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February 1, 2010

**TO: PARTIES INTERESTED IN EVALUATION REPORTS ON  
MEMBRANE ROOF COVERING SYSTEMS**

**SUBJECT: Proposed Revisions to the Acceptance Criteria for Membrane Roof  
Covering Systems, Subject AC75-0210-R1 (JV/WM)**

Dear Madam or Sir:

The revisions proposed to the subject acceptance criteria, as presented in the enclosed criteria draft, are being posted on the ICC-ES web site to allow for public comment. The revisions include:

1. Updating AC75 to the 2009 I-Codes, and deleting references to the UBC, the BNBC and the SBC.
2. Updating Section 1.3 (Referenced Documents) to reference the current editions of standards.
3. Adding conformance with IBC (*International Building Code*) Section 1504.8 to the design requirements for ballasted roof covering systems.
4. Adding compliance with SPRI Test RE-1 for ballasted and mechanically attached roof covering systems.
5. Changing the requirement for wind uplift tests from FM 4450 and FM 4470 to FM 4474, as set forth in the 2009 IBC.

The updated versions of ASTM C 578, ASTM C635, ASTM C728, ASTM C1289, ASTM D 4434, ASTM D 5019, ASTM D 6164, ASTM D 6222, ASTM D 6298, ASTM D 6878, ASTM E 108, ASTM G 152, ASTM G154, ASTM G155, UL 580, UL 790, UL 1256 and UL 1897 are mandated by the 2009 IBC and IRC (*International Residential Code*).

The test standard for wind resistance of membrane roof coverings was changed in the 2009 IBC, from FM 4450 and 4470 to FM 4474.

All other changes are for clarification purposes.

You are cordially invited to submit written comments, within 30 days of the date of this letter. Please use the comment form on the web site attaching any letters to the

form. An explanation of the alternate criteria process can be found on our web site at [http://www.icc-es.org/Criteria\\_Development/alternative\\_criteria\\_process.shtml](http://www.icc-es.org/Criteria_Development/alternative_criteria_process.shtml).

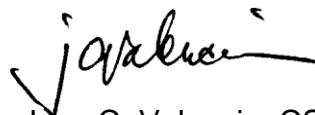
All comments received in the 30-day comment period will be considered in preparing revisions to the criteria that may be considered at a future Evaluation Committee meeting. Comments received will be posted on the web site shortly after the close of the comment period.

Your cooperation is requested in forwarding to the Los Angeles business/regional office all material directed to the Evaluation Committee. Parties interested in the deliberations of the committee should refrain from communicating, whether in writing or verbally, with committee members. The committee reserves the right to refuse communications that do not comply with this request.

Newly approved acceptance criteria may involve test methods or test protocols that are not currently included in the scope of testing services offered by accredited testing laboratories. As noted in the ICC-ES Rules of Procedure for Evaluation Reports, the scope of the laboratory's accreditation must include the type of testing that is to be reported to ICC-ES. We encourage accredited laboratories to expand their scopes of accreditation to include testing under newly approved acceptance criteria. Please note that testing laboratories must be accredited by the International Accreditation Service (IAS) or by another accreditation body that is a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement. For further information, please contact IAS at (562) 699-0541, extension 3309, or send an e-mail to [pmccullen@iasonline.org](mailto:pmccullen@iasonline.org).

Please submit all comments using the form on the web site. Attach any letters to the comment form. If you have any questions (not comments), please contact the undersigned at (800) 423-6587, extension 5693, or Woods McRoy, Senior Staff Engineer, at extension 5686. You may also reach us by e-mail at [es@icc-es.org](mailto:es@icc-es.org)

Yours very truly,



Jose C. Valencia, CSI  
Staff Architect

JCV/raf

Enclosures

cc: Evaluation Committee

## PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR MEMBRANE ROOF-COVERING SYSTEMS

### AC75

Proposed February 2010

Previously approved April 2007, February 2006, June 2005, June 2003,  
November 2001, May 2001, July 1999, September 1998, September 1997,  
July 1992

### 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.

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 proposed in this document, and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria proposed in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise meet the applicable performance requirements 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 malfunctioning is apt to cause unreasonable property damage or personal injury or sickness.

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

# PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR MEMBRANE ROOF-COVERING SYSTEMS (AC75)

## 1.0 INTRODUCTION

**1.1 Purpose:** The purpose of this acceptance criteria is to establish requirements for membrane roof-covering systems to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the ~~2006~~ 2009 *International Building Code*<sup>®</sup> (IBC), and the ~~2006~~ 2009 *International Residential Code*<sup>®</sup> (IRC), ~~the 1997~~ 2009 *Uniform Building Code*<sup>™</sup> (UBC), ~~the BOCA~~ 2009 *National Building Code* (NBBC), and the ~~1999~~ 2009 *Standard Building Code*<sup>®</sup> (SBC).

Bases of recognition are IBC Chapter 15 and Section 104.11, and IRC Chapter 9 and Section R104.11, ~~UBC Section 104.2.8, NBBC Section 106.4, and SBC Section 403.7.~~

The reason for the development of this criteria is to consolidate the various building code requirements applicable to the membrane roofing products and address applicable requirements for self-adhered membranes, which are not addressed in the code.

**1.2 Scope:** This acceptance criteria includes requirements for thermoplastic, thermoset and modified bitumen membrane roof-covering systems.

**1.3 Codes and Referenced Standards:** Where standards are referenced in this criteria, these standards shall be applied consistently with the code (~~UBC, NBBC, SBC,~~ IBC or IRC) upon which compliance is based.

**1.3.1** ~~2006~~ 2009 *International Building Code*<sup>®</sup> (IBC), International Code Council.

**1.3.2** ~~2006~~ 2009 *International Residential Code*<sup>®</sup> (IRC), International Code Council.

~~1.3.3~~ *1997 Uniform Building Code*<sup>™</sup> (UBC).

~~1.3.4~~ *BOCA*<sup>®</sup> *National Building Code* (NBBC).

~~1.3.5~~ *1999 Standard Building Code*<sup>®</sup> (SBC).

**1.3.3** ~~1.3.6~~ **ASTM International (ASTM):**

**1.3.3.1** ~~1.3.6.1~~ ASTM C 208-95(2001), Specification for Cellulosic Fiber Insulating Board.

**1.3.3.2** ~~1.3.6.2~~ ASTM C 552-03, Standard Specification for Cellular Glass Thermal Insulation.

**1.3.3.3** ~~1.3.6.3~~ ASTM C 578-0407, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

**1.3.3.4** ~~1.3.6.4~~ ASTM C 728-97-105, Standard Specification for Perlite Thermal Insulation Board.

**1.3.3.5** ~~1.3.6.5~~ ASTM C 1289-0307, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

**1.3.3.6** ~~1.3.6.6~~ ASTM D 635-0306, Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

**1.3.3.7** ~~1.3.6.7~~ ASTM D 903-98 (2004), Test Method for Peel or Stripping Strength of Adhesive Bonds.

**1.3.3.8** ~~1.3.6.8~~ ASTM D 1929-96 (2001)e01, Standard Test Method for Determining Ignition Temperature of Plastics.

**1.3.3.9** ~~1.3.6.9~~ ASTM D 1970-01, Specification for Self-adhering Polymer Modified Bituminous Sheet

Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

**1.3.3.10** ~~1.3.6.10~~ ASTM D 3746-85(2002), Test Method for Impact Resistance of Bituminous Roofing Systems.

**1.3.3.11** ~~1.3.6.11~~ ASTM D 4272-03, Test Method for Total Energy Impact of Plastic Films by Dart Drop.

**1.3.3.12** ~~1.3.6.12~~ ASTM D 4434-0406, Specification for Poly (Vinyl Chloride) Sheet Roofing.

**1.3.3.13** ~~1.3.6.13~~ ASTM D 4637-04, Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.

**1.3.3.14** ~~1.3.6.14~~ ASTM D 5019-960407, Specification for Reinforced Non-Vulcanized Polymeric Sheet Used in Roofing Membrane.

**1.3.3.15** ~~1.3.6.15~~ ASTM D 6162-00A, Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

**1.3.3.16** ~~1.3.6.16~~ ASTM D 6163-00e01, Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

**1.3.3.17** ~~1.3.6.17~~ ASTM D 6164-0005, Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

**1.3.3.18** ~~1.3.6.18~~ ASTM D 6222-0201, Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

**1.3.3.19** ~~1.3.6.19~~ ASTM D 6223-02, Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

**1.3.3.20** ~~1.3.6.20~~ ASTM D 6298-0005, Specification for Fiberglass Reinforced Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface.

**1.3.3.21** ~~1.3.6.21~~ ASTM D 6754-02, Specification for Ketone Ethylene Ester Based Sheet Roofing.

**1.3.3.22** ~~1.3.6.22~~ ASTM D 6878-0306a, Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.

**1.3.3.23** ~~1.3.6.23~~ ASTM E 108-0407a, Test Methods for Fire Tests of Roof Covering.

**1.3.3.24** ~~1.3.6.24~~ ASTM G 152-0406, Standard Practice for Operating Open-Flame Carbon Arc Light Apparatus for Exposure of Non-Metallic Materials.

**1.3.3.25** ~~1.3.6.25~~ ASTM G 154-00a05, Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.

**1.3.3.26** ~~1.3.6.26~~ ASTM G 155-0405a, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.

**1.3.4** ~~1.3.7~~ **Factory Mutual Research Corporation (FM):**

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**1.3.4.1** ~~1.3.7.1~~ FM 4450-89, Approval Standard for Class 1 Insulated Steel Deck Roofs - With Supplements through 7/92.

**1.3.4.2** ~~1.3.7.2~~ FM 4470-92, Approval Standard for Class 1 Roof Covers.

**1.3.4.3** FM 4474-04, Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.

### **1.3.5** ~~1.3.8~~ Underwriters Laboratories Inc.:

**1.3.5.1** ~~1.3.8.1~~ UL 580-9406, Test for Uplift Resistance of Roof Assemblies—~~with Revisions through February 1998.~~

**1.3.5.2** ~~1.3.8.2~~ UL 790-9804, Tests for Fire Resistance of Roof Covering Materials—~~with Revisions through July 1998.~~

**1.3.5.3** ~~1.3.8.3~~ UL 1256-02, Fire Test of Roof Deck Constructions – with Revisions through January 2007.

**1.3.5.4** ~~1.3.8.4~~ UL 1897-9804, Uplift Tests for Roof Covering Systems—~~with Revisions through November 2002.~~

### **1.3.6** ~~1.3.9~~ Canadian General Standards Board (CGSB):

**1.3.6.1** ~~1.3.9.1~~ CGSB 37-GP-52M (1984), Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric.

**1.3.6.2** ~~1.3.9.2~~ CAN/CGSB 37.54-95, Polyvinyl Chloride Roofing and Waterproofing Membrane.

**1.3.6.3** ~~1.3.9.3~~ CGSB 37-GP-56M (1980), Membrane, Modified Bituminous, Prefabricated and Reinforced for Roofing - With December 1985 Amendment.

### **1.3.7** ~~1.3.10~~ Single-Ply Roofing Industry:

**1.3.7.1** ~~1.3.10.1~~ ANSI/SPRI ES-1-03, Wind Design Standard for Edge Systems Used with Low-Slope Roofing Systems.

**1.3.7.2** ~~1.3.10.2~~ ANSI/SPRI RP-4-02, Wind Design Guide for Ballasted Single-ply Roofing Systems.

## **2.0 BASIC INFORMATION**

**2.1 General:** The following information shall be submitted:

**2.1.1 Product Description:** Complete information concerning material specifications, density, protective coatings, thickness, and size. The description shall also include dimensioned scale drawings and details noting all thicknesses, size and location of fasteners.

**2.1.2 Installation Instructions:** Installation instructions and details including limitations, fastening methods, joint treatments, and surface treatments.

**2.1.3 Packaging and Identification:** A description of the method of packaging and field identification of the membrane roof-covering system. All membrane components shall bear a label noting the product name, the name and address of the evaluation report holder or designated distributor, the name of the inspection agency responsible for follow-up inspections, and the evaluation report number.

**2.1.4 Field Preparation:** A description of the methods of field-cutting, application, trimming or forming, and treatment of cut edges.

**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. The test reports shall be in sufficient detail to identify specimen properties that might affect performance as a membrane roof covering. A qualified representative of the testing agency shall witness the production, fabrication and installation of test specimens. The testing agency shall verify and report, as applicable, dimensions, weight, density, and other relevant physical properties of the major components, and the manner of installation, and shall include a description of fastening elements.

**2.4 Product Sampling:** Sampling of the roof-covering system membrane for tests under this criteria shall comply with Section 3.1 of AC85.

## **3.0 TEST AND PERFORMANCE REQUIREMENTS**

### **3.1 Wind Resistance:**

**3.1.1 Nonballasted Membrane Roof Covering Systems:** Allowable wind uplift loads for nonballasted (mechanically attached or adhered) membrane roof-covering systems shall be determined by testing in accordance with Section 4.1.1. A safety factor of 2 shall be applied to the maximum load achieved without failure.

**3.1.2 Ballasted Membrane Roof Covering Systems:** Ballasted membrane roof-covering systems shall be designed in accordance with IBC Section 1504.8 and ANSI/SPRI RP-4.

**3.1.3 Edge Securement:** Edge securement for all membrane roof systems shall be in accordance with ANSI/SPRI ES-1 Section 6.0. Details of perimeter attachment and evidence of compliance with ANSI/SPRI ES-1 shall be provided for all types of membrane roofing systems. Where required by ANSI/SPRI ES-1, the edge device assembly for ballasted and mechanically attached systems shall be tested in accordance with ANSI/SPRI ES-1 Test RE-1 and shall provide the minimum holding power as required by the design wind load with a factor of safety of 2.

### **3.2 Physical Properties:**

**3.2.1 General:** Minimum requirements for physical properties are prescribed for different types of membranes in accordance with the applicable standards, as noted in Section 4.2.

**3.2.2 Accelerated Weathering:** Accelerated weathering testing in accordance with Section 4.2 shall be conducted. Where the applicable standard does not provide accelerated weathering for a minimum of 2000 hours, the requirements shall be as follows:

**3.2.2.1** For unreinforced membranes, elongation at break shall not be reduced to less than 200 percent.

**3.2.2.2** For reinforced membranes, elongation at break before and after accelerated weathering shall be as specified in the applicable standard in Table 1 for minimum load before and after heat conditioning when tested at  $23 \pm 2^{\circ}\text{C}$  ( $73.4 \pm 3.6^{\circ}\text{F}$ ).

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**3.2.2.3** For adhered membranes, the tensile strength for unreinforced membranes and the breaking strength for reinforced membranes before and after accelerated weathering shall be as specified in the applicable standard in Table 1 for minimum load before and after heat conditioning when tested at  $23 \pm 2^{\circ}\text{C}$  ( $73.4 \pm 3.6^{\circ}\text{F}$ ).

**3.2.2.4** For mechanically attached membranes, there shall be no reduction in tensile strength for unreinforced membranes and no loss in breaking strength for reinforced membranes.

**3.3 Impact Resistance:** Roof coverings shall be tested for impact damage in accordance with Section 4.3. The testing standard and the results of the testing shall be noted in the evaluation report.

### **3.4 Fire Classification:**

**3.4.1 New Roofing:** The roof-covering assembly shall be classified as Class A, B or C when tested in accordance with Section 4.4.

**3.4.2 Reroofing:** Systems installed over existing roof coverings shall satisfy classification requirements by testing of the composite system in accordance with Section 4.4.

**3.5 Self-adhering Membranes:** In addition to the testing of performance characteristics noted in Sections 3.1 through 3.4, self-adhering thermoplastic and modified bitumen membranes shall be tested in accordance with Section 4.5.

**3.6 Insulation:** Test reports in accordance with the applicable standard in Table 2 shall be submitted.

**3.6.1 Foam Plastic Insulation:** When a foam plastic insulation is specified in the evaluation report by the insulation manufacturer's name and product name, documentation from an approved third-party testing agency for the specified foam plastic insulation indicating the insulation flame-spread index at a given thickness shall be submitted.

**3.6.2 All Other Insulation:** Test reports in accordance with FM 4450 or UL 1256 shall be submitted for each roof-covering system. Roof-covering systems incorporating a concrete roof deck are exempt from this requirement.

## **4.0 TEST METHODS**

### **4.1 Wind Resistance:**

**4.1.1 Nonballasted Roof Covering Systems:** Nonballasted roof covering systems shall be tested for wind uplift in accordance with ~~FM 4450~~, ~~FM 4470~~ 4474, UL 580, or UL 1897, as applicable.

### **4.2 Physical Properties:**

**4.2.1 General:** Reports of tests complying with applicable standards in Table 1 are required.

**4.2.2 Accelerated Weathering:** Roof coverings shall be tested for a minimum of 2000 hours of accelerated weathering in accordance with ASTM G 152, ASTM G 154, or ASTM G 155, or as specified in the applicable standard in Table 1, whichever is greater. Test reports from old equivalent ASTM Standards G 23, G 26 or G 53 will be acceptable if there have been no changes to the product, formulation, or manufacturing method. Where the applicable standard does not specify the test

sample size, the test sample size shall be 8 inches by 8 inches (203 mm by 203 mm).

**4.3 Impact Resistance:** Roof coverings shall be tested for impact damage in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or the "Resistance to Foot Traffic Test" in Section 5.5 of FM 4470, as applicable.

**4.4 Fire Classification:** Roof assemblies shall be tested in accordance with ASTM E 108 or UL 790.

**4.5 Self-adhering Membranes:** Self-adhering modified bitumen membranes shall be tested for performance characteristics as noted in Sections 4.5.1, 4.5.2, 4.5.3, and 4.5.4.

#### **4.5.1 Waterproof Integrity of Lap Seam:**

**4.5.1.1 Sample:** Five representative samples shall be examined for each membrane for which recognition is sought.

**4.5.1.2 Procedure:** Samples shall be tested in accordance with Section 7.9 of ASTM D 1970, as clarified in Sections 7.9.1.2 and 7.9.3.6 for integrity of lap seams.

**4.5.1.3 Conditions of Acceptance:** There shall be no water in the bottom can, on the underside of the plywood, between the membrane and plywood, or within the lap seam.

#### **4.5.2 Adhesion to Plywood and Retention of Adhesion after Temperature Cycling:**

**4.5.2.1 Sample:** Samples shall be prepared in accordance with ASTM D 903, except as modified in this Section (4.5.2.1).

**4.5.2.1.1** Each sample shall consist of the following:

1. Five control specimens, consisting of the membrane applied to plywood, conditioned at  $75 \pm 2^{\circ}\text{F}$  ( $23.9 \pm 1.1^{\circ}\text{C}$ ) and at a relative humidity of  $50 \pm 2$  percent. See Section 4.5.2.1.6 for time materials must be conditioned before and after specimen assembly.

2. Five control specimens, consisting of the membrane applied to plywood, conditioned at  $40 \pm 2^{\circ}\text{F}$  ( $4.4 \pm 1.1^{\circ}\text{C}$ ) and at a relative humidity of  $50 \pm 2$  percent. See Section 4.5.2.1.6 for length of conditioning materials before and after specimen assembly.

3. Five specimens, consisting of the membrane adhered to plywood, subjected to temperature-cycling exposure in accordance with Section 4.5.4, and then conditioned at  $75 \pm 2^{\circ}\text{F}$  ( $23.9 \pm 1.1^{\circ}\text{C}$ ) and at a relative humidity of  $50 \pm 2$  percent, for not less than 1 hour prior to peel-strength testing.

4. Five control specimens consisting of the membrane adhered to each non-plywood substrate for which the applicant desires recognition, including membrane or other non-rigid substrates. The specimens are conditioned at  $75 \pm 2^{\circ}\text{F}$  ( $23.9 \pm 1.1^{\circ}\text{C}$ ) and at a relative humidity of  $50 \pm 2$  percent. See Section 4.5.2.1.6 for length of conditioning materials before and after specimen assembly.

5. Five specimens consisting of the membrane adhered to each non-plywood substrate for which the applicant desires recognition, including membrane or other non-rigid substrates. The specimens are subjected to temperature-cycling exposure in

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accordance with Section 4.5.4 for each non-plywood substrate for which the applicant desires recognition. After the temperature-cycling exposure, the specimens are conditioned at  $75 \pm 2^\circ\text{F}$  ( $23.9 \pm 1.1^\circ\text{C}$ ) and at a relative humidity of  $50 \pm 2$  percent, for not less than 1 hour prior to peel-strength testing.

**4.5.2.1.2** Specimens shall be assembled individually since cutting specimens to size after assembly may influence the test results.

**4.5.2.1.3** For membrane adhesion to rigid substrates (e.g., roof decking or insulation), each sample (five specimens per sample) shall consist of one piece of the membrane, measuring 3 by  $8 \pm 0.125$  inches (75 by  $200 \pm 2$  mm), bonded for 3 by 5 inches (75 by 125 mm) to the substrate material, measuring 3 by 6 inches (75 by 150 mm). Plywood shall be minimum  $\frac{1}{4}$ -inch-thick (6 mm), Exposure 1 plywood complying with Department of Commerce PS-1 or PS-2. Other rigid substrates shall be those for which the manufacturer desires recognition.

**4.5.2.1.4** For membrane adhesion to non-rigid substrates (e.g., base membrane), the test specimen shall consist of one piece of membrane, 3 by  $8 \pm 0.125$  inches (76 by  $203 \pm 2$  mm), bonded for 3 by 5 inches (76 by 127 mm) to one piece of the non-rigid substrate material measuring 3 by 6 inches (76 by 152 mm), which is securely bonded and/or nailed to a piece of minimum  $\frac{1}{4}$ -inch-thick (6 mm), Exposure 1 plywood complying with Department of Commerce PS-1 or PS-2, measuring 3 by 6 inches (76 by 152 mm).

**4.5.2.1.5** The test specimen shall be rolled three times back and forth with a roller having a mass of 26 pounds (11.8 kg)  $\pm 0.5$  percent, a diameter of 5 inches (127 mm)  $\pm 5$  percent, and a width of 5 inches (127 mm)  $\pm 5$  percent, at an approximate rate of 2 to 3 seconds per rolling cycle.

**4.5.2.1.6** Materials used to construct the control samples described in Section 4.5.2.1.1(1), (2), and (4), and the roller described in Section 4.5.2.1.5, shall be conditioned for not less than 4 hours prior to assembly, and the prepared control samples shall be conditioned at the test temperature for not less than 1 hour prior to peel-strength testing. The test temperature is the condition temperature.

**4.5.2.1.7** For post-temperature-cycling samples, test specimens shall be conditioned at  $75 \pm 2^\circ\text{F}$  ( $23.9 \pm 1.1^\circ\text{C}$ ) for not less than 1 hour prior to peel-strength testing.

**4.5.2.2 Peel-strength Test Procedure:** Samples shall be tested and results reported in accordance with ASTM D 903, except as modified in this Section (4.5.2.2).

**4.5.2.2.1** A constant rate-of-jaw separation type tester shall be used. The rate of travel of the power-actuated grip shall be  $2 \pm \frac{1}{16}$  inches per minute ( $51 \pm 1.6$  mm/min) and shall be uniform throughout the test.

**4.5.2.2.2** At least five specimens shall be tested for each test temperature. The test temperature is the condition temperature.

**4.5.2.2.3** The free end of the self-adhering membrane material shall be separated from the substrate by hand for an approximate distance of 2 inches (51 mm), leaving a bonded area of approximately 3 by 3 inches (76 by 76 mm). The specimen shall be placed in the testing

machine by clamping the free end of the substrate material in the lower grip, turning back the free end of the test membrane 180 degrees, and clamping it in the upper grip. The specimen shall be maintained in the approximate plane of the clamps during the test. Not less than three quarters of the bonded area shall be peeled to establish the peel curve.

**4.5.2.2.4** The peel strength shall be determined by drawing on the autographic chart the average load line that will accommodate the recorded curve. The load shall be recorded, eliminating any peaks associated with membrane tear. The result shall be converted to a lbf/ft width (kgf / 30.5 cm width) value.

**4.5.2.2.5** For each series of tests, the following shall be reported: the type of substrate (plywood or base material), the individual measurements, the average, and the standard deviation of all the test values in lb/ft (kg/mm) width.

### 4.5.2.3 Conditions of Acceptance:

**4.5.2.3.1** Control samples described in Section 4.5.2.1.1(1) for adhesion to plywood shall meet minimum average adhesion values  $\geq 12$  lbf/ft width. Control samples described in Section 4.5.2.1.1(2) shall meet minimum average adhesive values  $\geq 1$  lbf/ft width.

**4.5.2.3.2** Samples described in Section 4.5.2.1.1(3) shall display no loss in adhesion performance when compared to control samples described in Section 4.5.2.1.1(1).

**4.5.2.3.3** Samples described in Section 4.5.2.1.1(5) shall display no loss in adhesion performance when compared to control samples described in Section 4.5.2.1.1(4).

**4.5.3 Thermal Stability:** Roof-covering membrane samples shall be tested in accordance with Section 7.5 of ASTM D 1970.

**4.5.3.1 Sample:** Five representative specimens shall be examined for each self-adhering membrane for which recognition is sought.

**4.5.3.2 Procedure:** Test samples in accordance with Section 7.5 of ASTM D 1970.

**4.5.3.3 Conditions of Acceptance:** The maximum point of modified bitumen flow shall not exceed 0.1 inch (2.5 mm).

### 4.5.4 Temperature-cycling Tests:

**4.5.4.1 Sample:** A minimum of five representative samples shall be used.

**4.5.4.2 Procedure:** Samples shall be subjected to 25 consecutive cycles of this test, each cycle consisting of one hour of water exposure at room temperature prior to six hours at  $-40^\circ\text{F}$  ( $-40^\circ\text{C}$ ), two hours at  $70^\circ\text{F}$  ( $21.1^\circ\text{C}$ ), fourteen hours at  $180^\circ\text{F}$  ( $82^\circ\text{C}$ ), and one hour at  $70^\circ\text{F}$  ( $21.1^\circ\text{C}$ ). Between cycles, such as on weekends, holidays, etc., the samples may be maintained at  $70^\circ\text{F}$  ( $21.1^\circ\text{C}$ ). A  $+5^\circ\text{F}$  ( $2.8^\circ\text{C}$ ) tolerance is allowed on the above temperatures. Spray nozzles for the water exposure must be located approximately 7 feet (2134 mm) above the test decks and must deliver 6 inches (152 mm) of water per hour at a temperature of  $40^\circ\text{F}$  to  $60^\circ\text{F}$  ( $4.4^\circ\text{C}$  to  $15.6^\circ\text{C}$ ). The test decks shall consist of substrate materials (e.g., decking or insulation) assembled to simulate field installations. Membrane(s) shall be installed atop the

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substrate(s) in accordance with the manufacturer’s published installation instructions, incorporating vertical and horizontal joints (laps) in the specimen. Each substrate for which the evaluation report applicant desires recognition shall be examined. The test specimens shall be positioned at the lowest slope recommended for field installation. At the conclusion of the 25 cycles, the specimens shall be examined under 5x magnification.

**4.5.4.3 Conditions of Acceptance:** There shall be no crazing, cracking or other deleterious surface or joint changes at the end of test. Additionally, there shall be no sign of failure or distress at fastener locations (if applicable) or at the panel joints.

**5.0 QUALITY CONTROL**

**5.1** The products shall be manufactured under an approved quality control program with inspections by an inspection agency accredited by the International Accreditation Service (IAS) or otherwise acceptable to ICC-ES.

**5.2** A quality control manual complying with the ICC-ES Acceptance Criteria for Quality Control Manuals (AC10) shall be submitted.

**6.0 EVALUATION REPORT RECOGNITION**

The evaluation report shall include the following information:

**6.1** Product description, installation instructions, and packaging and identification information based on requirements in Section 2.1.

**6.2** A condition of use shall be included that states, “Wind uplift pressure on any roof area, including edge and corner zones, shall not exceed the allowable wind uplift pressure for the system installed in that particular roof area.”

**6.3 Foam Plastic:**

**6.3.1** When a specific foam plastic insulation is specified in the evaluation report by the manufacturer’s name and product name, the maximum allowed thickness shall be specified.

**6.3.2** Reports on roof-covering systems that include foam plastic board insulation shall include a condition of use requiring the foam plastic board to bear the label of an approved agency indicating that the foam plastic has a flame-spread index of not more than 75 at the maximum thickness intended for use.

**6.3.3** Reports on systems incorporating foam plastic insulation shall include a condition of use addressing the issue of thermal barriers. Example: Foam plastic shall be separated from the interior of the building by an approved thermal barrier in accordance with Section 2603.4 of the IBC.

**6.4 Reroofing:**

**6.4.1 Roof Classification:** Class A, B, or C roof-covering systems may be installed over existing roof-covering systems under the following conditions, provided the resulting classification is the lower of the new and existing roofing classification:

**6.4.1.1** New uninsulated systems installed only over existing uninsulated assemblies.

**6.4.1.2** New insulated systems installed over existing uninsulated systems only.

**6.4.2 Wind-uplift Resistance:** Mechanically anchored systems may be accepted based on adequacy of anchors penetrating through existing roof coverings into structural substrates. Ballasted systems shall comply with ANSI/SPRI RP-4. ■

**TABLE 1—REFERENCED STANDARDS FOR PHYSICAL PROPERTIES OF MEMBRANES<sup>1</sup>**

<b>MODIFIED BITUMEN AND SELF-ADHERING MODIFIED BITUMEN</b>	<b>FIBERGLASS-REINFORCED SBS-MODIFIED BITUMINOUS SHEET</b>	<b>THERMOPLASTIC</b>	<b>THERMOSET</b>
ASTM D 6162, ASTM D 6163, ASTM D 6164, ASTM D 6222, ASTM D 6223, or CGSB 37-GP-56M	ASTM D 6298	ASTM D 4434, or CAN/CGSB 37.54-95 ASTM D 6754 ASTM D 6878	ASTM D 4637, ASTM D 5019, CGSB 37-GP-52M, RMA RP-1, RMA RP-2, or RMA RP-3

<sup>1</sup>When multiple standards are listed, tests shall be conducted using the standard applicable to the product.

**TABLE 2—REFERENCED STANDARDS FOR ROOF INSULATION**

<b>INSULATION</b>	<b>STANDARD</b>
Cellular glass board	ASTM C 552
Composite boards	ASTM C 1289, Type III, IV, V or VI
Expanded polystyrene	ASTM C 578
Extruded polystyrene board	ASTM C 578
Perlite board	ASTM C 728
Polyisocyanurate board	ASTM 1289, Type I or Type II
Wood fiberboard	ASTM C 208