



## Standard Test Method for Staining of Porous Substrate by Joint Sealants<sup>1</sup>

This standard is issued under the fixed designation C1248; 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 four types of laboratory tests to determine if a joint sealant has a probability of staining a porous substrate (such as marble, limestone, sandstone, and granite). The tests are on compressed samples and include (1) storage under standard laboratory conditions, (2) storage in an oven, and (3) exposure in a fluorescent UV/condensation device, and (4) exposure in a xenon arc device.

1.2 The values stated in SI 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 problems, 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.*

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

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**C717** Terminology of Building Seals and Sealants

**C1442** Practice for Conducting Tests on Sealants Using Artificial Weathering Apparatus

**G113** Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

**G151** Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources

**G154** Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

**G155** Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.40 on Weathering.

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

### 3. Terminology

3.1 *Definitions:*

3.1.1 Refer to Terminology **C717** and **G113** for definitions of terms used in this test method.

### 4. Summary of Test Method

4.1 In this test method standard joint specimens are compressed and clamped at the manufacturer's rated movement capability and subjected to the following treatments; (a) four of the specimens are stored at standard conditions while under compression for up to 28 days; (b) four of the specimens are exposed in an oven while under compression for up to 28 days; (c) four of the specimens are exposed either in a fluorescent UV/condensation device or in a xenon arc device while under compression for up to 28 days.

4.1.1 This test method allows for additional exposure beyond the minimum 28 day exposure period as described in 4.1. If it is desired to extend the exposure period beyond 28 days, prepare an additional six specimens for each extended exposure period. Of these six specimens prepared, two specimens each should be stored as described in the three conditions named in 4.1.

4.2 The effects of the test are evaluated by visual inspection for changes in surface appearance and average measurements of any stain depth and stain width.

4.3 This test method is applicable to any type of elastomeric joint sealant and any type of porous substrate.

### 5. Significance and Use

5.1 Staining of building materials is an aesthetically undesirable occurrence. This test method evaluates the likelihood of a sealant causing an early stain on a porous substrate due to exudation of materials from the sealant. Since this is an accelerated test, it does not necessarily predict that the tested sealants will not stain or discolor porous substrates over longer periods of time.

### 6. Apparatus

6.1 *Forced-Draft Oven.*

6.2 *Exposure Apparatus:*

6.2.1 Fluorescent UV/condensation apparatus that conforms to the requirements in Practices **G151** and **G154** with UVA-340 type lamps.

6.2.2 Xenon-Arc apparatus that conforms to the requirements in Practices G151 and G155 with daylight type filters.

6.3 TFE-Fluorocarbon Spacers.

6.4 Masking Tape.

## 7. Test Specimens

7.1 Substrates shall be 25 by 25 by 75 mm (1 by 1 by 3 in.). A total of 24 substrates are required to make the twelve test specimens.

7.1.1 If testing beyond the minimum 28 day exposure period, prepare an additional twelve substrates to make the six additional test specimens as required in 4.1.1.

NOTE 1—The precision and bias statement is based on Vermont white marble and Bethel white granite substrates.

7.2 Primers—When a primer is recommended by the sealant manufacturer, apply the primer to one substrate block of each test specimen. Apply the primer where the sealant will be in contact with the substrate.

### 7.3 Preparation of Test Specimens:

7.3.1 Standard conditions of temperature and relative humidity used throughout this test method are defined as  $23 \pm 2^\circ\text{C}$  ( $73.4 \pm 3.6^\circ\text{F}$ ) and  $50 \pm 5\%$ , respectively.

7.3.2 Multi-Component Sealants—Prepare twelve test specimens for each substrate that is to be used in the test. After maintaining the unopened sample for at least 24 h at standard conditions, mix thoroughly for 5 min at least 250 g of base compound with the appropriate amount of curing agent. Apply a bead of sealant 13 by 13 by 50 mm ( $\frac{1}{2}$  by  $\frac{1}{2}$  by 2 in.) between parallel 25 by 75 mm (1 by 3 in.) faces of substrates (see Fig. 1). Use appropriate spacers to form the proper size bead. Use adhesive tape, rubber bands, or clamps to hold the test specimen together before and after filling it with the sealant. In the case of a self leveling sealant, use masking or other suitable tape to retain the sealant. Use masking tape on the top surface of substrates to prevent sealant from curing on the finished surface. Remove the tape immediately following filling of the specimen joint cavity.

7.3.3 Single-Component Sealants—Prepare the specimens as described in 7.3.2 except that no mixing is required. Condition the sealed cartridge or bulk container at standard conditions for at least 24 h before use.

## 8. Conditioning

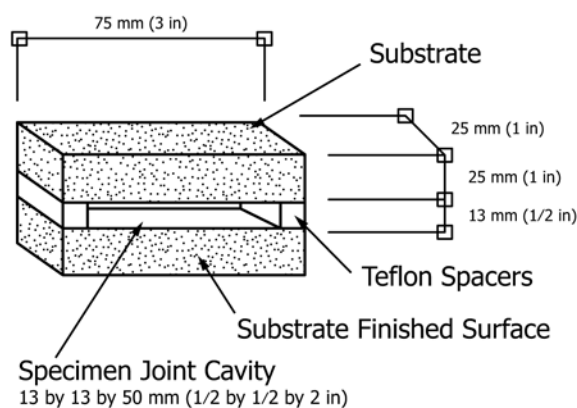
8.1 Cure specimens for 21 days at standard conditions. Separate the TFE-fluorocarbon spacers from the sealant as soon as practical during the curing period without damaging the sealant.

NOTE 2—The producer may request conditions other than standard conditions for the curing of single-component sealants provided they meet the following requirements: the curing period shall extend for 21 days; and the temperature during the curing period shall not exceed  $50^\circ\text{C}$  ( $122^\circ\text{F}$ ).

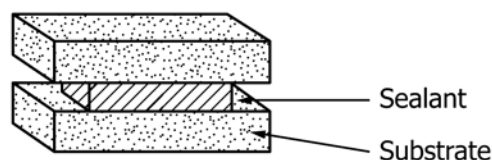
## 9. Procedure

9.1 Compress all test specimens and clamp them at the manufacturer's rated movement capability for the sealant being tested.

9.2 Store four compressed specimens at standard conditions. Remove two after 14 days and two after 28 days.



(A) PREPARED SPECIMEN BEFORE APPLICATION OF SEALANT



(B) SPECIMEN AFTER APPLICATION OF SEALANT AND REMOVAL OF SPACERS

FIG. 1 Stain Test Specimen

9.2.1 If testing beyond the minimum 28 day exposure period, prepare an additional two compressed specimens at standard conditions for each extended period, and remove those two compressed specimens at the end of each extended period.

9.3 Place four compressed specimens in an oven at  $70 \pm 2^\circ\text{C}$  ( $158 \pm 3.6^\circ\text{F}$ ). Remove two after 14 days and two after 28 days.

9.3.1 If testing beyond the minimum 28 day exposure period, place an additional two compressed specimens in an oven at  $70 \pm 2^\circ\text{C}$  ( $158 \pm 3.6^\circ\text{F}$ ) for each extended period, and remove those two compressed specimens at the end of each extended period.

9.4 Expose four compressed samples in one of the laboratory accelerated exposure devices listed below. Choice of type of apparatus shall be by mutual agreement among the interested parties. Because of differences in type of light source and test conditions, test results may differ with the type of apparatus used. Consult Practices G154 and G155 for differences in the spectral power distributions of the exposure sources and Practice C1442 for differences in test parameters in the two types of apparatus specified.

9.4.1 If testing beyond the minimum 28 day exposure period, similarly expose two additional compressed samples in the devices as described in 9.4, for each extended period.

9.4.2 Procedure for Fluorescent UV/Condensation Apparatus—Operate the device in accordance with the procedure in Section 7.3 of Practice C1442. Remove two specimens after 14 days (336 h) and two after 28 days (672 h).

9.4.2.1 If testing beyond the minimum 28 day exposure period, similarly remove the two additional test specimens from the weathering device, after each extended period has elapsed.

9.4.3 *Procedure for Xenon-Arc Apparatus*—Operate the device in accordance with the procedure in Section 7.2 of Practice C1442. When operated at the preferred irradiance level of 0.51 W/(m<sup>2</sup> · nm) at 340 nm, remove two specimens after 14 days (617 kJ/(m<sup>2</sup> · nm) at 340 nm) and two specimens after 28 days (1234 kJ/(m<sup>2</sup> · nm) at 340 nm). See Annex A1 in C1442 for determining the exposure time required to provide the same radiant exposure at other irradiance levels.

9.4.3.1 If testing beyond the minimum 28 day exposure period, similarly remove the two additional test specimens after each extended period has elapsed, from the Xenon-Arc Apparatus. When operated at the preferred irradiance level of 0.51 W/(m<sup>2</sup> · nm) at 340 nm, the exposure is 44.07 kJ/(m<sup>2</sup> · nm) at 340 nm, per day of exposure.

9.5 Allow specimens to cool at standard conditions for one day. Examine the surface of the substrates (both pieces on each specimen) to determine if the surface appearance has changed in any way. Measure the width of any stain in at least three places. Record the average of the measurements to the nearest 0.5 mm. If primer was used, record the stain width separately for the primed and unprimed substrates on each specimen.

9.6 Break the substrates into two pieces along the 25 mm axis (the final pieces will be approximately 40 by 25 by 25 mm in size). If there was a surface stain, break the substrates at the point of maximum surface stain. Measure the stain depth in at least three places. Record the average of the measurements to the nearest 0.5 mm.

## 10. Report

10.1 Report the following information:

10.1.1 Name of sealant, type of sealant, rated movement capability and identifying batch number,

10.1.2 Substrates used,

10.1.3 Name and description of primers used, if any,

10.1.4 Type of exposure apparatus, irradiance level and exposure cycle with test parameters.

10.1.4.1 Report the total length (days) of exposure.

10.1.5 Description of test effects observed, such as change in finished surface appearance, discoloration into the substrate, or other characteristics; average measurement of stain width and depth,

10.1.6 Description of, and reasons for any variations from the test procedure,

10.1.7 Statement describing curing conditions if other than at standard conditions, and

10.1.8 Record data on report form (see Fig. 2).

## 11. Precision and Bias

11.1 *Repeatability (Ir)*—The repeatability (within a given laboratory) intervals for six test parameters tested by four laboratories are listed in Table 1. 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 the values in Table 1 only about 5 % of the time.

11.2 *Reproducibility (IR)*—The reproducibility (between given laboratories) intervals for six test parameters tested by four laboratories are listed in Table 1. In future use of this test method, the difference between two test results obtained in different laboratories on the same material will be expected to exceed the values in Table 1 only about 5 % of the time.

11.3 Both UVA and UVB type bulbs were evaluated in the round robin testing. Negligible difference was found between these two types of bulbs during this short exposure period. However, UVA bulbs are the recommended light source inasmuch as they more closely represent natural ultraviolet.

## 12. Keywords

12.1 joint sealants; porous substrates; sealants; staining; ultraviolet exposure

Start Date: _____	Job Reference: _____	Log No.: _____
Completion Date: _____	Customer: _____	Submitter: _____

**Test Materials**

Sealant Name: _____	Substrate Name: _____
Sealant Type: _____	Substrate Type: _____
Identifying Batch No.: _____	Substrate Finish: _____
Rated Movement Capability: _____	
Primer Name: _____	

**Average Measurements of Substrate Stain**

**Width and Depth**

Measured At:	Primed		Unprimed	
	Finished Surface	Interior	Finished Surface	Interior
14 days at RT	_____	_____	_____	_____
28 days at RT	_____	_____	_____	_____
14 days 70°C	_____	_____	_____	_____
28 days 70°C	_____	_____	_____	_____
14 days UV	_____	_____	_____	_____
28 days UV	_____	_____	_____	_____

**Testing Equipment**

Oven: \_\_\_\_\_

Exposure Device: \_\_\_\_\_

Irradiance Level: \_\_\_\_\_

Test Cycle: \_\_\_\_\_

Description of test effects: \_\_\_\_\_

\_\_\_\_\_

Description of variation from procedure (if any): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**FIG. 2 Staining Test Report Form**

**TABLE 1 Repeatability (Ir) and Reproducibility (IR)**

Material	Depth of Stain (mm)		Width of Stain (mm)	
	<i>I<sub>r</sub></i>	<i>I<sub>R</sub></i>	<i>I<sub>r</sub></i>	<i>I<sub>R</sub></i>
Polyurethane				
Marble	0.68	1.14	0.72	1.10
Granite	1.02	2.29	1.25	3.56
Silicone				
Marble	2.72	10.35	3.14	6.69
Granite	1.38	13.46	2.69	5.93
Polysulfide				
Marble	2.74	12.73	1.42	3.62
Granite	1.48	13.33	1.08	1.73
Latex				
Marble	1.27	2.03	0.51	1.02
Granite	1.02	2.03	0.76	1.78
Styrene Block Copolymer				
Marble	0.51	1.52	0.25	0.76
Granite	0.51	1.02	0.25	0.51
Oil Base				
Marble	5.08	6.10	4.83	7.11
Granite	2.54	3.05	3.81	4.57

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