Designation: C 1016 – 94a

Standard Test Method for Determination of Water Absorption of Sealant Backing (Joint Filler) Material[1]

This standard is issued under the fixed designation C 1016; 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 a laboratory procedure for determining the water absorption characteristics of sealant backing and joint filler materials, hereinafter referred to as backing.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound units 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 717 Terminology of Building Seals and Sealants[2]

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method[3]

3. Terminology

3.1 *Definitions*—Refer to Terminology C 717 for the following terms used in this test method: joint filler, sealant, and sealant backing.

4. Summary of Test Method

4.1 The mass of three measured specimens of backing is determined. The specimens are then placed in room temperature water for 24 h after which the specimens are removed from the water and their mass measured. The change in mass is calculated, and the result is expressed as a change in mass per unit of volume.

4.2 Procedure A measures the maximum amount of water that can enter the backing. Procedure B measures the amount of water that can enter the backing with the backing cut ends sealed.

5. Significance and Use

5.1 This test method determines the amount of water absorbed by a backing material. Water absorption by the backing may affect sealant performance.

5.2 This test method is also useful when designating proper storage of back up material and in determining appropriate precautions when using backing materials.

5.3 The specifier, using this test method, can exercise judgment in the selection of backing materials based on water absorption characteristics.

6. Apparatus

6.1 *Balance*, sensitive to 0.1 g (0.004 oz).

6.2 *Rule*, steel, graduated to 1.0 mm (~1/16 in.).

6.3 *Shallow Pan for Water*, at least 50 mm (2 in.) deep and 350 mm (14 in.) long.

6.4 *Paraffin Wax*. [4]

7. Sampling

7.1 Take samples from manufactured product. The number of samples for each lot shall be agreed upon between the purchaser and the seller. A sample shall consist of three test specimens.

7.2 Sample selection is important, therefore, the sample should be representative of typical backing production. Care should be exercised in choosing samples that have not been damaged by inappropriate storage or handling.

7.3 Samples should be of uniform shape for their length to enable accurate calculation of volume.

8. Test Specimens

8.1 A test specimen is a piece of backing 300 ± 5 mm (12 ± 0.25 in.) in length. Ideally the cross-sectional backing area should be from 2 to 3 cm^2 (0.3 to 0.5 $in.^2$). Cut three test specimens from each sample.

9. Conditioning

9.1 Condition the test specimens at 23 ± 2°C (73 ± 3°F) and 50 ± 5 % relative humidity for a minimum of 24 h prior to testing, provided the specimens feel and appear dry. Specimens that appear damp should be dried in accordance with the

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[2] *Annual Book of ASTM Standards*, Vol 04.07.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] Paraffin wax, manufactured by Thomas Scientific, 99 High Hills Rd., Swedesboro, NJ 08085, or equal, has been found suitable for this purpose.

manufacturer's recommendations before the 24 h conditioning period starts.

10. Procedure

10.1 *Procedure A*:

10.1.1 Measure the mass of each conditioned specimen to the nearest 0.1 g (0.004 oz) and record.

10.1.2 Measure and record the length of each specimen to the nearest 1 mm (1⁄16 in.).

10.1.3 Measure and record the appropriate end dimensions of each specimen to the nearest 1 mm (1⁄16 in.), to permit a cross-sectional area calculation.

10.1.3.1 The procedures in 10.1.2 and 10.1.3 are critical to the precision and bias of the test. Care is required to obtain accurate measurements.

10.1.4 Submerge the entire specimen in water in a shallow pan. Secure the specimen so the top side in the long dimension, is approximately 25 mm (1 in.) below surface.

10.1.5 After immersion for 24 h, remove the specimen by picking it up 3 in. (75 mm) from the ends and place it immediately on the weighing platform. Do not press or squeeze the specimen. Within the next 1 min, record the mass of the specimen. Within the next 1 min, record the mass of the specimen to the nearest 0.1 g (0.004 oz).

10.1.5.1 The weighing platform on the balance should be large enough to support the entire specimen and serve as a tray to catch any water that may leave the specimen during mass determination.

10.2 . *Procedure B:*

10.2.1 Measure and record the length of each specimen to the nearest 1 mm (1⁄16 in.).

10.2.2 Measure and record the appropriate end dimensions of each specimen to the nearest 1 mm (1⁄16 in.), to permit a cross-sectional area calculation.

10.2.2.1 The procedures in 10.2.1 and 10.2.2 are critical to the precision and bias of the test. Care to obtain accurate measurements is required.

10.2.3 Dip the cut ends of the specimen to a depth of 3.0 mm (1⁄8 in.) in melted paraffin wax at 65 ± 5°C, remove and let cool. Repeat the dipping three times until the ends are completely sealed by approximately 1 mm (1⁄16 in.) of paraffin wax on each cut end.

10.2.4 After the wax cools, measure the mass of each conditioned specimen to the nearest 0.1 g (0.004 oz) and record.

10.2.5 Submerge the entire specimen in water in a shallow pan. Secure the specimen so the top side, in the long dimension, is approximately 25 mm (1 in.) below the surface.

10.2.6 After immersion for 24 h, remove the specimen by picking it up 3 in. (75 mm) from the ends and place it immediately on the weighing platform. Do not press or squeeze the specimen. Within the next 1 min, record the mass of the specimen to the nearest 0.1 g (0.004 oz).

10.2.6.1 The weighing platform should be large enough to support the entire specimen and serve as a tray to catch any water that may leave the specimen during mass determination.

11. Calculation

11.1 Calculate each specimen's dry cross-sectional area (A_0) using the appropriate formula for the geometry of the cross-section shape.

11.2 Calculate the dry, original volume, (V_0), as follows:

$$V_0 = 1_0 \times A_0$$

where:
V_0 = original dry volume, cm^3 ($in.^3$),
A_0 = cross-sectional area cm^2 ($in.^2$), and
1_0 = original length, cm (in.).

11.3 Calculate water absorption as a mass per unit volume for each specimen as follows:

$$W = \frac{m_0 - m_1}{V_0}$$

where:
W = water absorption, g/cm^3 ($oz/in.^3$),
m_1 = initial mass, g (oz),
m_0 = final mass, g (oz), and
V_0 = initial dry volume, cm^3 ($in.^3$)

11.4 For purposes of calculation it is assumed that, at 23 ± 2°C (73 ± 3°F) and atmospheric pressure, 1 g (0.035 oz) of water occupies 1 cm^3 (0.061 $in.^3$) in volume.

11.5 Calculate the sample average water absorption as follows:

$$W_a = \frac{W_1 + W_2 + W_3}{3}$$

where:
W_a = average water absorption, g/cm^3 ($oz/in.^3$),
W_1 = Specimen 1 water absorption, g/cm^3 ($oz/in.^3$),
W_2 = Specimen 2 water absorption, g/cm^3 ($oz/in.^3$), and
W_3 = Specimen 3 water absorption, g/cm^3 ($oz/in.^3$).

12. Report

12.1 Report the following information:

12.1.1 Name and description of the tested backing material,

12.1.2 Date of receipt of the backing material,

12.1.3 Procedure A or B, and

12.1.4 Individual specimen and sample average water absorption values.

13. Precision and Bias [5]

13.1 These data were developed using 1.59 cm (5⁄8 in.) diameter closed cell, open cell, and soft-type backing material, therefore results may vary with different diameter backing materials.

13.1.1 *Procedure A*:

13.1.1.1 The repeatability (within a given laboratory) interval for three materials tested by four laboratories is 0.044 g/cm^3 (0.025 $oz/in.^3$). In future use of this test method, the difference between two test results obtained in the same laboratory on the same material will be expected to exceed 0.044 g/cm^3 (0.025 $oz/in.^3$) only about 5 % of the time.

13.1.1.2 The reproducibility (between given laboratories) interval for three materials tested by four laboratories is 0.387 g/cm^3 (0.222 $oz/in.^3$). In future use of this test method, the difference between test results obtained in a different laboratory on the same material will be expected to exceed 0.387

[5] Supporting data is available from ASTM Headquarters. Request RR:C24-1014.

g/cm^3 (0.222 oz/in.^{3}) only about 5 % of the time.

13.1.2 *Procedure B*:

13.1.2.1 The repeatability (within a given laboratory) interval for three materials tested by four laboratories is 0.024 g/cm^3 (0.014 oz/in.^{3}). In the future use of this test method, the difference between two test results obtained in the same laboratory on the same material will be expected to exceed 0.024 g/cm^3 (0.014 oz/in.^{3}) only about 5 % of the time.

13.1.2.2 The reproducibility (between given laboratories) interval for three materials tested by four laboratories is 0.387 g/cm^3 (0.217 oz/in.^{3}). In future use of this test method, the difference between two test results obtained in a different laboratory on the same material will be expected to exceed 0.387 g/cm^3 (0.217 oz/in.^{3}) only about 5 % of the time.

14. Keywords

14.1 sealant; sealant backing; water absorption