

# ACCEPTANCE CRITERIA FOR POLYMER-BASED AND POLYMER-MODIFIED EXTERIOR AND INTERIOR WALL CLADDING

**AC92**

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**(Corrected December 2010)**

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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 the basis of recognition of polymer-based and polymer-modified panels and siding, used as exterior and interior wall cladding, in ICC Evaluation Service, LLC. (ICC-ES), evaluation reports, under the 2009 and 2006 *International Building Code*<sup>®</sup> (IBC), the 2009 and 2006 *International Residential Code*<sup>®</sup> (IRC) and the 1997 *Uniform Building Code*<sup>™</sup> (UBC). Bases of recognition are IBC Section 104.11, IRC Section R104.11 and UBC Section 104.2.8.

**1.2 Scope:** Recognition of the end use of the polymer-based and polymer-modified panels and siding in an ICC-ES evaluation report shall be limited to exterior or interior applications in nonfire-resistive buildings classified as combustible or noncombustible construction. A weather-resistive barrier or water-resistive barrier complying with the applicable code shall be installed behind the polymer-based or polymer-modified panels and siding. All fasteners used to support the panels shall be corrosion resistant.

**1.3 Reference Documents:** Refer to Table 1 for year of publication of ASTM Standards that are to be used under the 2009 and 2006 IBC, IRC and 1997 UBC.

**1.3.1** 2009 *International Building Code*<sup>®</sup>, International Code Council.

**1.3.2** 2009 *International Residential Code*<sup>®</sup>, International Code Council.

**1.3.3** 2006 *International Building Code*<sup>®</sup>, International Code Council.

**1.3.4** 2006 *International Residential Code*<sup>®</sup>, International Code Council.

**1.3.5** 1997 *Uniform Building Code*<sup>™</sup>.

**1.3.6** ASTM B 117, Practice for Operating Salt Spray (Fog) Apparatus, ASTM International.

**1.3.7** ASTM C 297, Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions, ASTM International.

**1.3.8** ASTM D 1037, Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials, ASTM International.

**1.3.9** ASTM D 1929, Test Method for Ignition Properties of Plastics, ASTM International.

**1.3.10** ASTM D 2247, Practice for Testing Water Resistance of Coatings in 100 Percent Relative Humidity, ASTM International.

**1.3.11** ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials, ASTM International.

**1.3.12** ASTM E 330, Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference, ASTM International.

**1.3.13** ASTM G 23, Test Method for Operating Light and Water Exposure Apparatus (carbon-arc type) for Exposure of Nonmetallic Materials, ASTM International.

**1.3.14** ASTM G 26, Practice for Operating Light-Exposure Apparatus (Xenon Arc-Type) With and Without

Water for Exposure of Nonmetallic Materials, ASTM International.

**1.3.15** ASTM G 152, Practice for Operating Open-Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials, ASTM International.

**1.3.16** ASTM G 155, Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials, ASTM International.

**1.3.17** NFPA 259, Test Method for Potential Heat of Building Materials, National Fire Protection Association.

**1.3.18** NFPA 268, Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source, National Fire Protection Association.

**1.3.19** NFPA 285, Standard Method of Tests for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components Using the Intermediate Scale, Multistory Test Apparatus, National Fire Protection Association.

## 1.4 Definitions:

**1.4.1 Acrylic:** Cast acrylic.

**1.4.2 Aggregate:** Natural stone aggregates embedded in the exterior FRP skin prior to panel curing.

**1.4.3 Fastening System:** The method used to mechanically attach panels with aggregate to framing includes corrosion-resistant nails or screws. Panels without aggregate are glazed in moldings that are mechanically attached to the building structure.

**1.4.4 FRP:** Fiberglass reinforced plastic.

**1.4.5 Mineral-filled Acrylic Panels:** Panels produced in a proprietary continuous-cast process. The panels consist of an acrylic-based polymer, mineral fillers and a colorant system.

**1.4.6 Polymer-modified FRP Panels:** Panels consisting of a proprietary core material with integral fiberglass and polyester resin on both faces. The exterior finish is either an exposed aggregate finish or a smooth, pigmented, polyester, gel-coat surface.

**1.4.7 Thermoplastic Wood Composite Lap Siding:** Thermoplastic wood composite lap siding consists of at least 50 percent thermoplastic polymer by weight, with the remainder being wood substance.

**1.4.8 Thermosetting Resin:** A solid organic, of high molecular weight that while curing with heat form an irreversible solid product. It usually fractures conchoidally.

**1.4.9 Thermosetting Wood Composite Panels:** Panels consisting of proprietary thermosetting resins homogeneously reinforced with wood-based fibers, manufactured under high pressure and temperature.

**1.4.10 Wall Cladding:** Panels or siding used as combination wall sheathing and finishing materials that resist transverse wind loads. The panel can be applied to the exterior or interior face of either bearing or nonbearing, wood or steel wall framing.

**1.4.11 Weather Barrier:** A material, complying with IBC Section 1404.2, IRC Section R703.2, UBC Section 1402.1

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or the ICC-ES Acceptance Criteria for Water-resistive Barriers (AC38), used for the construction of exterior walls.

### 2.0 BASIC INFORMATION

**2.1** The following information must be submitted:

**2.1.1 Product Description:** Complete information concerning material specifications, thickness, size, and the manufacturing process.

**2.1.2 Installation Instructions:** Installation details and limitations, fastening methods, joint treatments, face treatments, and any special precautions required for installation.

**2.1.3 Packaging and Identification:** A description of the method of packaging and field identification of the panel. Identification provisions must include the ICC-ES evaluation report number and the name or logo of the inspection agency.

**2.1.4 Field Preparation:** A description of the methods of field-cutting, application and finishing.

**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:** Products for testing shall be sampled in accordance with Section 3.1 of AC85. Products shall be sampled at the manufacturing site by an accredited inspection agency or testing laboratory. Exceptions to sampling at the manufacturing site, such as at a warehouse or distribution center, require written consent by ICC-ES. The sampled product must be truly representative of the standard manufactured product for which recognition is sought.

### 3.0 TEST PERFORMANCE AND REQUIREMENTS

**3.1 General:** Tests in this section shall be conducted on each panel type. Recognition will be limited to sizes and material used in tests. Variations in the following items cannot be considered, unless additional justification is furnished:

**3.1.1** Pigmentation of panels without aggregate. The additional justification, if submitted, shall address the potential adverse effects of pigmentation on the results of the accelerated-weathering tests as to conditions of acceptance in Sections 4.1.2 and 4.3.2.

**3.1.2** Type and size of natural stone aggregate on panels with aggregate.

**3.1.3** Mineral filler content of mineral-filled acrylic panels.

**3.1.4** Panel thickness.

#### 3.2 Durability:

**3.2.1 Accelerated Weathering:** Accelerated-weathering tests are as set forth in Section 4.1.

**3.2.2 Freeze Thaw:** Freeze-thaw tests are as set forth in Section 4.2.

**3.2.3 Bond Strength:** Bond-strength tests after weatherometer and freeze-thaw tests are as set forth in Section 4.3.

**3.2.4 Flexural Strength:** Flexural-strength tests are as set forth in Section 4.2.

**3.2.5 Salt Spray Resistance:** Salt spray resistance tests are as set forth in Section 4.5.

**3.2.6 Water Resistance:** Water resistance tests are as set forth in Section 4.6.

**3.3 Structural Performance Tests:** Structural performance tests are as set forth in Section 4.7.

**3.4 Interior Finish:** Panels used as an interior finish shall have flame-spread and smoke-density ratings as specified in IBC Section 803, 2009 IRC Section R302.9, 2006 IRC Section R315 or UBC Section 802), with tests conducted in accordance with UBC Standard 8-1 or (ASTM E 84).

**3.5 Self-ignition Temperature:** Self-ignition temperature of the panels shall be 650°F (343°) or greater when tested in accordance with UBC Standard 26-6 or (ASTM D 1929).

**EXCEPTION:** Thermoplastic wood composite lap siding shall be tested in accordance with UBC Standard 8-1 (ASTM E 84) and shall have a flame-spread no greater than 200.

**3.6 Noncombustible Construction (Optional):** Panels shall comply with the following if they are to be installed on the exterior face of exterior walls of buildings where the exterior walls are required to be of noncombustible construction:

1. For panels recognized for compliance with the UBC and IBC, the potential heat of the panels shall not exceed the potential heat expressed in Btu per square feet ( $\text{MJ}/\text{m}^2$ ) of the panels used in the wall assembly tested in accordance with paragraph 3 of this section (3.6). The potential heat of the panels shall be determined in accordance with NFPA 259 and the results shall be expressed in Btu per square feet ( $\text{MJ}/\text{m}^2$ ). For panels recognized for compliance with the UBC only, testing in accordance with NFPA 259 is not required, provided the combustible content of the panels does not exceed 6,000 Btu per square foot ( $68.2 \text{ MJ}/\text{m}^2$ ) of wall area as determined by tests in accordance with UBC Standard 26-1.

2. The panel and weather barrier, tested separately, shall each have a flame-spread rating of 25 or less and a smoke-developed rating of 450 or less as determined by tests in accordance with UBC Standard 8-1 (ASTM E 84). The panel shall be tested in the thickness intended for use.

3. The wall assembly shall be tested in accordance with and comply with the conditions of acceptance of UBC Standard 26-4 or NFPA 285. For panels recognized for compliance with the UBC only, the wall assembly shall be tested in accordance and comply with the conditions of acceptance of UBC Standard 26-4 or 26-9.

4. Under the IBC only, panels used on exterior walls shall not exhibit sustained flaming when tested in accordance with NFPA 268. Where panels are intended to be installed in more than one thickness, tests of the minimum and maximum thickness intended for use shall be performed.

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### 4.0 TEST PROCEDURES

#### 4.1 Accelerated-weathering Test (Weatherometer):

**4.1.1 General:** Five 3-inch-by-9-inch (76 mm by 229 mm) specimens are prepared and procedures outlined in either Section 4.1.2 or 4.1.3 are used.

**4.1.2** ASTM G 23 using Model D or DH, Method 1, Section 5, or ASTM G 152, Cycle 1 shall be used. The test shall be for 2,000 hours with cycles of 102 minutes of light followed by 18 minutes of light and water spray. Black panel temperature shall be 145°F ± 5°F (62.7°C ± 3°C).

**4.1.3** ASTM G 26, Test Method A, Type B or BH, with a 6,000- or 6,500-watt xenon burner tube or ASTM G 155, Cycle 1 shall be used. Exposure must be for 2,000 hours, with each cycle consisting of 102 minutes of light-only exposure and 18 minutes of water-spray and light exposure. The water spray must be deionized water. The spray nozzle must be Type F-80. The apparatus must be operated with a light exposure of 0.35 W/m<sup>2</sup> at 340 nm. The relative humidity for the Type BH exposure apparatus must be 30 ± 5 percent. Black panel temperature must be 145°F ± 5°F (62.7°C ± 2.3°C) during the light-only portion of the cycle.

**4.1.4 Condition of Acceptance:** After exposure, there shall be no cracking, checking, crazing, erosion or other characteristics that might affect performance as an exterior wall covering of any specimen when viewed under minimum 5× magnification.

**4.1.5** After visual inspection, the specimens are retained to be used in bond-strength tests as specified in Section 4.3.

#### 4.2 Freeze-thaw Test:

**4.2.1 General:** Five 6-inch-square (152 mm) specimens and twenty 6-inch-by-12-inch (152 mm by 305 mm) specimens are prepared and subjected to 10 freeze-thaw cycles. Ten of the twenty 6-inch-by-12-inch (152 mm by 305 mm) specimens shall have the machine direction parallel to the 12-inch (305 mm) dimension and the remainder shall have the cross direction parallel to the 12-inch (305 mm) dimension. Specimens are coated on the back and sides with a nonpermeable material and the exterior face is to remain uncoated. Each cycle consists of air drying in 120°F ± 5°F (49°C ± 3°C) temperature 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 minimum eight hours and then exposure to -20°F (-29°C) for minimum 16 hours.

**4.2.2 Condition of Acceptance:** After exposure, there shall be no cracking, checking, crazing, erosion, or other characteristics that might affect performance as an exterior wall covering of any specimen when viewed under minimum 5× magnification. Delamination or indications of same between component materials or layers are also defined as failure.

**4.2.3** The 6-inch-square (152 mm) specimens shall be subjected to bond-strength tests according to procedures described in Section 4.3.

**4.2.4** The 6-inch-by-12-inch (152 mm by 305 mm) specimens shall be subjected to the flexural-strength tests described in Section 4.4.

#### 4.3 Bond-strength Tests After Weatherometer and Freeze-thaw Tests:

**4.3.1 General:** Bond-strength tests are conducted in accordance with ASTM C 297. Five control specimens, 6-inch-square (152 mm) specimens which were subjected to freeze-thaw and specimens subjected to weatherometer tests, are prepared for the flatwise tension test by cutting specimens to 3-inch (76 mm) square by sawing off all four edges. Specimens are maintained at 45 to 55 percent relative humidity and 70°F to 80°F (21.1°C to 26.7°C) until weight equilibrium has been attained. A 3-inch-square (76 mm) steel plate is adhered with epoxy to faces of each specimen. The plate should have a clevis or other means of installation in a tensile-strength machine. After epoxy has cured, each specimen is tested in tension perpendicular to surface in a displacement controlled test machine. Displacement rate should not exceed 0.05 inch (1.27 mm) per minute. As an alternative, the procedures of ASTM D 1037 are permitted to be used, in which case the specimens are trimmed to 2 inches (51 mm) square.

**4.3.2 Condition of Acceptance:** The average ultimate flatwise tensile stress for all specimens shall be at least 10 psi (68.9 kPa). If failure occurs between the steel plates and specimens below 10 psi (68.9 kPa), results shall be disregarded and specimens retested.

#### 4.4 Flexural-strength Tests:

**4.4.1 General:** Flexural-strength tests are conducted in accordance with ASTM D 1037. Twenty dry and 20 wet specimens, composed of 10 specimens in the machine direction and 10 specimens in the cross-machine direction for both dry and wet conditions, shall be prepared. The specimen size is 6 inches by 12 inches (152 mm by 305 mm). Prior to testing, specimens are conditioned at 75°F ± 5°F (23.8°C ± 3°C) and 50 ± 10 percent relative humidity (RH) for seven days. In addition, wet specimens are conditioned in water, maintained at 75°F ± 5°F (23.8°C ± 3°C), for 48 hours before testing. The test span is 10 inches (254 mm). Specimens are placed on roller-type supports with a length equal to the specimen width and having a 1/8-inch (3.2 mm) minimum to 1/2-inch (12.7 mm) maximum radius. Load is applied at midspan through a similar roller. One-half of the wet and dry machine direction specimens and one half of the wet and dry cross-machine direction specimens (five specimens each set, 20 specimens total) shall be subjected to flexural tension on the exterior panel face. The remainder of the specimens shall have their interior face in flexural tension. The loads are applied at a rate such that failure of each specimen occurs in approximately one minute. Results are reported as loads at which each specimen breaks.

The flexural-strength tests are also conducted on the twenty 6-inch-by-12-inch (152 mm by 305 mm) specimens subjected to freeze-thaw test as noted in Section 4.2. One-half of the machine and cross-machine direction specimens (five specimens each set, 10 specimens total) shall be subjected to flexural tension on the exterior panel face. The remainder of the specimens shall have their interior face in flexural tension.

**4.4.2 Conditions of Acceptance:** Average flexural strengths of freeze-thaw and wet specimens shall be at least 60 percent of average strength of dry-control specimens. If values obtained for wet and/or freeze-thaw specimens are less than 90 percent of control-dry

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specimens, allowable positive and negative load capacity from Section 4.7 of the criteria will be reduced proportionately.

**4.5 Salt Spray Resistance:** Testing shall be according to ASTM B 117. Three 4-inch-by-5-inch (102 mm by 127 mm) specimens are prepared in accordance with Section 4.2.1. Specimens shall be periodically inspected and results reported. The testing period is 300 hours. Condition of Acceptance is that at the end of the test there are no deleterious effects from salt spray such as any cracking, checking, crazing, erosion, delamination or other distress that might affect performance as an exterior wall covering.

**4.6 Water Resistance:** Testing shall be according to ASTM D 2247. Three 4-inch-by-6-inch (102 mm by 152 mm) samples are prepared in accordance with Section 4.2.1. Specimens shall be periodically inspected and results reported. The testing period is 14 days. Condition of acceptance is that at the end of the test there are no deleterious effects such as any cracking, checking, crazing, erosion, delamination or other distress that might affect performance as an exterior wall covering.

### 4.7 Structural-performance Tests:

**4.7.1 General:** Structural tests are required to determine allowable positive and negative pressures that may be imposed on the panels and their fastening system. The test specimens shall represent the critical conditions of installation. This includes maximum support spacing and minimum panel thickness, support material thickness, density, connections, and any other conditions that affect the structural performance of the panels.

**4.7.1.1** For panel products, testing shall be done according to ASTM E 330, Procedure B. At least three positive and three negative load tests shall be conducted with panels fastened to the framing system in accordance with the published installation instructions. Tests shall be conducted on systems assembled without the use of adhesives.

Test assemblies shall be minimum 4 feet by 8 feet (1219 mm by 2438 mm) [4-foot by 4-foot (1219 mm by 1219 mm) specimens can be used if the panel spans between framing members without bearing on the top and bottom headers]. Application of loads to failure shall be in at least six increments with a 10-second load duration for each increment. Test assemblies shall be mounted according to ASTM E 330. Load deflection readings at the midpoint of panel spans shall be reported.

**4.7.1.2** For lap siding products, flexural testing shall be conducted in accordance with ASTM D 1037. Thirty specimens shall be tested to failure. The test specimen cross section shall be representative of the size of lap siding products to be recognized.

Fastener pull-through testing shall be conducted in accordance with ASTM D 1037 for each type of fastener, such as nails, screws, and staples, used to attach lap siding to structural framing. Ten specimens of each fastener shall be tested to determine pull-through strength, minimum spacing, and minimum edge and end distances.

**4.7.2 Conditions of Acceptance:** Allowable loading shall be based on a factor of safety of 3 applied to the ultimate load, if all of the following are satisfied:

**4.7.2.1** No single test result varies by more than 15 percent from the average of three tests. Variations exceeding this limit will result in larger safety factors.

**4.7.2.2** Allowable load does not exceed established values for mechanical connectors such as nails and screws.

## 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, Inc., or otherwise acceptable to ICC-ES.

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

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**TABLE 1—PUBLICATION DATES OF ASTM STANDARDS REFERENCED IN THIS ACCEPTANCE CRITERIA**

<b>STANDARD</b>	<b>1997 UBC</b>	<b>2006 IBC, IRC</b>	<b>2009 IBC, IRC</b>
ASTM B 117	90	97	—
ASTM C 297	61(1998)	94	—
ASTM D 1037	91	99	—
ASTM D 1929	68(1975)	96(2001) <sup>e01</sup>	96(2001) <sup>e01</sup>
ASTM D 2247	87	97	—
ASTM E 84	UBC Standard 8-1	04	07
ASTM E 330	84	02	02
ASTM G 23	96	—	—
ASTM G 26	96	—	—
ASTM G 152	—	04	06
ASTM G 155	—	04	05a
NFPA 259	98	04	03
NFPA 268	96	01 (IBC only)	07 (IBC only)
NFPA 285	98	98 (IBC only)	06 (IBC only)