Designation: C 510 – 05a

Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants[1]

This standard is issued under the fixed designation C 510; 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 an accelerated laboratory procedure to determine if a sample of a joint sealant will stain the substrate when in contract with masonry, concrete, or stone (such as marble, limestone, sandstone, and granite). This test method also is intended to determine whether the sealant itself will change in color when exposed to the weather.

1.2 The values stated in SI units are to be regarded as the standard. The value 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:* [2]

C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
C 150 Specification for Portland Cement
C 207 Specification for Hydrated Lime for Masonry Purposes
C 717 Terminology of Building Seals and Sealants
C 1442 Practice for Conducting Tests on Sealants Using Artificial Weathering Apparatus
D 2203 Test Method for Staining from Sealants
G 113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology C 717 for terms relating to building seals and sealants, and Terminology G 113 for terms relating to natural and artificial weathering tests.

4. Significance and Use

4.1 Staining of a building is an aesthetically undesireable occurance. This test method evaluates the likelihood of a sealant causing early stain on a porous substrate due to certain chemical exudations from the sealant.

4.1.1 This test method may not predict staining caused by such factors as residue run-down or dirt pick-up by a sealant exudate.

4.2 This test method is useful to predict potential color changes in the sealant itself after weathering.

4.3 This test method measures color change in a sealant and staining of substrate by the sealant under conditions of artificial weathering. See also Test Method D 2203, which measures staining by a sealant due to gross exudations from the sealant; it does not subject the sealant to artificial weathering.

5. Apparatus

5.1 The exposure apparatus shall be one of the three types of laboratory accelerated weathering devices described in Practice C 1442, that use either xenon arc, fluorescent UV or open flame carbon arc radiation. Consult Practice C 1442 for the differences in test parameters among the devices. Because of differences in test conditions, test results may differ with the type of device used. The choice of device shall be by mutual agreement among the interested parties.

6. Materials

6.1 *Portland Cement*, white, nonstaining, conforming to Type I of Specification C 150.

6.2 *Hydrated Lime*, conforming to Type S of Specification C 207.

6.3 *Ottawa Sand*, graded, white, conforming to the requirements of Section 4 of Test Method C 109.

6.4 *Aluminum Plates*, three 152 by 70-mm (6 by 2¾-in.), No. 16 gage.

6.5 *Metal Frames*, two rectangular noncorrosive, designated as *A* and *B*; frame *A* shall be 6 mm (¼ in.) thick with the inside opening slightly larger than an aluminum plate described in 6.4; frame *B* shall have inside dimensions of 127 by 38 by 6 mm (5 by 1½ by ¼ in.) thick.

[1] This test method is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.40 on Weathering.

Current edition approved May 1, 2005. Published June 2005. Originally approved in 1963 as C 510 – 63 T. Last previous edition approved in 2005 as C 510 – 05.

[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.

7. Test Specimens

7.1 The test specimen shall consist of a slab of mortar mix upon which is placed a layer of sealant.

7.2 The mortar mix shall be prepared by combining, by weight, 1 part white portland cement, 0.25 part hydrated lime, and 4 parts graded Ottawa sand, with sufficient water to make a smooth, workable paste (water-cement ratio = 0.8).

7.3 The mortar mix shall be spread, with the aid of frame *A*, over the entire surface of each of the three aluminum plates to a depth approximately 6 mm (¼ in.) and struck off flat with a spatula. After carefully removing the frame, allow the specimens to cure in air for 4 h at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity.

8. Conditioning

8.1 Store the unopened sample of one- or two-part sealant at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity for 16 to 24 h immediately before testing.

9. Procedure

9.1 At the end of the 4-h curing period described in 7.3, spread a 6-mm (¼-in.) thick layer of sealant, with the aid of frame *B*, over the surface of two of the three specimens, leaving a margin of approximately 13 mm (½ in.) of mortar free of sealant. Leave the third specimen without sealant.

9.1.1 Where a primer is submitted with a sample, apply the primer in accordance with the manufacturer's directions to half the surface of the cured mortar of the three specimens before application of the sealant. For two-part sealants, mix approximately 200 g.

9.2 Then expose the three specimens in air for 16 to 24 h at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity.

9.3 After the 16 to 24-h curing period, place at least four specimens, two with and two without sealant, on the inside of the accelerated weathering machine. The exposure duration shall be a minimum of 100 h for the fluorescent UV/condensation and open flame carbon arc tests. The exposure duration for the xenon arc test shall be a minimum of 184 kJ/(m^2 · nm) at 340 nm. This is based on a minimum of a 100-h exposure at an irradiance level of 0.51 W/(m^2 · nm) at 340 nm. See Annex A1 in Practice C 1442 for determining the exposure time required to obtain the same radiant exposure at other irradiance levels.

NOTE 1—The minimum exposure duration may not be sufficient to identify an unaceptable material.

9.3.1 Specimen temperature shall be 60 ± 2.8°C (140 ± 5°F) and water temperature 24 ± 2.2°C (75 ± 4°F).

9.4 Expose the third specimen (with sealant) in air in the laboratory at 23 ± 2°C (73.4 ± 3.6°F) and 50 ± 5 % relative humidity for 14 consecutive days. During this exposure period immerse the third specimen in distilled water for 1 min once a day (5 days per week).

9.5 At the end of the exposure periods, examine the specimens containing the sealant for stains in the mortar and color changes in the sealant. Use the mortar specimen without the sealant as a control.

10. Report

10.1 Report a stain if there is any discoloration in the mortar color of the sealant test specimens when compared with the mortar color of the control specimen.

10.2 Report the name and description of the accelerated weathering machine and its test conditions.

10.3 Record a color change if there is any variation in color of the sealant specimen that has been placed in the weathering machine and the sealant specimen exposed under laboratory conditions.

11. Precision

11.1 In a round-robin test series eight producers tested nine sealants for stain and color–change properties. Excellent agreement was obtained by the testing laboratories among the 432 determinations that were completed in the test series.

12. Keywords

12.1 color change; sealant; stain