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Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage[1]

This standard is issued under the fixed designation E2570/E2570M; 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.

ε1 NOTE—Units information was editorially corrected and editorial changes were made throughout in September 2014.

1. Scope

1.1 These test methods apply to trowel, roller, or spray applied Water-resistive barrier (WRB) coatings that are applied over exterior sheathing prior to application of EIFS or EIFS with drainage wall claddings.

1.2 Test methods for in place wall system and cladding related to tests such as fire resistance, wind load capability, air barrier performance, and so forth. should also be considered but are outside the scope of this document.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *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]

C297/C297M Test Method for Flatwise Tensile Strength of Sandwich Constructions

D2247 Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity

D2898 Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing

E72 Test Methods of Conducting Strength Tests of Panels for Building Construction

E96/E96M Test Methods for Water Vapor Transmission of Materials

E330/E330M Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

E331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

E631 Terminology of Building Constructions

E1233/E1233M Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls by Cyclic Air Pressure Differential

E2110 Terminology for Exterior Insulation and Finish Systems (EIFS)

E2134/E2134M Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS)

E2485/E2485M Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings

2.2 *AATCC Standards:*[3]

AATCC 127 Water Resistance: Hydrostatic Pressure Test

3. Terminology

3.1 Definitions related to EIFS may be found in Terminology E2110 and general terms in Terminology E631.

4. Significance and Use

4.1 This series of test methods provides a means to evaluate performance of the water-resistive barrier coating when subjected to various physical and environmental conditions. The water-resistive barrier coating is applied between the EIFS and

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[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.

[3] Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709-2215, http://www.aatcc.org.

substrate in an EIFS-clad wall assembly and is intended to provide additional protection to the building and its contents from incidental moisture intrusion that may occur through the building envelope. Although protected from direct weather exposure after the EIFS is installed, the coating must be durable and weather resistant as it is subjected to various environmental conditions prior to application of the EIFS as well as while the system is in service.

5. Test Specimens

5.1 *Tensile Bond:*

5.1.1 Prepare five samples for each sheathing substrate, a minimum of 152 mm × 152 mm [6 in. × 6 in.], that consists of two sheathing sections assembled with a 3.2 mm [⅛ in.] wide joint. Apply the joint treatment, if applicable, and water-resistive barrier coating in accordance with the manufacturer's recommended instructions.

5.1.2 Test where the water resistive barrier is a system composed of multiple products that overlap, the bond between water resistive barrier products.

5.1.3 Prepare five specimens for each flashing material for which recognition is sought, a minimum of 51 mm × 51 mm [2 in. × 2 in.] by applying the water-resistive barrier coating, and the flashing treatment, to the flashing material.

5.2 *Freeze Thaw:*

5.2.1 Construct five samples for each sheathing substrate, a minimum of 152 mm × 152 mm [6 in. × 6 in.] that consists of two sheathing sections assembled with a 3.2 mm [⅛ in.] wide joint. Apply the joint treatment, if applicable, and the water-resistive barrier coating in accordance with the manufacturer's recommended instructions. The back and sides of the specimens shall be sealed with an impervious material that need not be the coating. Specimens shall be representative of those used in actual construction.

5.3 *Water Resistance:*

5.3.1 Prepare three samples, a minimum of 102 mm × 152 mm [4 in. × 6 in.], and containing a 6.4 mm [¼ in.] wide joint for each substrate by applying the joint treatment, if applicable, and the water-resistive barrier coating to the substrate according to the manufacturer's recommended application instructions. The back and sides of the samples shall be sealed with material impervious to water that need not be the water resistive barrier coating. Specimens shall be representative of those used in actual construction.

5.4 *Water Vapor Transmission:*

5.4.1 Prepare three samples, a minimum of 70 mm [2¾ in.] diameter of the water-resistive barrier coating by applying the water-resistive barrier coating, at the recommended thickness, to a non-adhesive surface. After curing for the time recommended by the manufacturer, the coating is removed from the non-adhesive surface and the average thickness is determined from the material density, area, and weight or by using a micrometer or calipers to the nearest 0.025 mm [0.001 in.].

5.5 *Durability (Transverse Load, Racking, Environmental Conditioning, and Water Penetration):*

5.5.1 Construct one sample, a minimum of 2438 mm × 2438 mm [8 ft × 8 ft] with either steel studs or 2 × 4 wood studs spaced a minimum of 406 mm [16 in.] oc. Attach the sheathing substrate to the framing and include 3.2 mm [⅛ in.] wide vertical and horizontal substrate joints. Flashing shall also be included in the sample preparation to ensure that the interface of the water-resistive barrier coating and flashing will not be affected by various loading conditions. Apply the joint treatments, if applicable, and water-resistive barrier coating to the sheathing and cured in accordance with the manufacturer's recommendations. The sheathing used in the test shall be the least shear-resistant sheathing material to which application of the water- resistive barrier coating is proposed for application.

5.6 *Weathering (Ultraviolet Light Exposure, Wet/Dry Cycling, and Hydrostatic Exposure):*

5.6.1 Prepare five samples, a minimum of 102 mm × 152 mm [4 in. × 6 in.] containing a 6.4 mm [¼ in.] wide joint for each substrate. Apply the joint treatment, if applicable, and the water-resistive barrier coating to the substrate according to the manufacturer's recommended application instructions. Sheathing specimens shall consist of two sheathing sections assembled with the 6.4 mm [¼ in.] wide joint. Seal the sides of the samples with material impervious to water that need not be the water resistive barrier coating.

6. Apparatus

6.1 The description of apparatus in this section is general in nature consequently any set up capable of performing the test is acceptable.

6.2 *Tensile Bond:*

6.2.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in Test Method C297/C297M or Test Method E2134/E2134M.

6.3 *Freeze Thaw:*

6.3.1 The apparatus shall be capable of subjecting specimen uniformly to test conditions and cycles described in Test Method E2485/E2485M.

6.4 *Water Resistance:*

6.4.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in Practice D2247 for 14 days.

6.5 *Water Vapor Transmission:*

6.5.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in Test Method E72 and 8.4.1 of these test methods.

6.6 *Durability (Transverse Load, Racking, Environmental Conditioning, and Water Penetration):*

6.6.1 *Transverse Load:*

6.6.1.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in Test Method E1233/E1233M and 8.5.1.1 of these test methods.

6.6.2 *Racking:*

6.6.2.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in Test Methods E72 and 8.5.2.1 of these test methods.

6.6.3 *Environmental Conditioning:*

6.6.3.1 The apparatus for the water spray shall be capable of uniformly wetting the entire panel surface. The apparatus for

radiant heat shall be capable of producing conditions described in 8.5.3.1 of these test methods.

6.6.4 *Water Penetration:*

6.6.4.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in Test Method E331 and 8.5.4.1 of these test methods.

6.7 *Weathering:*

6.7.1 *Ultraviolet Light Exposure:*

6.7.1.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in Test Methods D2898, Method B and 8.6.1.1 of these test methods.

6.7.2 *Wet/Dry Cycling:*

6.7.2.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in 8.6.2 of these test methods.

6.7.3 *Hydrostatic Pressure:*

6.7.3.1 The apparatus shall be capable of subjecting the specimen uniformly to test conditions described in AATCC 127 and 8.6.3.1 of these test methods.

7. Conditioning

7.1 7.1 Dry or cure test samples a minimum of 28 days for cementitious materials and 7 days for acrylic materials under ambient conditions prior to testing.

8. Procedure

8.1 *Tensile Bond:*

8.1.1 Conduct tests in accordance with Test Methods C297/C297M or E2134/E2134M.

8.2 *Freeze Thaw:*

8.2.1 Conduct tests in accordance with Section 9.2 of Test Method E2485/E2485M.

8.3 *Water Resistance:*

8.3.1 Conduct tests in accordance with Practice D2247 for 14 days.

8.3.2 Conduct periodic inspection of the samples. Testing may be concluded sooner if cracking, erosion or delamination from the substrate is noted.

8.4 *Water Vapor Transmission:*

8.4.1 Condition the samples at 24 ± 3°C [75 ± 5°F] and 50 ± 5 % relative humidity for 40 h prior to testing.

8.4.2 Conduct tests in accordance with Section 12 of Test Method E96/E96M except place each cup in a room with controlled conditions of 24 ± 3°C [75 ± 5°F] and 50 % relative humidity.

8.5 *Durability (Transverse Load, Racking, Environmental Conditioning, and Water Penetration):*

8.5.1 *Transverse Load:*

8.5.1.1 Test specimen in accordance with Test Method E1233/E1233M, E2110, Procedure A, using the load required to produce a mid-point deflection of the test panel measuring 8.13 mm [0.32 in.]. Repeat for 10 cycles.

8.5.1.2 Proceed with 8.5.2 if there is no cracking observed through visual examination of the water-resistive barrier coating within the field of the panel, at substrate joints and at the flashing interface.

8.5.2 *Racking:*

8.5.2.1 Conduct test on the same test specimen as was tested in 8.5.1. Apply load in accordance with Test Methods E72 with or without hold downs. Load shall be applied until ½ in. net deflection without hold downs or 3.2 mm [⅛ in.] net deflection with hold downs is achieved. As an alternative, apply load until shear design value of sheathing is achieved except net deflection shall not exceed ½ in. without hold downs or 3.2 mm [⅛ in.] deflection with hold downs.

8.5.2.2 Proceed with 8.5.3 if there is no cracking observed through visual examination of the water-resistive barrier coating within the field of the panel, at substrate joints and at the flashing interface.

8.5.3 *Environmental Conditioning:*

8.5.3.1 Conduct test on the same test specimen as was tested in 8.5.1 and 8.5.2. Subject entire exterior surface to five cycles consisting of 24 h uniform water spray and 24 h of radiant heat. Radiant heat shall be 49 ± 3°C [120 ± 5°F] as measured on a 1 mm thick aluminum plate painted black and affixed to test surface at a minimum of four locations symmetrically located.

8.5.3.2 Proceed with 8.5.4 if there is no cracking observed through visual examination of the water-resistive barrier coating within the field of the panel, at substrate joints and at the flashing interface.

8.5.4 *Water Penetration:*

8.5.4.1 Conduct test on the same test specimen as was tested in 8.5.1, 8.5.2, and 8.5.3. Test sample in accordance with Test Method E331, E631 at a minimum pressure difference of 137 kPa [2.86 psf] for a period of 15 minutes.

8.6 *Weathering:*

8.6.1 *Ultraviolet Light Exposure:*

8.6.1.1 Test specimens in accordance with Test Method D2898 Method B except subject entire surface of specimens to ultraviolet light without water spray for conditions for 210 h (10 h per day for 21 days). Lamps and enclosure shall be adjusted so the specimen temperature is between 57°C [135°F] and 60°C [140°F].

8.6.2 *Wet/Dry Cycling:*

8.6.2.1 Conduct test on the same test specimens that were tested in 8.6.1. Subject samples to 25 cycles of drying and soaking as follows:

(1) Oven dry at 49°C [120°F] for 3 h with all surfaces exposed.

(2) Immerse coating surface in room temperature water for 3 h.

(3) After removal from the water, blot specimens dry and then air dry for 18 h at 24 ± 3°C [75 ± 5°F] with all surfaces exposed.

8.6.3 *Hydrostatic Pressure:*

8.6.3.1 Conduct test on the same test specimens that were tested in 8.6.1 and 8.6.2. The samples shall be tested in accordance with AATCC 127 except that the specimens shall be held at a hydrostatic head of 55 cm [21.6 in.] for a period of 5 h.

9. Calculation or Interpretation of Results

9.1 The WRB coating shall conform to the minimum results prescribed in Table 1.

TABLE 1 Physical Requirements of Water Resistive Barrier (WRB) Coatings

Test	Results (minimum)
Tensile bond	average tensile bond strength shall be minimum 105 kPa [15 psi]
Freeze thaw	no delamination or surface changes such as cracking or crazing when viewed by minimum 5× magnification
Water resistance	no deleterious effects such as cracking or crazing
Water vapor transmission	shall be reported
Water penetration	no visible water penetration at sheathing joints when viewed from the back of the panel
Durability transverse load racking environmental conditioning water penetration	no cracking of the WRB as determined by visual examination within the field of the panel, at substrate joints, and at interface of the flashing no visible water penetration at sheathing joints as viewed form back of panel.
Weathering ultraviolet light exposure accelerated aging hydrostatic pressure	no cracking of the coating or bond failure between the WRB and substrate no water penetration on the plane of the exterior facing side of the substrate

10. Report

10.1 Report the following information for each test method:

10.1.1 Description of test specimen including manufacturers brand, product or trade names,

10.1.2 Test agency,

10.1.3 Date of test and report,

10.1.4 Test results including photographs, failure mode, and so forth, and

10.1.5 Report all deviations.

11. Precision and Bias

11.1 Neither the precision or bias of this test method has been determined.

12. Keywords

12.1 coating; drainage; Exterior Insulation and Finish System (EIFS); substrate; Water Resistive Barrier (WRB)

APPENDIX

(Nonmandatory Information)

X1. LANGUAGE FOR INFORMATIONAL PURPOSES

X1.1 The following information provides an overview and background about the origin, basic content and purpose, and use of standard test to assist in its proper use.

X1.2 These test methods are a series of tests for Water Resistive Barriers (WRB). A WRB is a material used in some EIFS-clad wall assemblies that is placed between the EIFS foam insulation and the substrate to protect the substrate from incidental water leakage that could cause damage to the supporting wall.

X1.3 These test methods consist of a number of different types and sizes of samples and test methods. It is for use of stud and sheathing EIFS substrate systems (such as wood or gypsum-based sheathings), and not for solid substrates like concrete or unit masonry.

X1.4 These test methods use a number of existing ASTM standards and sometimes includes modifications to those standards, or entirely new test methods, to make the tests more suitable for use with EIFS.

X1.5 Sometimes the WRB is left exposed to the weather prior to applying the EIFS, and hence tests that assess the effects of weather during construction (prior to normal in-use conditions) are included in these test methods. An example is UV weathering, to which the WRB is not exposed when the EIFS is in place, but conceivable might affect the WRB during construction.

X1.6 The tests are run as a series, in a specific order; some samples are tested and re-tested. It is possible to run the selected tests separately, for instance if re-running only one test makes sense during evaluation of a specific WRB material.

X1.7 These tests are for qualifying WRB's of the coating type (applied as a wet material, such as a liquid or paste), when used with EIFS, for building code approval and product development purposes, and are not for use on existing or in-place EIFS installations.

X1.8 Other non-coating types of WRB's (such as papers and dry films) can be used with EIFS, as well as with other claddings, assessing those types of WRB's is not covered by

these test methods (there are other existing standards available for such purposes).

X1.9 These tests originated in the Model Codes (in particular the International Conference of Building Officials (ICBO)) and are currently found in one of the Acceptance Criteria issued by the International Code Council (ICC). They have been updated and expanded from the original ICBO and ICC versions, and put into ASTM format. One of the primary intended uses of these test methods is in the International Codes as one of a series of standards by which WRB's are qualified as code-compliant.

X1.10 Other tests on WRB's may be required by the building codes and other authorities, such as flammability, inspection, structural performance and so forth.

X1.11 These test methods consist of a number of test specimen types upon which specific tests are conducted. These sample types and tests types include:

X1.11.1 *Tensile Bond:* hand-size samples of the WRB attachment to various sheathing and flashing types.

X1.11.2 *Freeze-thaw:* hand-size samples repeatedly wetted and dried and checked for cracking and other problems.

X1.11.3 *Water-resistance:* hand-size samples subjected to water immersion to see if WRB will soften or otherwise change.

X1.11.4 *Water vapor transmission:* the presence of the WRB in the wall assembly may be a factor in the hygrothermal performance of the wall and the permeability of the WRB is assessed for this reason.

X1.11.5 *Durability:* a large-scale test assembly in which a WRB is evaluated by structurally loading (cyclical wind and racking), wetted and dried, and then checked for cracking followed by water penetration.

X1.11.6 *Weathering:* hand-size samples are subjected to UV exposure and are wetted and dried and checked for water penetration under a hydrostatic water head.

X1.12 These test methods provide minimum performance requirements in order to qualify a liquid applied water-resistive barrier over a sheathing substrate.