ¼ in.).

5.3 *Aluminum Plates*, two 16 to 24 gage, 80 by 150 mm (approximately 3 by 6 in.).

5.4 *Thin-Bladed Knife*.

5.5 *Chamber*, capable of maintaining 38 ± 2°C (100 ± 3.5°F) and 95 % relative humidity.

5.6 *Metal Straightedge*.

6. Standard Test Conditions

6.1 Unless otherwise specified by those authorizing the tests, standard conditions for test are room temperature: 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity.

7. Procedure

7.1 *Test for Hardness of Multicomponent Sealants*:

7.1.1 Condition at least 250 g of base compound and appropriate amounts of curing agent for at least 24 h at standard conditions; then mix the components thoroughly for 5 min.

7.1.2 Fill the brass frame, after centering it on the aluminum plate, with a portion of the conditioned compound and strike it off flat with a metal straightedge. Lift the frame from the sealant after separating it by running a thin-bladed knife along the inside of the frame. Prepare two such specimens and cure them for 14 days at standard conditions.

NOTE 1—In the case of a self-leveling sealant or compound, do not lift the brass frame until the sealant is sufficiently cured so that it will not spread on the plate.

7.1.3 At the end of the curing period, take three hardness readings on each specimen at standard conditions. Hold the durometer on the surface of the specimen and press it firmly

[1] This test method is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.20 on General Test Methods.

Current edition approved Jan. 1, 2006. Published February 2006. Originally approved in 1970. Last previous edition approved in 1998 as C 661 – 98.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

against the surface using a force of about 1.3 kgf (3 lbf). Keep the pressure foot parallel to the surface of the specimen. Take the instantaneous indentation reading immediately after making firm contact between the pressure foot and the specimen. After taking the first reading, shift the durometer (or specimen) to a new position in order to avoid errors due to fatigue and surface effects from the previous indentation. Take readings on smooth portions of the surface no closer than 13 mm (½ in.) from the edges of the sealant pat and also no closer than 25 mm (1 in.) from each other. Note the individual values, each rounded off to the nearest unit on the scale.

NOTE 2—The highest precision in this test can be obtained when the durometer is supported by a rigid stand and a dead weight is fastened directly to the instrument with the center of gravity of the weight acting in line of the indentor point. A freely acting total deadweight load of approximately 1.3 kgf (3 lbf) has been found satisfactory for the testing of various sealants (Fig. 1).

NOTE 3—The values obtained in the test method described in 7.1.3 are known as "instantaneous" values. Occasionally a purchaser may request "delayed" values such as these taken after a 5 or 10-s delay. To obtain a delayed value the same procedure is followed, except that the pressure foot is allowed to rest on the surface of the sealant under the fixed load for the additional time requested and a reading is taken at the specified time, for example, after 5 s, 10 s, or other specified period. Delayed readings are taken in addition to the instantaneous reading. An instrument with a maximum reading hand is helpful in making such determinations.

7.2 *Test for Hardness of Single-Component Sealants*:

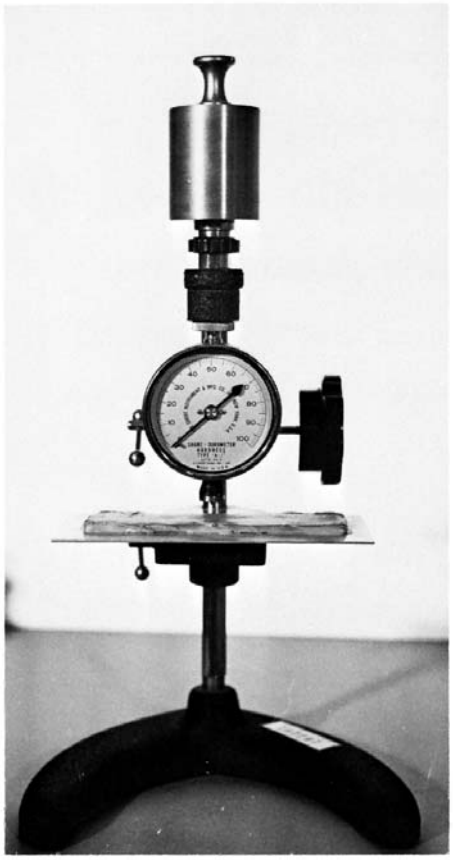

FIG. 1 Type of Durometer Used to Measure Indentation Hardness of Joint Sealants

7.2.1 Condition at least 250 g of compound for a minimum of 24 h at standard conditions before starting the test.

7.2.2 Center the brass frame on the aluminum plate and fill the opening with a portion of the conditioned compound, striking the compound off flat with a straightedge. Lift the frame from the sealant after separating it by running a thin-bladed knife along the inside edge of the frame. Two such specimens shall be prepared.

7.2.3 Cure the test specimens for a total of 21 days as follows: 7 days at standard conditions; 7 days in a chamber controlled at 38 ± 2°C (100 ± 3.5°F) and 95 % relative humidity; and 7 days at standard conditions.

NOTE 4—The manufacturer may request combinations of temperature and relative humidity for curing purposes other than those specified, provided that (*1*) the curing period is not longer than 21 days and (*2*) the temperature does not exceed 50°C (122°F).

7.2.4 At the end of the 21-day curing period, proceed as described in 7.1.3. (See Notes 2 and 3.)

8. Report

8.1 Report the following information for each specimen tested:

8.1.1 Tradename or other identification of the sealant.

8.1.2 Description of the type of compound, such as whether non-sag, self-leveling sealant, single- or multi-component, color, etc.

8.1.3 Description of the curing conditions used in test.

8.1.4 Name and description of the durometer.

8.1.5 The six individual hardness values and the mean value.

8.1.5.1 To determine the mean value, individual readings with a variation of 15 % from the average value of the six readings shall be discarded. If more than two readings are thus discarded, a completely new set of six readings shall be taken.

8.1.6 The delayed reading values, if they are specified by the purchaser.

9. Precision and Bias [3]

9.1 The precision and bias calculations for this test method are based on the results of four laboratories testing five sealants performing the test five times for each sealant. The results are given in Table 1.

9.2 In another series, ten laboratories tested three well-cured sealants. All were cured by one laboratory and distributed and tested on the same day by all ten laboratories. Two testing devices were used on all three sealants (one hand held, one fixed to a stand); all were calibrated. The results are given in Table 2.

NOTE 5—The key to the reproducibility between laboratories improving in 9.2 over 9.1 is the elimination of the variability of the cure cycle from laboratory to laboratory. The data in 9.2 indicates the test can be relatively precise if the cure cycle is identically repeated in each laboratory. The usual case between laboratories may more closely be represented by the statistics in 9.1.

[3] Supporting data are available from ASTM Headquarters. Request RR: C24–1012 and C24–1015.

TABLE 1 Precision and Bias Data from Four Laboratories for Five Sealants[A]

Material	Average	Estimated Standard Deviation Within a Laboratory	Estimated Standard Deviation Between Laboratories	Repeatability (Internal)	Reproducibility (Internal)
G1	12.8	1.4	2.4	4.4	18.1
G2	36.2	3.5	4.0	6.2	16.0
G3	43.8	1.6	6.4	4.0	6.8
G4	25.7	3.6	7.8	10.1	22.0
G5	38.2	2.2	5.6	9.9	11.2

[A] At 95 % confidence, the durometer as measured by this test method can vary 10 points within a laboratory and 22 points between laboratories.

9.3 The data using four test machines (two hand held, two on a stand), all on the same cure sealant in each at ten laboratories, is given in Table 3.

10. Keywords

10.1 elastomeric sealant; hardness

TABLE 2 Precision and Bias Data from Ten Laboratories for Three Cured Sealants[A]

Material	Average	Estimated Standard Deviation Within a Laboratory	Estimated Standard Deviation Between Laboratories
G2	40	2.3	2.6
G1	41	2.3	2.8
G3	71	1.4	2.0

[A] At 95 % confidence a durometer can vary ± 6 points within a laboratory and ±8 points between laboratories.

TABLE 3 Precision and Bias Data from Ten Laboratories with One Cured Sealant and Two Testing Instruments[A]

Material	Average	Estimated Standard Deviation Between Laboratories
G4	67	1.1
G2	70	2.1
G3	71	0.6
G1	71	1.6

[A] At 95 % confidence, a durometer can vary ± 6 points between laboratories when different test machines are used.