



ACCEPTANCE CRITERIA FOR RIGID CELLULAR POLYURETHANE PANELS USED AS EXTERIOR AND INTERIOR WALL CLADDING

AC181

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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.

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1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for recognition, in ICC-ES evaluation reports, of rigid cellular polyurethane panels used as exterior and interior wall cladding, as alternate materials under Section 104.2.8 of the 1997 *Uniform Building Code*TM, Section 104.11 of the 2000 *International Building Code*[®], and Section R104.11 of the 2000 *International Residential Code*[®].

1.2 Scope: The polyurethane foam panels recognized under this criteria may be used as interior and exterior wall cladding using mechanical or adhesive attachment methods.

1.3 Referenced Documents:

1.3.1 2000 *International Building Code*[®] (IBC), International Code Council.

1.3.2 2000 *International Residential Code*TM (IRC), International Code Council.

1.3.3 1997 *Uniform Building Code*TM (UBC).

1.3.4 UBC Standard 8-1, Test Method for Surface-burning Characteristics of Building Materials.

1.3.5 UBC Standard 26-1, Test Method to Determine Potential Heat of Building Materials.

1.3.6 UBC Standard 26-4, Method of Test for Evaluation of Flammability Characteristics of Exterior, Nonload-bearing Wall Panel Assemblies Using Foam Plastic Insulation.

1.3.7 UBC Standard 26-9, Method of Test for Evaluation of Flammability Characteristics of Exterior, Nonload-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-scale, Multistory Test Apparatus.

1.3.8 UBC Standard 26-3, Room Fire Test Standard for Interior of Foam Plastic Systems.

1.3.9 UBC Standard 7-1, Fire Tests of Building Construction and Materials.

1.3.10 ASTM E 84-98^{e1}, Standard Test Method for Surface Burning Characteristics of Building Materials, ASTM International.

1.3.11 ASTM G 23-96, Standard Practice for Operating Light Exposure Apparatus (Carbon Arc Type) With and Without Water for Exposure of Nonmetallic Materials, ASTM International.

1.3.12 ASTM B 117-90, Test Method of Salt Spray (Fog) Testing, ASTM International.

1.3.13 ASTM D 2247-99, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity, ASTM International.

1.3.14 ASTM E 330-97, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference, ASTM International.

1.3.15 ASTM C 591-94, Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation, ASTM International.

1.3.16 ASTM D 1929-96, Standard Test Method for Ignition Determining Temperature of Plastics, ASTM International.

1.3.17 ASTM C 297-61 (1988), Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane, ASTM International.

1.3.18 ASTM C 203-92, Test Method for Breaking Load and Flexural Properties of Block-type Thermal Insulation, ASTM International.

1.3.19 ASTM E 119-98, Standard Test Methods for Fire Tests of Building Construction and Materials, ASTM International.

1.3.20 ASTM E 331-93, Standard Test Method for Water Penetration of External Walls, Doors by Uniform Static Air Pressure Difference, ASTM International.

1.3.21 NFPA 259-98, Test Method for Potential Heat of Building Materials, National Fire Protection Association.

1.3.22 NFPA 268-96, Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source, National Fire Protection Association.

1.3.23 NFPA 285-98, Standard Method of Test for Evaluation of Flammability Characteristics of Exterior, Nonloadbearing Wall Assemblies Containing Combustible Components Using the Intermediate Scale, Multistory Test Apparatus, National Fire Protection Association.

1.3.24 FM 4880-94, Approval Standard for Class 1 Insulated Wall or Wall and Roof/Ceiling Panels, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems and Interior or Exterior Finish Systems; Factory Mutual Standards Laboratories Department.

1.3.25 UL 1715-97, Fire Test of Interior Finish Material, Underwriters Laboratories.

1.4 Definitions:

1.4.1 Wall Cladding: Panels 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 walls of wood or steel framing.

1.4.2 Fastening System: Means of attaching the cladding panels to the structural framing or structural sheathing with either approved adhesives or mechanical fasteners.

2.0 BASIC INFORMATION

Information on the following must be submitted:

2.1 Product Description: Complete information must be submitted, as applicable, concerning formulation, density, dimensioned scale drawings, protective finish coatings and manufacturing process.

2.2 Installation Instructions: Typical installation details must be submitted, noting limitations and location of fasteners.

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2.3 Packaging and Field Identification: Method must be submitted of packaging and field identification of components. Packaging shall include the ICC-ES evaluation report number, and the name or logo of the inspection agency. Additionally, each panel shall be labeled with the evaluation report number. Installation instructions noting limitations shall also be packaged with the product.

2.4 Field Preparation: Method of field cutting, trimming or forming, and treatment of cut edges and cut ends, must be submitted.

2.5 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.

2.6 Test Reports and Test Specimen Sampling: Test reports shall comply with AC85. Test specimens shall be sampled at the manufacturing site by an accredited inspection agency or testing laboratory. The sampled product must be truly representative of the standard manufactured product for which recognition is being sought. See Section 3.1 of AC85.

2.7 Miscellaneous:

2.7.1 Thermal Barrier Requirement: The polyurethane panels shall be separated from the interior of the building with an approved thermal barrier as set forth in UBC Section 2602, IBC Section 2603, or IRC Section R318, whichever code is applicable.

EXCEPTION: For use without a thermal barrier as required by the codes, the panels must be tested in accordance with UBC Standard 26-3 (UBC, IBC and IRC); FM 4880, UL 1040 or UL 1715 (IBC and IRC), and meet the conditions of acceptance of the referenced applicable standards. Assemblies justified by full-scale corner tests in accordance with FM 4880 or UL 1040 may be located only in areas with a minimum clear ceiling height of 20 feet (6096 mm).

2.7.2 Expansion and Control Joints: The need for expansion and control joint materials must be determined and specified by the architect, designer, builder or manufacturer, in that order. If used, expansion and control joints must be part of the test specimens for durability and structural tests.

2.7.3 Weather-resistive Consideration: For mechanically attached panel cladding, a weather-resistive barrier complying with UBC Sections 1402.1 and 2506.4, IBC Sections 1404.2 and 2510.6, and IRC Section R703.2, whichever code is applicable, is required over the substrate prior to panel attachment. Fasteners must be corrosion-resistant.

See Section 3.7 for weather-resistive consideration for adhered panels.

2.7.4 Joint Sealants: Sealant materials must comply with ASTM C 920, and be compatible with the report applicant's system. An installation card, in the format shown in Figure 1, completed by the sealant installer, must be presented to the building official at the completion of each project. The sealant declaration states that the sealant installation conforms to the system evaluation report and the sealant manufacturer's installation methods and procedures.

3.0 REQUIRED TEST DATA

3.1 Material Specification:

3.1.1 Material Properties: Material properties of the rigid cellular polyurethane must be tested in accordance with ASTM C 591 and must comply with Table 1 of the referenced ASTM standard, based on the polyurethane foam board type. Where the number of test specimens is not specified in the applicable test methods, a minimum of five specimens must be used.

3.1.2 Surface-burning Characteristics: Unless otherwise noted in this criteria, the panels must have a flame-spread rating of 75 or less and a maximum smoke-developed rating of 450 when tested in accordance with UBC Standard 8-1 (UBC) or ASTM E 84 (IBC and IRC) in the maximum thickness intended for use.

3.2 Exterior Application: Reports of the following tests must be submitted for panels used as exterior wall application:

3.2.1 Durability Tests:

3.2.1.1 Accelerated Weathering: Accelerated weathering test is as set forth in Section 4.1.

3.2.1.2 Freeze-thaw: Freeze-thaw test is as set forth in Section 4.2.

3.2.1.3 Salt Spray Resistance: Salt spray resistance test is as set forth in Section 4.3.

3.2.1.4 Water Resistance: Water resistance test is as set forth in Section 4.4.

3.2.2 Noncombustible Construction (Optional): Panels may be recognized for use where exterior walls are required to be of noncombustible construction, provided all of the following conditions are met:

1. The combustible content (potential heat) of the panel does not exceed 6,000 Btu per square foot (68.2 MJ/m²) of wall area as determined by tests in accordance with UBC Standard 26-1 or NFPA 285.

2. The panel, coating and weather-resistive barrier, tested separately, each exhibit a flame-spread rating of 25 or less and a maximum smoke-developed rating of 450 when tested in accordance with UBC Standard 8-1 or ASTM E 84. The panel must be tested in the thickness intended for use.

3. The wall assembly is tested and complies with the conditions of acceptance of UBC Standard 26-4 or 26-9, or NFPA 285.

3.2.3 Fire-resistive Construction (Optional): Panels for use in fire-resistive construction require testing in accordance with UBC Standard 7-1 or ASTM E 119.

3.2.4 Ignition Resistance: For recognition under the *International Building Code*, on other than exterior walls of Type V construction, the panels must be tested in accordance with NFPA 268.

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

3.4 Interior Application: The panels may be used as an interior finish provided both of the following conditions are met:

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1. The thermal-barrier requirements are resolved in accordance with Section 2.7.1 of this criteria.

2. Self-ignition temperature of the panels is 650°F (343°C) or greater when tested in accordance with UBC Standard 26-6 or ASTM D 1929 (IBC and IRC).

3. The materials have a flame spread rating of not more than 75 and a smoke-developed rating of not more than 450 when testing in accordance with Section 3.1.2.

4. For recognition under the UBC, adhered systems must not readily become detached when subjected to room temperatures of 300°F (149°C) for 25 minutes. For recognition under the IBC and IRC, adhered systems must not readily become detached when subjected to room temperatures of 200°F (93°C) for less than 30 minutes.

3.5 Tensile Bond Strength Test: For panels that are adhesively attached to the substrate, tensile bond strength tests as set forth in Section 4.5 are required for each substrate sought for recognition and on specimens exposed to water resistance tests in Section 4.4.

3.6 Flexural Strength Test: Flexural strength test is as set forth in Section 4.6.

3.7 Water Penetration Test: For panels that are adhesively attached to the substrate, water penetration tests as set forth in Section 4.8, are required.

4.0 TEST PROCEDURES

4.1 Accelerated Weathering Test (Weatherometer):

4.1.1 General: Five 3-inch-by-12-inch (76 mm by 305 mm) finish-coated specimens are prepared, and the procedure must be used as outlined in Test Method 1 of ASTM G 23 or Test Method A of ASTM G 26.

4.1.2 Test Method 1 of ASTM G 23: The exposure apparatus must be Type D or DH, with the operating schedule set forth under Method 1, Section 6, of the referenced ASTM procedure.

4.1.3 Test Method A of ASTM G 26: The exposure apparatus must be Type B or BH as specified in ASTM G 26, Method A, with a 6,000- or 6,500-watt xenon burner tube. 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/m² at 340 nm. The test must be performed using a daylight filter system. 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 ± 3°C) during the light-only portion of the cycle.

4.1.4 Test Duration: The test must be for 2,000 hours.

4.1.5 Condition of Acceptance: After exposure, there shall be no cracking, checking, crazing, erosion or other characteristics that might effect performance of the product when viewed under minimum 5x magnification.

After visual inspection, the specimens must be retained for use in flexural strength tests.

4.2 Freeze-thaw Test:

4.2.1 General: Five 4-inch-by-12-inch (102 mm by 305 mm) finish-coated specimens are prepared and subjected to

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

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

After visual inspection, the test specimens must be retained for flexural strength tests.

4.3 Salt Spray Resistance:

4.3.1 General: Five 4-inch-by-12-inch (102 mm by 305 mm) finish-coated specimens must be prepared and tested in accordance with ASTM B 117. The testing period is 300 hours, with periodic inspections of the specimens and visual results reported.

4.3.2 Condition of Acceptance: After exposure, there shall be no deleterious effects such as cracking, checking, crazing, erosion, delamination or other distress that may affect performance as an exterior wall covering.

After visual inspection, the specimens must be used for flexural strength tests.

4.4 Water-resistance Test:

4.4.1 General: Three 4-inch-by-6-inch (102 mm by 152 mm) specimens are prepared and tested in accordance with ASTM D 2247. If adhesively attached panels are to be recognized, three 8-inch-by-8-inch (203 mm by 203 mm) specimens, adhered to a wood-based sheathing substrate shall also be prepared and tested. The testing period is a minimum of 14 days. Specimens must be periodically inspected and visual results reported.

4.4.2 Condition of Acceptance: After conclusion of the test, there shall be no deleterious effects such as cracking, checking, crazing, erosion, delamination or other distress that may affect performance as an exterior wall covering.

After visual inspection, the specimens must be used for tensile bond strength tests.

4.5 Tensile Bond Strength Test (For Adhesively Attached Panels):

4.5.1 General: Tensile bond tests must be conducted in accordance with ASTM C 297. Specimens, 3 inches by 3 inches (76 mm by 76 mm) in size, are bonded to each substrate sought for recognition. Three-inch-by-three-inch (76 mm by 76 mm) specimens shall be cut from the center of the 8-inch-by-8-inch (203 mm by 203 mm) specimens exposed to the water resistance tests. Specimens must be maintained at temperatures ranging from 70°F to 80°F (21.1°C to 26.7°C), at a 45 to 55 percent relative humidity, until weight equilibrium has been attained. A 3-inch-square (76 mm) steel plate is adhered with epoxy to the face of each specimen. The plate must have a clevis or other means of installation in a tensile testing machine. After the epoxy has cured, each specimen is tested in tension perpendicular to surface in a displacement controlled test machine. Displacement rate must not exceed 0.05 inch (1.27 mm) per minute.

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4.5.2 Condition of Acceptance: The average ultimate flatwise tensile strength for all specimens must be at least 10 psi (69 kPa). Samples that fall below 10 psi (69 kPa), due to epoxy used to bond the steel plate to the specimens, must be disregarded and the specimens retested.

Tensile bond strength of samples exposed to the water resistance test in Section 4.4 must be at least 80 percent of the tensile bond strength of control specimens having the same wood-based sheathing substrate.

4.6 Flexural Strength Test:

4.6.1 General: Flexural strength tests must be conducted following the general guidelines of ASTM C 203, Method II, and this section. For anisotropic materials, tests must be conducted in the weaker direction. Twenty specimens must be prepared for testing in both dry and wet conditions. The specimen size is 3 inches by 12 inches (72 mm by 305 mm). Ten specimens must be conditioned at 75°F ± 5°F (23.8 ± 3°C) and 50% ± 10% relative humidity for seven days. Ten specimens must be conditioned in water, maintained at 75°F ± 5°F (23.8 ± 3°C) for 48 hours prior to testing. The test span is 10 inches (254 mm). Specimens are placed on roller-type supports with a length equal to the width and having a 1/4- to 1-inch diameter (6.4 to 25 mm). Load is applied at the midspan through a similar roller. One half of the wet and dry specimens (five specimens from 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 faces in flexural tension. The loads are applied using either Procedure A or Procedure B, as applicable. The method used must be reported.

The flexural strength tests are also conducted on the specimens from the weatherometer, freeze-thaw and salt spray resistance tests. Specimens shall be subjected to flexural tension on the exterior panel face.

4.6.2 Condition of Acceptance: Average breaking strengths of freeze-thaw, weatherometer, salt spray and wet specimens must be at least 80 percent of the average strength of dry-control specimens. If the average flexural strength values obtained are less than 90 percent of the control-dry specimens, allowable positive and negative load capacity from Section 4.7 of this criteria shall be reduced proportionately.

4.7 Structural Performance Test:

4.7.1 General: Testing must be in accordance with ASTM E 330, Procedure B, to establish the allowable positive and negative wind pressures that may be imposed on the panels and their fastening systems. The test specimens must represent the minimum conditions of installation, such as maximum support spacing, minimum panel thickness, support material thickness, density, and connections. At least three positive and three negative load

tests must be conducted with panels fastened to structural members in accordance with the manufacturer's published installation instructions. In lieu of testing, allowable load for adhered panels may be governed by the tensile bond test noted in Section 4.5.

Test assemblies must be a minimum of 4 feet by 8 feet (1219 mm by 2438 mm) [4-foot-by-4-foot (1219 mm by 1219 mm) specimens may 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 in accordance with ASTM E 330. Load deflection readings at the midpoint of the panel spans must be reported.

4.7.2 Condition of Acceptance: Allowable load will be based on a factor of safety of 3 applied to the average ultimate load, if both of the following are satisfied:

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

2. Allowable load does not exceed established values for mechanical connectors such as nails and screws. Calculations for the fasteners must be submitted for this determination.

4.8 Water Penetration Test (For Adhesively Attached Panels):

4.8.1 General: Three samples are prepared by adhesively attaching the panels to each substrate sought for recognition. The test samples must be a minimum of 4 feet by 8 feet (1219 mm by 2438 mm) in size, and must include typical panel joints and a minimum of two vertical joints and one horizontal joint within the sheathing substrate. Each sample must be tested in accordance with ASTM E 331. A 6.24 psf (0.297 kPa) air-pressure differential must be maintained across the test specimens for 2 hours. As an alternative, the panels can be tested without a substrate.

4.8.2 Condition of Acceptance: No water penetration is permitted on the unexposed substrate face (i.e., the face of the test specimen that is not exposed to the test conditions). Panels tested without a substrate and meeting this condition of acceptance can be recognized for use with any substrate, provide adhesive attachment of the panel to the substrate is validated with all applicable sections of this criteria.

5.0 QUALITY CONTROL

The products shall be produced under a quality control program monitored by an inspection agency accredited by the International Accreditation Service, Inc., or otherwise acceptable to ICC-ES. Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted. ■

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(SEALANT INSTALLER NAME)

Completion Date: _____

THE SEALANT INSTALLED IN CONJUNCTION WITH A RIGID CELLULAR POLYURETHANE PANEL (PANEL) INSTALLED ON THE STRUCTURE LOCATED AT THE ADDRESS INDICATED BELOW:

_____ CONFORMS

TO (PANEL MANUFACTURER NAME) AND (SEALANT MANUFACTURER'S NAME) RECOMMENDED INSTALLATION PRACTICES AND SECTION(S) _____ OF ICC-ES, INC., EVALUATION REPORT ESR-_____.

Address of Structure:

Product Component Names:

Primer(s) _____
Sealers _____
Bond Breakers _____
Sealant Materials _____

INSTALLATION CONFORMS

- A. Designer's requirements, details and instructions _____
- B. Sealant manufacturer's details and requirements _____
- C. Panel manufacturer's requirements _____

D. The information entered above is offered in testimony that the Sealant installation conforms with the sealant manufacturer's installation methods and procedures, and the Panel manufacturer's evaluation report.

Sealant Installer Company Name and Address:

Signature of responsible Officer: _____

Typed Name and Title of Officer: _____

Telephone Number: (____) _____

- cc: Original: Building Department
- Copies: Panel Manufacturer
- Panel Contractor
- Sealant Manufacturer

FIGURE 1