Designation: D 5076 – 90 (Reapproved 2000)ε1

Standard Test Method for Measuring Voids in Roofing and Waterproofing Membranes[1]

This standard is issued under the fixed designation D 5076; 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.

ε[1] NOTE—Editorially switched from English dominant to SI dominant.

1. Scope

1.1 This test method includes two procedures for measuring the area of voids in the adhesive between materials used in roofing and waterproofing systems. Both procedures require a count of the number of voids.

1.2 The values given in SI units are to be regarded as the standard. The values 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:*

D 1079 Terminology Relating to Roofing, Waterproofing, and Bituminous Materials[2]

D 2829 Practice for Sampling and Analysis of Built-up Roofs[2]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology D 1079.

4. Summary of Test Method

4.1 All voids are counted and measured. In addition, in built-up roofing and waterproofing membrane samples, voids may be classified into dry, glazed, uncoated, and overlying voids (see Terminology D 1079). Count and measure only voids with at least one dimension equal to or larger than 13 mm (0.5 in.). Smaller adhesive layer defects are not considered voids.

4.2 The void area in each adhesive layer is estimated with the aid of a template, or alternatively, digitized and measured with a computer.

5. Significance and Use

5.1 This laboratory test method can be used on multi-ply roofing and waterproofing systems to measure, classify, and count the voids between felt plies, between insulation layers, and between the membrane and insulation layers. Voids between the felt plies or between the membrane and insulation layer in multi-ply systems can be the seeds for future blisters.

5.2 In one-ply systems, this test method can be used to count and measure the voids in the adhesive in laps and, in adhered systems, in the adhesive between the membrane and the insulation. Voids in the lapping adhesive can be the source of leakage while voids in the lapping adhesive or in the adhesive between the membrane and insulation can be the seeds for future blisters.

6. Apparatus

6.1 *Freezer*, for conditioning bituminous samples. A standard freezer, such as that used for storing frozen foods, may be used provided it has the volume to loosely hold the samples to be tested. Do not store food and condition samples in the same equipment.

6.2 *Transparent Sheets*, to record the size and location of the voids. Any clear, rigid sheet that can be marked with a flow pen can be used.

6.3 *Flow Pen*, or other marking device that is compatible with the transparent sheet selected.

6.4 *Void Estimating Template*—A stiff, 305-mm^2(12-in.^{2}) transparent template with a 25.4-mm (1-in.) minimum grid. Special templates can be prepared and used with lap samples, or just part of the above template can be used.

6.5 *Computer Equipment and Software*, for digitizing accurate images, image enhancement such as background leveling, noise cleaning and edge sharpening, and area determination by pixel (point of light) count.[3]

7. Sampling, Test Specimens, and Test Units

7.1 Samples may be from the laboratory or the field as in Practice D 2829.

7.2 Multiply samples must be at least 305 mm^2(12 in.^{2}). Lap samples, for single-ply systems, must be at least 305 mm (12 in.) long by the width of the lap.

7.3 If desired, the voids may be classified into dry, glazed, or uncoated voids (see Terminology D 1079).

[1] This test method is under the jurisdiction of ASTM Committee D08 on Roofing, Waterproofing, and Bituminous Materials and is the direct responsibility of Subcommittee D08.20 on Roofing Membrane Systems.

Current edition approved June 29, 1990. Published August 1990.

[2] *Annual Book of ASTM Standards*, Vol 04.04.

[3] Software is available from the Jandel Corp., 3030 Bridgeway, Sausalito, CA 94965.

8. Procedure

8.1 Delaminate the built-up roofing or waterproofing samples. Be careful to maintain the same orientation for the felts in each sample. To facilitate splitting, use coal-tar samples conditioned at 0°C (32°F), asphalt-organic or asphalt-asbestos felt samples conditioned at −18°C (0°F), or asphalt-glass felt samples conditioned at −34°C (−30°F).

8.2 Examine both faces of each interply area for voids. If voids are present, select the face with the largest void area for the void count and area measurement in 8.3. If there are no voids, record "none" for that interface.

8.3 If a void is present, cover the sample area to be measured with the clear tracing material and trace the outline of each void. Count the number of voids and mark the tracing for identification and orientation.

8.4 Stack the tracings of the voids from each sample in the same orientation as the original sample and inspect the stack for overlapping voids on adjoining sheets. Mark and report the presence of any overlapping voids. For samples from one-ply roofs, record the presence of any voids that extend through a lap.

8.5 Measure the area of the voids on each tracing by estimating the void area with the aid of the template with a grid, or digitize the voids on each tracing and calculate the void area with appropriate software. Calculate the percent voids on each tracing by multiplying the void area by 100 and dividing by the area traced. Record the area estimated or measured and the percent voids on the tracing.

9. Report

9.1 Report the following information:

9.1.1 Type and source of each sample.

9.1.2 Test method used. For each sample, report the number of interfaces examined and the number of voids, the area of the voids in each interface, and the percent of the voids in each interface area. Report the totals of the void count, area, and percent voids found in each interface for each sample.

9.1.3 The presence of overlapping voids and, in one ply membrane laps, the presence of any voids that extend through the lap area.

9.1.4 If requested, report the voids classified as dry, glazed and uncoated, as percentages of the interply areas.

10. Precision and Bias

10.1 *Precision*—The precision of this test method is based on round-robin interlaboratory measurements of identical tracings with void areas of 43 to 419 mm^2 (1.7 to 16.5 $in.^2$).

10.1.1 Two operators at the same laboratory or at different laboratories should not differ by more than two in the count of the voids in an interface.

10.1.2 Two operators at the same laboratory should not differ by more than 10 % of the void area in their estimates of the void area in an interface when a computer is used. They should not differ by more than 20 % when the manual estimation method is used.

10.1.3 Two laboratories should not differ by more than 33 % of the void area.

10.2 *Bias*—Areas measured with the aid of a computer tend to be 4 % higher than areas estimated with a template.

11. Keywords

11.1 roofing membranes; voids; waterproofing membranes