

ACCEPTANCE CRITERIA FOR FLEXIBLE FLASHING MATERIALS

AC148

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PREFACE

Evaluation reports issued by ICC Evaluation Service, LLC (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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1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for recognition of self-adhering membranes used as flashings on roof hips and ridges (hip and ridge tape), and self-adhering flashing and mechanically fastened flashing for wall penetrations, in ICC Evaluation Service, LLC (ICC-ES), evaluation reports under the 2009 *International Building Code*[®] (IBC), and the 2009 *International Residential Code*[®] (IRC).

The reason for the development of this criteria is that the cited codes do not provide procedures for evaluating flashing materials for use at wall penetrations and roof hips and ridges (hip and ridge tape).

1.2 Scope: The acceptance criteria is limited to recognition of the following:

1.2.1 Hip and Ridge Tape: Synthetic butyl rubber-based membranes for use as a wind and rain block beneath hips and ridges of concrete or clay tile roofs under IBC Section 1507.3 and IRC Section R905.3. The membranes self-adhere to substrates.

1.2.2 Self-adhering Flashing: Evaluation under this criteria is limited to rubber-based or modified asphalt membranes, or either of these materials laminated to a fabric or plastic film, used as flashing for wall penetrations under IBC Section 1405.4 and IRC Section R703.8.

1.2.3 Mechanically Attached Flashing: Evaluation under this criteria is limited to kraft-paper- or polymeric-based membranes used as flashing for wall penetrations under IBC Section 1405.4 and IRC Section R703.8.

1.3 Definitions:

1.3.1 Flashing: Sheet material, integrated with the water-resistive barrier, that bridges and protects the joint (gap) between the window or door frame members and the adjacent construction for the purpose of preventing water penetration by draining water away from the window or door.

1.3.2 Self-adhering Flashing: Flashing consisting of flexible facing materials coated completely or partially on at least one side with an adhesive material and which do not depend on mechanical fasteners for permanent attachment.

1.3.3 Mechanically Fastened Flashings: Flexible facing materials which depend upon mechanical fasteners for permanent attachment.

1.3.4 Pan Flashing: A type of flashing used at the base of a rough opening to divert incidental water to the exterior, or to the exterior surface of a concealed water-resistive barrier. Pan flashings have upturned legs at the interior edge and ends of the rough opening to form a three-sided pan. They are intended to collect and drain water toward the exterior, including water that may enter through a window unit (for example, between the jambs and sill).

1.4 Referenced Documents:

1.4.1 2009 *International Building Code*[®] (IBC), International Code Council.

1.4.2 2009 *International Residential Code*[®] (IRC), International Code Council.

1.4.3 AAMA 711-07, Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products, American Architectural Manufacturers Association.

1.4.4 ASTM C 794-80, Test Method for Adhesion-in-peel of Elastomeric Joint Sealants, ASTM International.

1.4.5 ASTM D 412-98a(2002)e1, Test Method for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension, ASTM International.

1.4.6 ASTM D 779-94 (reapproved 1998), Standard Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry Indicator Method, ASTM International.

1.4.7 ASTM D 828-97, Standard Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus, ASTM International.

1.4.8 ASTM D 882-00, Standard Test Method for Tensile Properties of Thin Plastic Sheeting, ASTM International.

1.4.9 ASTM D 1970-01, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials used as Steep Roofing Underlayment for Ice Dam Protection, ASTM International.

1.4.10 ASTM D 5034-95, Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test), ASTM International.

1.4.11 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.

1.4.12 ASTM F 1306-90 (reapproved 1998), Standard Test Method for Slow Rate Penetration Resistance of Flexible Barrier Films, ASTM International.

1.4.13 AATCC Method 127, Water Resistance: Hydrostatic Pressure Test.

2.0 BASIC INFORMATION

2.1 Product Description: Description of the membrane and the manufacturing process shall be submitted.

2.2 Installation Instructions: Installation instructions shall be submitted. Installation instructions for self-adhering flashing shall demonstrate compliance with Section 6.0 of AAMA 711.

2.3 Packaging and Identification: Description of the method of packaging and field identification of the membrane shall be submitted. The packaging shall include the manufacturer's name and address, the product name and the evaluation report number. Where applicable, labeling on hip and ridge tapes shall include a statement that the product is intended for concealed areas of the roof.

2.4 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria

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for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedure for Evaluation Reports.

2.5 Test Reports: Test reports shall comply with AC85.

2.6 Product Sampling: Sampling of the flashing material for tests under this criteria shall comply with Section 3.2 of AC85.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Hip and Ridge Tape:

3.1.1 Tensile Strength: See Section 4.1.1. When recognition in the evaluation report is sought for installations where the membrane will not be covered within 72 hours of installation, reports of tensile strength tests after ultraviolet-light exposure in compliance with Section 4.4.1 of this acceptance criteria shall be submitted.

3.1.2 Nail Sealability: See Section 4.2.1.

3.1.3 Peel Adhesion: See Section 4.3.1.

3.2 Self-adhering Flashing: Self-adhering flashing shall comply with AAMA 711.

3.3 Mechanically Fastened Flashing:

3.3.1 Tensile Strength: See Section 4.1.3. When recognition in the evaluation report is sought for installations where the membrane will not be covered within 72 hours of installation, reports of tensile strength tests after ultraviolet-light exposure in compliance with Section 4.4.3 of this acceptance criteria shall be submitted.

3.3.2 Nail Sealability: See Section 4.2.2.

3.3.3 Water-resistance: See Section 4.5.2.

3.3.4 Pliability: See Section 4.6.2.

3.3.5 Penetration Resistance: See Section 4.7.

4.0 TEST METHODS

4.1 Tensile Strength:

4.1.1 Hip and Ridge Tapes:

4.1.1.1 Procedure:

4.1.1.1.1 Self-adhering Non-laminated Rubber-based Membranes: Testing shall be conducted on a minimum of five machine-direction and five cross-machine-direction specimens in accordance with ASTM D 412, Method A, Die C.

4.1.1.2 Self-adhering Laminated Membranes (Rubber-based or Modified Asphalt): Section 7.3 of ASTM D 1970. Specimen size shall comply with Section 7.3.1 of ASTM D 1970.

4.1.1.3 Conditions of Acceptance: The average tensile strength shall be a minimum of 2.6 pounds per inch (0.455 N/mm) of width. For laminated membranes, failure is defined as the maximum load occurring upon or prior to the first occurrence of delamination of the composite membrane, or tearing or ultimate failure of any individual component of the laminate.

4.1.2 Mechanically Fastened Flashing: Tensile strength testing shall be conducted in accordance with

Sections 4.1.2.1 and 4.1.2.2, with conditions of acceptance in accordance with Section 4.1.2.3.

4.1.2.1 Procedure: Testing shall be conducted on a minimum of five machine-direction and five cross-machine-direction specimens in accordance with ASTM D 828 or ASTM D 882.

Optionally, mechanically attached polymeric membranes may be tested for dry breaking force in accordance with ASTM D 5034, using the Grab Method set forth in Section 4.2.1.1 of ASTM D 5034. Test specimens shall be tested in both warp (machine) and filling (cross) direction as forth in Section 7.3 of ASTM D 5034. The number of test specimens shall be as required in Section 7.3 of ASTM D 5034.

4.1.2.2 Procedure: Tensile strength testing shall be conducted in accordance with Section 4.1.2.1 on specimens that have been conditioned in accordance with Sections 5.4, 5.5, 5.6 and 5.8 of AAMA 711.

4.1.2.3 Conditions of Acceptance: The average tensile strength shall be a minimum of 20 pounds per inch (0.175 N/mm).

When polymeric membranes are tested for dry breaking force in accordance with ASTM D 5034, the average dry breaking force shall be a minimum of 40 lbf (18.2 kg-force) in the wrap direction (machine) and 35 lbf (15.9 kg-force) in the filling (cross) direction.

4.2 Nail Sealability:

4.2.1 Hip and Ridge Tapes:

4.2.1.1 Procedure: Nail sealability tests shall be conducted in accordance with Section 7.9 of ASTM D 1970.

4.2.1.2 Condition of Acceptance: Test specimens shall comply with Section 7.9.4 of ASTM D 1970.

4.2.2 Mechanically Fastened Flashing: Testing for nail sealability shall be conducted in accordance with either Section 4.2.2.1 or Section 4.2.2.3.

4.2.2.1 Procedure: Testing shall be conducted in accordance with Section 5.2 of AAMA 711 in the vertical application.

4.2.2.2 Conditions of Acceptance: The specimens shall meet the minimum requirements set forth in Section 7.0 of AAMA 711.

4.2.2.3 Procedure: Testing in accordance with ASTM E 331 as set forth in IBC Section 1403.2, Exception 2.

4.2.2.4 Conditions of Acceptance: There shall be no water penetration on the back side of the test specimen.

4.3 Peel Adhesion:

4.3.1 Hip and Ridge Tapes:

4.3.1.1 Procedure: Five control and five aged test specimens shall be prepared and tested in accordance with ASTM C 794 for each substrate for which recognition is sought. Control specimens shall be conditioned at 73°F ± 4°F (22.8°C ± 2.2°C) and 50 ± 5 percent relative humidity for a minimum of 40 hours. Aged specimens shall be exposed to 25 conditioning cycles following either

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Method A or Method B as described in Section 4.3.1.1.1 or 4.3.1.1.2, respectively.

4.3.1.1.1 Method A:

1. Oven drying at 120°F (48.9°C) for three hours, with all surfaces exposed.
2. Horizontal immersion in water maintained at 75°F ± 5°F (24.2°C ± 2.8°C) for three hours, with all surfaces exposed.
3. Removal from water and blotting dry before 18 hours at -40°F (-40°C).

4.3.1.1.2 Method B:

1. Oven drying at 120°F (48.9°C) for eight hours, with all surfaces exposed.
2. Horizontal immersion in water maintained at 75°F ± 5°F (24.2°C ± 2.8°C) for three hours, with all surfaces exposed.
3. Removal from water and blotting dry before 13 hours at -40°F (-40°C).

4.3.1.2 Conditions of Acceptance: No visible damage, such as cracking or chipping, to the specimens. Peel strength of aged specimens shall exceed 75 percent that of the control specimens.

4.4 Ultraviolet-light Exposure:

4.4.1 Hip and Ridge Tapes:

4.4.1.1 Procedure: Exposure to ultraviolet light from sunlamps for 210 hours (10 hours per day for 21 days) in an enclosure in accordance with Figure 1. Two 18-inch-by-48-inch (457 mm by 1219 mm) samples are required for this. Ultraviolet light shall be directed on the specimen surface that will be exposed to sunlight in normal application. Lamps and enclosure are to be adjusted so that the temperature on the sample is between 135°F and 140°F (57.2°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 one meter.

4.4.1.2 Conditions of Acceptance: No visible surface or structural changes such as peeling, chipping, cracking, flaking or pitting when observed under minimum five-power magnification. Additionally, specimens that have been exposed to ultraviolet light shall be subjected to tensile-strength tests, with conditions of acceptance as noted in Section 4.1.1 of this acceptance criteria.

4.4.2 Mechanically Fastened Flashing:

4.4.2.1 Procedure: Exposure to ultraviolet light from sunlamps for 210 hours (10 hours per day for 21 days) in an enclosure in accordance with Figure 1. Two 18-inch-by-48-inch (457 mm by 1219 mm) samples are required for this. Ultraviolet light shall be directed on the specimen surface that will be exposed to sunlight in normal application. Lamps and enclosure are to be adjusted so that the temperature on the sample is between 135°F and 140°F (57.2°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 one meter.

4.4.2.2 Conditions of Acceptance: No visible surface or structural changes such as peeling, chipping, cracking, flaking or pitting when observed under minimum five-power magnification. Additionally, specimens that have been exposed to ultraviolet light shall be subjected to tensile-strength testing, with conditions of acceptance as noted in Section 4.1.2 of this acceptance criteria.

4.5 Water-resistance:

4.5.1 Hip and Ridge Tapes:

4.5.1.1 Procedure: Water resistance testing shall be conducted in accordance with AATCC Test Method 127, or Section 4.5.3 of this criteria, except that the specimens shall be held at a minimum hydrostatic head of 1.2 inches (30.5 mm) for a period of two hours minimum duration. Tests shall be conducted on control specimens and on specimens taken from material sequentially subjected to the ultraviolet exposure in Section 4.4.1 of this acceptance criteria, and the accelerated aging exposure in Section 4.5.1.2 of this acceptance criteria. Control and exposed specimens shall be conditioned at 73°F ± 4°F (22.8°C ± 2.2°C) and 50 ± 5 percent relative humidity for a minimum of 40 hours prior to testing.

4.5.1.2 Accelerated Aging: Three 10-inch-square (254-mm-square) specimens shall be cut from the ultraviolet-light-exposed samples. The three 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. Immersion in room-temperature water for three hours, with all surfaces exposed.
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.

4.5.1.3 Conditions of Acceptance: For control and exposed specimens, no leakage is permitted on the underside of any specimen.

4.5.2 Mechanically Fastened Flashing:

4.5.2.1 Procedure: Water-resistance testing shall be conducted in accordance with ASTM D 779.

4.5.2.2 Conditions of Acceptance: There shall be no water transmission through the membrane for a minimum of 24 hours.

4.5.3 Water Ponding 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 by about 250 mm above a sheet of plain kraft 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 be inspected at frequent intervals over a period of two hours. Ten test specimens shall be chosen at random from the membrane supplied.

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No water seepage shall be observed through the membrane during the water ponding test.* (*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 Center.)

4.6 Pliability:

4.6.1 Hip and Ridge Tapes:

4.6.1.1 Procedure: A $\frac{1}{8}$ -inch-diameter (3.2 mm) mandrel and ten specimens measuring 1 inch by 6 inches (25.4 mm by 152 mm) long, shall be placed in a refrigeration chamber and maintained at 32°F (0°C). The mandrel, test specimens, and chamber shall be allowed to equilibrate to 32°F (0°C), and shall be maintained at this temperature throughout the duration of the test. While inside the chamber, five specimens shall be individually bent 180 degrees around the mandrel with the exterior surface in tension, and five specimens shall be individually bent 180 degrees around the mandrel with the interior surface in tension. Each bend shall be completed in 2 ± 1 seconds.

Note: For materials having directionality, a second set of ten specimens shall be tested so that both machine and cross-machine directions are evaluated.

4.6.1.2 Conditions of Acceptance: The flashing material shall not crack when bent over a $\frac{1}{8}$ -inch diameter (3.2 mm) mandrel, at a temperature of 32°F (0°C).

4.6.2 Mechanically Fastened Flashing:

4.6.2.1 Procedure: A $\frac{1}{8}$ -inch-diameter (3.2 mm) mandrel and ten specimens measuring 1 inch by 6 inches (25.4 mm by 152 mm) long, shall be placed in a refrigeration chamber and maintained at 32°F (0°C). The mandrel, test specimens, and chamber shall be allowed to equilibrate to 32°F (0°C), and shall be maintained at this temperature throughout the duration of the test. While inside the chamber, five specimens shall be individually bent 180 degrees around the mandrel with the exterior surface in tension, and five specimens shall be individually bent 180 degrees around the mandrel with the interior surface in tension. Each bend shall be completed in 2 ± 1 seconds.

Note: For materials having directionality, a second set of ten specimens shall be tested so that both machine and cross-machine directions are evaluated.

4.6.2.2 Conditions of Acceptance: The flashing material shall not crack when bent over a $\frac{1}{8}$ -inch-diameter (3.2 mm) mandrel, at a temperature of 32°F (0°C).

4.7 Penetration Resistance (Mechanically Fastened Flashing):

4.7.1 Procedure: Testing shall be conducted in accordance with ASTM F 1306.

4.7.2 Conditions of Acceptance: The mean penetration resistance shall be a minimum of 4 lbf (17.8 N).

5.0 QUALITY CONTROL

5.1 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

5.2 Third-party follow-up inspections are not required under this acceptance criteria.

6.0 EVALUATION REPORT RECOGNITION

6.1 Hip and Ridge Tape: The evaluation report shall state that use of the tape shall be recognized in a specific evaluation report on concrete or clay roofing tiles.

6.2 Self-adhering Flashing: The evaluation report shall include the following conditions of use:

6.2.1 The flashing shall be limited to installation on the substrates qualified through testing to Section 3.2 of this criteria.

6.2.2 These products are limited to use in Type V (IBC) construction and in structures constructed in accordance with the IRC.

6.3 Mechanically Fastened Flashing: The evaluation report shall include the following conditions of use:

6.3.1 The wall flashing shall be limited to application on vertical walls.

6.3.2 The flashing is not recognized for use as pan flashing or through-wall flashing.

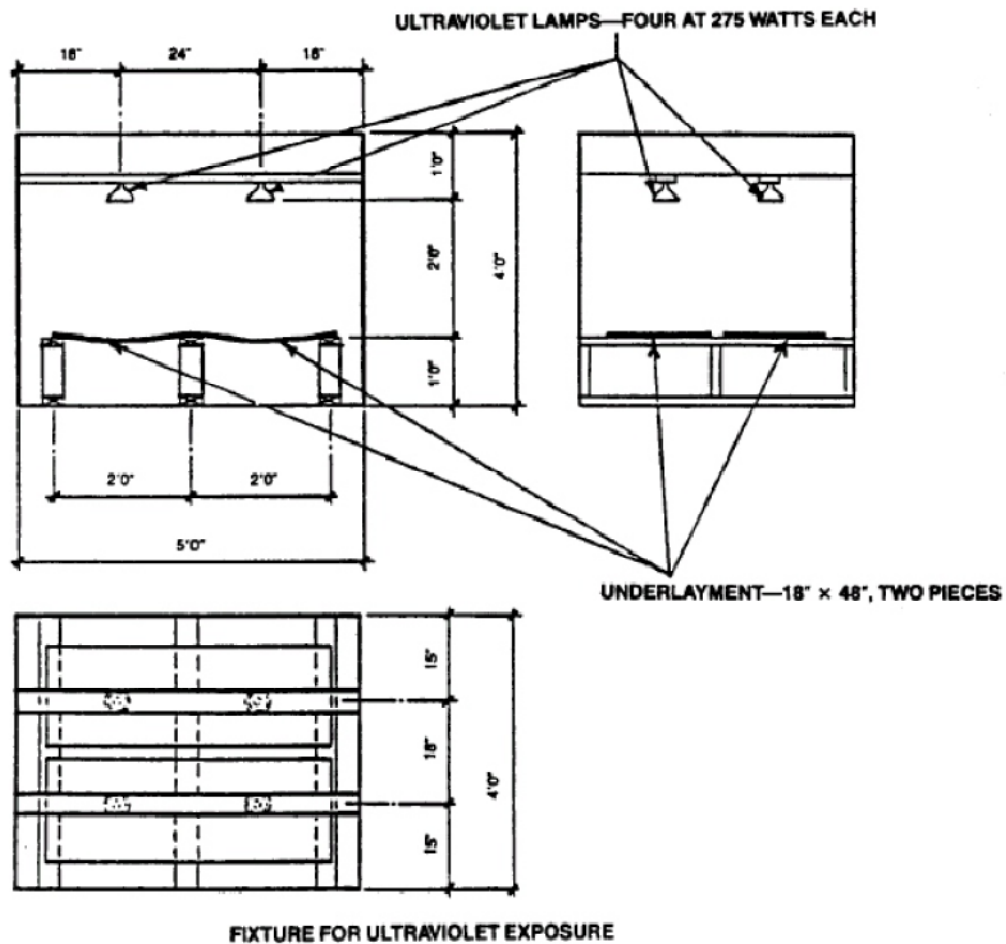
6.3.3 The flashing shall be limited to use in Type V (IBC) construction and in structures constructed in accordance with the IRC. ■

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TABLE 1 – TEST REQUIREMENTS

HIP AND RIDGE TAPE		SELF-ADHERING FLASHING		MECHANICALLY ATTACHED FLASHING	
Test Requirement	AC148 Section	Test Requirement	AC148 Section	Test Requirement	AC148 Section
Tensile Strength - Ultraviolet exposure ¹	3.1.1 4.4.1	AAMA 711	3.2	Tensile Strength - Ultraviolet exposure ¹	3.3.1, 4.1.2 + 4.4.2
Nail Sealability	3.1.2 + 4.2.1			Nail Sealability	3.3.2 + 4.2.2
Peel Adhesion	3.1.3 + 4.3.1			Pliability	3.3.4 + 4.6.2
				Penetration resistance	3.3.5 + 4.7
				Water resistance	3.3.3 + 4.5.2

¹Required for tensile strength testing where the materials will not be covered within 72 hours after installation.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 1