



June 3, 2008

TO: PARTIES INTERESTED IN EVALUATION REPORTS ON WATER-RESISTIVE MEMBRANES


SUBJECT: Revisions to the Acceptance Criteria for Water-resistive Membranes Factory-bonded to Wood-based Structural Sheathing, Used as Water-resistive Barriers, Subject AC310-0508-R1 (MB/ST)

Dear Madam or Sir:

Enclosed is a copy of the subject revised acceptance criteria approved by the ICC-ES Evaluation Committee on May 29, 2008, with an effective date of June 1, 2008. The document was revised to (1) update the criteria to the 2006 International Codes; (2) add requirements for recognition of the panels in an air barrier assembly; and (3) delete references to CCMC Guide MF 07102 and replace them with a description of the test procedure.

Evaluation reports issued on or after the effective date noted above, and falling within the scope of this criteria, will be required to comply with the enclosed edition of the criteria. Evaluation reports issued prior to the effective date may be in compliance either with the enclosed acceptance criteria or with the previous edition. Evaluation reports based on a superseded version of an acceptance criteria must be brought into compliance with the most recent edition at the time the reports are reissued. Therefore, applicants should submit data verifying compliance at the time they apply for re-examination.

If you have any questions, please contact Michael Beaton, Senior Regional Manager, at (800) 423-6587, extension 3292. You may also reach us by e-mail at es@icc-es.org.

Yours very truly,


Kurt Stochlia, P.E.
Vice President

KS/gh

Enclosure

cc: Evaluation Committee



ACCEPTANCE CRITERIA FOR WATER-RESISTIVE MEMBRANES FACTORY-BONDED TO WOOD-BASED STRUCTURAL SHEATHING, USED AS WATER-RESISTIVE BARRIERS

AC310

Approved May 2008

Effective June 1, 2008

Previously approved April 2006, February 2005

PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*[®] reads as follows:

The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the ICC-ES Evaluation Committee, and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from the previous edition, a solid vertical line (|) in the margin within the criteria indicates a technical change, addition, or deletion from the previous edition. A deletion indicator (→) is provided in the margin where a paragraph has been deleted if the deletion involved a technical change. This criteria may be further revised as the need dictates.

ICC-ES may consider alternate criteria, provided the report applicant submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features of the codes, ICC-ES retains the right to refuse to issue or renew an evaluation report, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or if malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

Acceptance criteria are developed for use solely by ICC-ES for purposes of issuing ICC-ES evaluation reports.

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ACCEPTANCE CRITERIA FOR WATER-RESISTIVE MEMBRANES FACTORY-BONDED TO WOOD-BASED STRUCTURAL SHEATHING, USED AS WATER-RESISTIVE BARRIERS (AC310)

1.0 INTRODUCTION

1.1 Purpose: The purpose of this criteria is to establish requirements for recognition of water-resistive membranes, used as water-resistive barriers over wood-based structural sheathing, in ICC Evaluation Service, Inc. (ICC-ES), evaluation reports under the 2006 *International Building Code*[®] (IBC), the 2006 *International Residential Code*[®] (IRC), the BOCA[®] *National Building Code/1999* (BNBC), the and the 1997 *Uniform Building Code*[™] (UBC). The bases of recognition are IBC Section 104.11, IRC Section R104.11, BNBC Section 106.4, SBC Section 103.7 and UBC Section 104.2.8.

1.2 Scope: This criteria is limited to membranes that are factory-bonded to wood-based sheathing and that are used on exterior walls as alternatives to the water-resistive barriers specified in Section 1404.2 of the IBC, Section 1406.3.6 of the BNBC and Section R703.2 of the IRC, and the weather-resistive barriers specified in Section 1402.1 of the UBC, and optionally as an air barrier under Sections 402.4.1 and 5.2.4.3 of the *International Energy Conservation Code*[®] (IECC). The membranes are covered with either a code-approved exterior wall covering, or one that is recognized in a current ICC-ES evaluation report. Substrates that can be considered under this criteria are wood-based structural sheathing complying with the applicable code.

When the water-resistive membranes are intended to be the intervening material between two layers of exterior cementitious coatings, detrimental relative movement of the system shall be considered. This criteria does not consider adhesive attachment to the factory-bonded water-resistive membranes.

This criteria is applicable to field-applied tapes used to seal joints and to overlap flashings and accessories. This criteria does not apply to tapes that are used to flash wall penetrations, which shall comply with the Acceptance Criteria for Flashing Materials (AC148).

1.3 Definitions:

1.3.1 Water-resistive Barrier: For the purposes of this criteria, the term "water-resistive barrier" includes within its scope water-resistive barriers under Section 1404.2 of the IBC and Section 1404.6.3.6 of the BNBC, Section R703 of the IRC, weather-resistive barriers under Section 1402.1 of the UBC, and water-repellent panel sheathing under Section 1402.1 of the UBC.

1.3.2 Air Barrier Assembly: The air barrier materials and accessories that provide a continuous designated plane to the movement of air through portions of building enclosure assemblies.

1.4 Codes and Reference Standards:

1.4.1 2006 *International Building Code*[®] (IBC), International Code Council.

1.4.2 2006 *International Residential Code*[®] (IRC), International Code Council.

1.4.3 2006 *International Energy Conservation Code*[®] (IECC), International Code Council.

1.4.4 BOCA[®] *National Building Code/1999* (BNBC).

1.4.5 1997 *Uniform Building Code*[™] (UBC).

1.4.6 ASTM D 2247-97, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity, ASTM International.

1.4.7 ASTM D 3330-02^{e1}, Standard Test Method for peel Adhesion of Pressure Sensitive Tape.

1.4.8 ASTM E 72-98, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction, ASTM International.

1.4.9 ASTM E 96-00, Standard Test Method for Water Vapor Transmission of Materials, ASTM International.

1.4.10 ASTM E 331-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference, ASTM International.

1.4.11 ASTM E 1233-97, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Cyclical Static Air Pressure Differential, ASTM International.

1.4.12 PS 1-95, U.S. Department of Commerce Voluntary Product Standards for Construction and Industrial Plywood.

1.4.13 ASTM E 2357-05, Test Method for Determining Air Leakage of Air Barrier Assemblies, ASTM International.

2.0 BASIC INFORMATION AND REPORTS OF TESTS

2.1 The following information shall be submitted:

2.1.1 Product Description: A complete description of the water-resistive membrane material shall be submitted and shall include the following, as applicable:

2.1.1.1 Type and amount of priming material applied to the substrate prior to the application of the coating.

2.1.1.2 Statements on product-use limitations, including ultraviolet exposure.

2.1.1.3 Supplemental products, such as tapes, shall be described.

2.1.2 Installation Instructions: Printed installation procedures, available to the installer, shall be submitted and shall include information as indicated below:

2.1.2.1 Substrate preparation for application of field-applied tape.

2.1.2.2 Type, location, and installation procedures for all flashing, counterflashing, caulking and other special treatments.

2.1.2.3 Illustrative details, showing tape application, interface with terminations, openings, penetrations and other discontinuities, as applicable.

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2.1.2.4 Details for inspection of the field-applied taped joints. See Section 5.3.

2.1.2.5 If the material or assembly is to be evaluated as an air barrier assembly in addition to a water-resistive barrier, any differing or additional installation provisions shall be included in the installation instructions.

2.1.3 Packaging and Identification: A description of the method of packaging and identifying the material shall be submitted. Labeling for field identification shall include the following:

1. Name and address of manufacturer.
2. Product name.
3. Plant identification number, if applicable.
4. Labeling of the wood-based sheathing substrate as required by code.
5. Date of manufacture.
6. Evaluation report number.
7. Field-applied tapes shall be labeled with the product name.

2.2 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

2.3 Test Reports: Test reports shall comply with AC85.

2.4 Product Sampling: Test specimens shall be sampled in accordance with Sections 3.2, 3.3 and 3.4 of AC85.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Report(s) of tensile bond testing as set forth in Section 4.1 of this criteria.

3.2 Report(s) of freeze-thaw testing as set forth in Section 4.2 of this criteria.

3.3 Report(s) of water-resistance testing as set forth in Section 4.3 of this criteria.

3.4 Report(s) of water-vapor transmission testing as set forth in Section 4.4 of this criteria.

3.5 Report(s) of water-penetration testing as set forth in Section 4.5 of this criteria. This requirement applies to exterior wall coverings capable of demonstrating water-penetration resistance in accordance with ASTM E 331 with a minimum 2.86 psf (137 Pa) static air pressure differential on a minimum 4-foot-by-8-foot (1219 mm by 2438 mm) sample.

3.6 Report(s) of structural, racking, restrained environmental conditioning and water-penetration tests as set forth in Section 4.6 of this criteria. This requirement permits use of water-resistive coatings beneath all exterior wall coverings.

3.7 Report(s) of weathering exposure and hydrostatic pressure testing as set forth in Section 4.7 of this criteria.

4.0 TEST METHODS

4.1 Tensile Bond Testing:

4.1.1 Membrane Bond to Substrate: For each sheathing substrate for which recognition is sought, ten specimens incorporating the membrane shall be tested in

accordance with the boiling test outlined in Section 6.1.5.3 of PS 1.

4.1.2 Tape Bond to Membrane and Flashing: Tests shall be conducted on the water-resistive membrane and each flashing material for which recognition is sought. For each substrate, five specimens shall be prepared by applying the joint tape to the membrane or flashing in accordance with the manufacturer's instructions. Peel adhesion tests shall be conducted in accordance with ASTM D 3330, Method F, with a one-hour dwell time prior to testing. If the tape backing is overly extensible, the tape may be backed with a suitable non-extensible material.

4.1.3 Conditions of Acceptance: For bond durability tests under PS 1, the average wood failure of the coated samples shall be a minimum of 85 percent. For peel adhesion testing under ASTM D 3330, the peel adhesion strength of each specimen shall be a minimum of 1.0 pli.

4.2 Freeze-thaw Tests:

4.2.1 For each sheathing substrate for which recognition is sought, five 6-inch-square (23 226 mm²) specimens shall be tested. Sheathing specimens shall consist of two sheathing sections assembled with a 1/8-inch-wide (3.2 mm) joint. The joint shall be treated as described in the information submitted under Section 2.1.2 of this criteria. The backs and sides of the specimens shall be sealed with an impervious material. Specimens shall be representative of those used in actual construction.

4.2.2 Specimens are subjected to 10 freeze-thaw cycles. Each cycle consists of air-drying at a temperature of 120°F (49°C) for a minimum of eight hours, followed by total immersion in water at 70°F to 80°F (21.1°C to 26.7°C) for eight hours, and exposure to a temperature of -20°F (-28.9°C) for 16 hours.

4.2.3 Conditions of Acceptance: Failure is defined as surface changes, as viewed by minimum 5x magnification, such as cracking, checking, crazing, erosion or other characteristics, that may affect performance as a water-resistive barrier. There shall be no delamination, or indications of delamination, between components.

4.3 Water-resistance Testing:

4.3.1 For each sheathing substrate for which recognition is sought, three specimens, a minimum of 4 inches by 6 inches (102 mm by 152 mm) in size, and containing a 1/4-inch-wide (6.4 mm) joint between two sheathing sections, shall be tested. The joint shall be treated as described in the information submitted under Section 2.1.2 of this criteria. The backs and sides of the specimens shall be sealed with an impervious material. Specimens shall be representative of those used in actual construction. The evaluation report shall include details for support of joints larger than those tested.

4.3.2 Testing shall be in accordance with ASTM D 2247. Periodic inspections shall be conducted. Testing may be concluded after 14 days, or after deleterious effects of exposure to water are observed.

4.3.3 Conditions of Acceptance: There shall be no deleterious effects from 14 days of exposure to water, such as cracking, checking, crazing, erosion or other characteristics, that may affect performance as a water-resistive barrier.

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4.4 Water-vapor Transmission Testing:

4.4.1 Three specimens of the water-resistive membrane shall be prepared. The specimens are used to set up three wet cups in accordance with ASTM E 96, Water Method. Specimens are conditioned at 75°F ± 5°F (24°C ± 3°C) and 50 percent relative humidity for 40 hours before testing. Each cup is placed in a room with controlled conditions of 75°F ± 5°F (24°C ± 3°C) and 50 percent relative humidity. Reduction in weight is recorded daily. Water vapor transmission and permeance shall be calculated in accordance with Section 13 of ASTM E 96, and reported in grams per square meter per 24 hours and perms, respectively.

4.4.2 Conditions of Acceptance: Water vapor transmission shall satisfy one of the grade requirements in Table 14-1-A of UBC Standard 14-1 or Table 1 of the ICC-ES Acceptance Criteria for Weather-Resistive Barriers (AC38).

4.5 Water Penetration Testing: Three samples shall be prepared. The substrate shall be attached to the supporting framework as required by the substrate manufacturer. The test samples shall be a minimum of 4 feet by 8 feet (1219 mm by 2438 mm) in size, and shall include a minimum of two vertical joints and one horizontal joint. Joints within the substrates shall be a minimum of 1/8 inch (3.2 mm) wide.

The joints shall be treated as described in the information submitted under Section 2.1.2 of this criteria. Test assemblies shall include at least one opening, one penetration, one roof-wall intersection and one wall sill.

Each sample shall be tested in accordance with ASTM E 331. A minimum 2.86 psf (137 Pa) air-pressure differential shall be maintained, across the test specimen, for 15 minutes.

4.5.1 Conditions of Acceptance: There shall be no visible water penetration at sheathing joints, as viewed from the back of the panel. In addition, there shall be no visible water penetration at nail penetrations.

4.6 Structural, Racking, Restrained Environmental Conditioning, and Water Penetration Testing:

4.6.1 Transverse Load (Structural): One specimen shall be prepared. The sheathing shall be attached to either steel or wood framing members (size of wood or size and gage of steel shall be specified). The test specimen shall be a minimum of 8 feet by 8 feet (2438 mm by 2438 mm) in size, and shall include a minimum of two vertical joints and one horizontal joint. Joints shall be a minimum of 1/8 inch (3.2 mm) wide. If flashing is to be recognized, it shall be included in the specimen. Joints shall be treated as described in information submitted under Section 2.1.2 of this criteria. The specimen shall be tested in accordance with ASTM E 1233, Procedure A, at a specified deflection (specified by proponent) in accordance with Table 1604.3 of the IBC. The specimen shall be cycled for a minimum of 10 positive load cycles.

4.6.1.1 Conditions of Acceptance: There shall be no cracking of the water-resistive membrane, or tape when used, as determined by visual examination within the field of the panel, at substrate joints and at the interface of the flashing. If there is cracking, the racking test protocol shall

not go forward. There shall be no delamination of taped joints or taped flashing.

4.6.2 Racking: The intent of the racking procedure is to subject the water-resistive membrane to racking stress. Test setup, measurements and application of load shall comply with ASTM E 72.

4.6.2.1 The test shall be conducted on the same specimen used under Section 4.6.1 of this criteria. Application of load shall be in increments as described in the ASTM E 72 test method with or without hold-downs. Load shall be applied until a 1/2-inch (12.7 mm) net deflection without hold-downs or 1/8-inch (3.2 mm) net deflection with hold-downs is achieved. As an alternative, load shall be applied until the shear design value of the sheathing is achieved, except net deflection shall not exceed 1/2 inch (12.7 mm) without hold-downs or 1/8 inch (3.2 mm) with hold-downs. Throughout the test, the surface of the wall shall be inspected for signs of cracking or tearing of the water-resistive membrane, or tape when used, within the field of the panel and at the interface of the flashing.

4.6.2.2 Conditions of Acceptance: There shall be no cracking of the water-resistive membrane or tape, or delamination, as determined by visual examination within the field of the panel, at substrate joints and at the interface of the flashing. If there is cracking or tape cracking or delamination, the restrained environmental test protocol shall not go forward.

4.6.3 Restrained Environmental Cycling Test: The intent of this test is to evaluate the cracking performance of the water-resistive membrane after exposure to cycles of wetting and drying and changes in temperature.

4.6.3.1 The test shall be conducted on the same specimen used under Sections 4.6.1 and 4.6.2 of this criteria. There shall be a water spray apparatus capable of uniformly wetting the entire test surface, and a radiant heater capable of providing a uniform radiant heat of 120°F ± 5°F (49°C ± 2.8°C) as measured on a 1 mm thick aluminum plate painted mat black and affixed to the test surface at a minimum of four locations, symmetrically distributed. Temperature shall be measured with a covered thermocouple attached to the surface of the black plate. The top edge of the water-resistive membrane shall be flashed and the back side of the assembly protected from moisture. Periods of exposure to ambient conditions not exceeding 48 hours are permitted during the tests, to accommodate laboratory operations.

4.6.3.2 The entire exterior surface shall be subjected to five cycles of the following uniform exposure conditions:

1. Water spray—24 hours
2. Radiant heat—24 hours

4.6.3.3 Throughout the test, the wall surface shall be inspected for signs of cracking of the membrane or tape within the field of the panel and at the substrate joints and the interface of the flashing.

4.6.3.4 Conditions of Acceptance: There shall be no cracking of the water-resistive membrane or tape, or delamination, as determined by visual examination within the field of the panel, at substrate joints and at the interface of the flashing.

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4.6.4 Water Penetration Testing:

4.6.4.1 The test shall be conducted on the same specimen used under Sections 4.6.1, 4.6.2, and 4.6.3 of this criteria. The specimen shall be tested in accordance with ASTM E 331. A minimum 2.86 psf (137 Pa) air pressure differential shall be maintained across the test specimen for 15 minutes.

4.6.4.2 Conditions of Acceptance: There shall be no visible water penetration at sheathing joints or the interface of the flashing, as viewed from the back of the panel. In addition, there shall be no visible water penetration at nail penetrations.

4.7 Weathering Test: Five specimens, a minimum of 9¹/₄ inches by 9 inches (235 mm by 229 mm) in size, shall be prepared by taping two 4-inch-by-9-inch (102 mm by 229 mm) samples side by side, with a ¹/₄-inch-wide seam between the membrane pieces. No impervious material shall be applied to the membrane or tape.

These specimens shall be exposed to light from ultraviolet light, followed by accelerated aging in accordance with Sections 4.7.1 and 4.7.2 of this criteria, respectively. Following exposure, the specimens shall be tested in accordance with Section 4.7.3 of this criteria.

4.7.1 Ultraviolet Light Exposure: The specimens shall be exposed to light from ultraviolet sun lamps for 210 hours (10 hours per day for 21 days) in an enclosure. Ultraviolet light exposure shall be directed on the entire sample surface that will be exposed to sunlight in normal application. Lamps and enclosure shall be adjusted so the specimen temperature is between 135°F and 140°F (57°C and 60°C). Sunlamp bulbs shall be General Electric Type H275 RUV (275 W) or equivalent bulbs, providing UV characteristics of 5.0 W/m²/nm irradiance at a wavelength of 315 to 400 nm at 1 meter. Bulbs shall be located 2 feet (610 mm) above samples.

4.7.2 Accelerated Aging: The specimens shall be subjected to 25 cycles of drying and soaking as follows:

1. Oven drying at 120°F (49°C) for three hours, with all surfaces exposed.
2. The coating surface shall be immersed in room-temperature water for three hours.
3. After removal from the water, specimens are blotted dry, then air-dried for 18 hours at a 75°F ± 5°F (23.8°C ± 2.8°C) room temperature, with all surfaces exposed.

4.7.3 Hydrostatic Pressure Test: A ring shall be constructed with a sample of the membrane fastened between two 200-millimeter-diameter aluminum rings using a rubber-type gasket. The membrane shall be placed between the rings and cupped to permit a depth of 30.5 mm of tap water to be exposed on 160 cm² of its surface. The test shall be conducted at room temperature (20±2°C) and 65±3% RH. The ring shall be raised about 250 mm above a sheet of plain craft paper placed underneath the membrane to aid in monitoring any passage of water.

The membrane shall be maintained at constant conditions of temperature (20±2°C) and relative humidity (65±3%) and shall be inspected at frequent intervals over a

period of two hours. Ten test specimens shall be chosen at random from the membrane supplied.

No water seepage shall be observed through the membrane during the water ponding test. (This test procedure has been copied with permission from CCMC Guide MF07102, Technical Guide for Sheathing, Membrane, Breather-type, Section 6.4.5. The CCMC Guide is published by the Canadian Construction Materials Centre.)

4.7.4 Conditions of Acceptance: There shall be no cracking of the membrane, or tape when used, or bond failure or between the tape and the membrane. Condition of acceptance shall be that no water shall penetrate through the membrane or the taped joint.

4.8 Air Barrier Assembly Test: When the product is to be evaluated as a component of an air barrier assembly, reports of air leakage testing in accordance with ASTM E 2357 shall be submitted. A minimum of two assemblies shall be tested. The test report shall indicate which cycling procedure was used (four stages of 500 cycles or two stages of 1000 cycles.)

4.8.1 Conditions of Acceptance: The air leakage rate shall be no more than 0.2L/(s·m²) at 75 Pa [0.04 cfm/ft² at 0.3 inch w.g. (1.57 psf)] for all specimens.

5.0 QUALITY CONTROL

5.1 The membranes shall be manufactured under a quality control program documented in a manual complying with the ICC-ES Acceptance Criteria for Quality Control Manuals (AC10). The program shall include, but not be limited to, verification of membrane properties described in Section 2.1 of this criteria. Field-applied tapes shall be verified to be consistent with the tape used in the qualifying tests.

5.2 Follow-up inspections by an inspection agency are not required under this criteria.

5.3 Field Inspection and Reporting: The manufacturer shall provide, within the installation instructions, details for verification of proper tape application.

6.0 EVALUATION REPORT RECOGNITION

The evaluation report shall include the following information:

1. Product description, installation instructions, and packaging and identification information, based on requirements in Section 2.1 of this criteria.
2. Permitted substrates qualified by the tests described in Section 4.0 of this criteria.
3. Water vapor transmission values, described in Section 4.4.2 of this criteria.
4. Details for flashing and protection of openings as determined by testing in accordance with Section 4.5 of this criteria.
5. When data is submitted for recognition as an air barrier assembly, the evaluation report shall provide a description of the assembly that is consistent with the assembly tested. ■