

ACCEPTANCE CRITERIA FOR WALKING DECKS

AC39

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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. (Some reports may also reference older code families such as the BOCA National Codes, the Standard Codes, and the Uniform 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.

This acceptance criteria has been issued to provide interested parties with guidelines for demonstrating compliance with performance features of the codes referenced in the criteria. The criteria was developed through a transparent process involving public hearings of the ICC-ES Evaluation Committee, and/or on-line postings where public comment was solicited.

New acceptance criteria will only have an “approved” date, which is the date the document was approved by the Evaluation Committee. When existing acceptance criteria are revised, the Evaluation Committee will decide whether the revised document should carry only an “approved” date, or an “approved” date combined with a “compliance” date. The compliance date is the date by which relevant evaluation reports must comply with the requirements of the criteria. See the ICC-ES web site for more information on compliance dates.

If this criteria is a revised edition, a solid vertical line (|) in the margin within the criteria indicates a technical change from the previous edition. A deletion indicator (→) is provided in the margin where wording has been deleted if the deletion involved a technical change.

ICC-ES may consider alternate criteria for report approval, provided the report applicant submits 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. ICC-ES retains the right to refuse to issue or renew any evaluation report, if the applicable product, material, 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 injury or unreasonable damage.

NOTE: The Preface for ICC-ES acceptance criteria was revised in July 2011 to reflect changes in policy.

Acceptance criteria are developed for use solely by ICC-ES for purpose 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 walking decks to be recognized in an ICC Evaluation Service, LLC (ICC-ES), evaluation report under the 2009 *International Building Code*[®] (2009 IBC), the 2009 *International Residential Code*[®] (2009 IRC), the 2006 *International Building Code*[®] (2006 IBC), the 2006 *International Residential Code*[®] (2006 IRC) and the 1997 *Uniform Building Code*[™] (UBC). Bases of recognition are IBC Section 104.11, IRC Section R104.11 and UBC Section 104.2.8.

The reason for development of this criteria is to provide guidelines for evaluating walking decks since the codes do not address walking decks.

1.2 Scope: Walking decks consist of plywood, cementitious or steel substrates covered by proprietary cementitious coatings, elastomeric coatings, or membranes to comprise systems meeting the requirements of this acceptance criteria. Plywood sheathing shall be exterior grade plywood complying with U.S. Department of Commerce Product Standard PS-1 (UBC Standard 23-2) or PS-2 (UBC Standard 23-3).

Parking decks are excluded from the scope of this acceptance criteria.

1.3 Codes and Reference Standards:

1.3.1 Codes:

1.3.1.1 2009 *International Building Code*[®] (2009 IBC), International Code Council.

1.3.1.2 2009 *International Residential Code*[®] (2009 IRC), International Code Council.

1.3.1.3 2006 *International Building Code*[®] (2006 IBC), International Code Council.

1.3.1.4 2006 *International Residential Code*[®] (2006 IRC), International Code Council.

1.3.1.5 1997 *Uniform Building Code*[™] (UBC), International Code Council.

1.3.2 Reference Standards:

1.3.2.1 ASTM C 67-07, Standard Test Method for Sampling and Testing Brick and Structural Clay Tile, ASTM International.

1.3.2.2 ASTM C 297-04, Standard Test Method for Flatwise Tensile Strength of Sandwich Construction, ASTM International.

1.3.2.3 ASTM D 570-98 (2005), Standard Test Method for Water Absorption of Plastics, ASTM International.

1.3.2.4 ASTM D 751-06, Standard Test Method for Coated Fabrics, ASTM International.

1.3.2.5 ASTM D 756-93, Standard Practice for Determination of Weight and Shape Changes of Plastics under Accelerated Service Conditions (Discontinued in 1998), ASTM International.

1.3.2.6 ASTM D 1242-95a, Standard Test Methods for Resistance of Plastic Materials to Abrasion (Discontinued in 2004), ASTM International.

1.3.2.7 ASTM D 1499-05, Standard Practice Filtered Open-Flame Carbon-Arc Type Exposures of Plastics, ASTM International.

1.3.2.8 ASTM D 2299-68 (reapproved 1982), Determining Relative Stain Resistance of Plastics (discontinued in 1992)¹, ASTM International.

1.3.2.9 ASTM D 3746-85 (2002), Test Method for Impact Resistance of Bituminous Roofing Systems, ASTM International.

1.3.2.10 ASTM D 4272-03, Test Method for Total Energy Impact of Plastic Films by Dart Drop, ASTM International.

1.3.2.11 ASTM D 4434-06, Specification for Poly (Vinyl Chloride) Sheet Roofing, ASTM International.

1.3.2.12 ASTM E 108-07a, Test Methods for Fire Tests of Roof Coverings, ASTM International.

1.3.2.13 ASTM E 119-07, Test Methods for Fire Tests of Building Construction and Materials, ASTM International.

1.3.2.14 ASTM G 154-05, Practice for Operating Fluorescent Light Apparatus for UV Exposure of Non metallic Materials, ASTM International.

1.3.2.15 UL 790-04, Tests for Fire Resistance of Roof Covering Materials with Revisions through July 1998, Underwriters Laboratories Inc.

1.3.2.16 US DOC PS-1-07, Construction and Industrial Plywood, United States Department of Commerce.

1.3.2.17 US DOC PS-2-04, Performance Standard for Wood-based Structural-use Panels, United States Department of Commerce.

1.3.2.18 FM 4470-92, Approval Standard for Class 1 Roof Covers, Factory Mutual.

1.3.2.19 ICC-ES Acceptance Criteria for Membrane Roof-covering Systems (AC75).

1.3.2.20 CGSB 37-GP-52M (1984), Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric, Canadian General Standard Board.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description:

2.1.1.1 Cementitious and Elastomeric Coating Systems:

1. Description of components including density, thickness, etc., as applicable. All coating components to be expressed in terms of dry-film thickness, in mils (mm), and in terms of gallons per 100 square feet (9.29 m²).

¹A copy of this document may be obtained from Global Engineering Documents (e-mail:globalcustomerservice@ihs.com; phone: 800-854-7179 or 303-397-7956

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2. Mix proportions.
3. Type and gradation of aggregates.
4. Types of fillers or additives.
5. Adhesives or bonding agents.
6. Types and amount of sealers.
7. Shelf and pot life of components.

2.1.1.2 Membrane Systems:

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:

1. Description and preparation of acceptable substrates.
2. Detailed information on mixing, forming, curing, and finishing, including ambient conditions during application for cementitious and elastomeric coating systems.
3. Detailed application (installation) instructions. This includes preparation of substrates; application rate; time interval between successive coats or layers; and information on joint treatment, flashing, and application around deck penetrations for cementitious and elastomeric coating systems. Details here shall include preparation of substrates; fastening methods; joint treatments; and surface treatments for membrane systems.
4. Methods of repair shall also be included in the installation instructions.
5. Installation Details shall be consistent with the installation instructions and shall be suitable for publication.

2.1.3 Packaging and Identification: Method of field identification of all components shall be provided. Means of identification shall include manufacturer's name and address, product name, shelf life, date of manufacture or lot number traceable to production date, name of the inspection agency and evaluation report number.

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: Sampling of the cementitious or elastomeric walking decks for tests under this criteria shall comply with Section 3.2 of AC85.

Sampling of walking deck system membranes for tests under this criteria shall comply with Section 3.1 of AC85.

3.0 TEST AND PERFORMANCE REQUIREMENTS

Walking decks may be used in three different applications: 1) walking deck only; 2) walking deck and nonclassified roof covering; 3) walking deck and classified roof covering. For applications as a walking deck only, see Sections 3.1 and 3.2, and 3.4 through 3.13, For applications as a walking deck and nonclassified roof covering, see Sections 3.1, 3.2, 3.4 through 3.13, 3.15 and 3.16. For

applications as a walking deck and classified roof covering, see Sections 3.1 through 3.13, 3.15 and 3.16. For any applications on one-hour fire-resistance-rated construction, see Section 3.14.

3.1 Weatherometer Test: See Section 4.1.

3.2 Accelerated Aging Test: See Section 4.2.

3.3 Fire-classified Roof-covering Test: See Section 4.3.

3.4 Tensile and Elongation Test: See Section 4.4.

3.5 Bond-strength Test: See Section 4.5.

3.6 Abrasion Test: See Section 4.6.

3.7 Percolation Test: See Section 4.7.

3.8 Water-absorption Test: See Section 4.8.

3.9 Chemical-resistance Test: See Section 4.9.

3.10 Freeze-thaw Test: See Section 4.10.

3.11 Low-temperature Flexibility Test: See Section 4.11.

3.12 Concentrated Load Test: See Section 4.12.

3.13 Wind-uplift Test: See Section 4.13.

3.14 One-hour Fire-Resistance Rated Construction (Optional): See Section 4.14.

3.15 Impact Resistance: See Section 4.15.

3.16 Physical Properties: See Section 4.16.

4.0 TEST METHODS

4.1 Weatherometer Test: Report of weatherometer test conducted for 2,000 hours on five samples in accordance with ASTM D 1499 (ASTM G152) As an alternative, polyvinyl chloride (PVC) membranes may be exposed in accordance with ASTM G 154 for a minimum of 5000 hours under the conditions noted in ASTM D 4434, Section 8.11.2. Condition of acceptance is that specimens shall show no crazing, cracking, spalling, softening or other surface deteriorations. After exposure, the specimens shall be examined under 5× magnification. Additionally, for noncementitious materials, tensile and elongation tests shall be conducted as described in Section 4.4.

4.2 Accelerated Aging Test: Report of aging test for plastic materials with three cycles of both Procedures D and E of ASTM D 756 on five specimens. Upon completion of the accelerated aging procedure:

1. For cementitious bonded systems, specimens shall undergo bond strength tests specified in Section 4.5.

2. For non-cementitious systems, specimens shall undergo tensile and elongation tests specified in Section 4.4.

4.3 Fire-classified Roof-covering Test: For applications as a classified roof covering, reports of fire-classified roof-covering tests in accordance with ASTM E 108, UL 790 (IBC and IRC) or UBC Standard 15-2 (UBC) shall be required. A minimum Class C classification shall be required.

4.4 Tensile and Elongation Test: Tensile and elongation tests are to be conducted on elastomeric and membrane systems only. Five control specimens and five specimens after weathering in accordance with the

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procedures described in Section 4.1 shall be tested. Similarly, tensile and elongation tests shall be conducted on five control specimens before aging and five specimens after aging in accordance with the procedure described in Section 4.2. The test procedure to be used is ASTM D 751. Loss in elongation shall be limited to 55 percent. Minimum tensile strength after exposure will be established on a case-by-case basis.

4.5 Bond-strength Test: Report of bond strength tests for cementitious or elastomeric systems shall be in accordance with ASTM C 297 on five specimens for each intended substrate. Tests to be conducted on control specimens and on specimens subjected to the accelerated aging test (Section 4.2) and the freeze-thaw test (Section 4.10). Minimum required bond strength is 10 psi (69 kPa).

4.6 Abrasion Test: Report of abrasion tests in accordance with Method A of ASTM D 1242 for a period of 1,000 revolutions under a 1,000-gram load with an aluminum oxide grit No. 80TP abrasant or equivalent on three specimens. Reduction in average thickness in mils (mm) and percent reduction for each specimen should be reported. Maximum loss in thickness for cementitious systems shall not exceed 40 mils (1.02 mm), and the maximum loss in thickness for elastomeric or membrane systems shall not exceed 20 mils (0.51 mm).

4.7 Percolation Test: Report of percolation tests which involve mounting a 1-inch (25.4 mm) or larger diameter tube on the surface of at least three specimens that have been abraded to remove the sealer coat. The tube shall be centered over the abraded surface and sealed. The tube shall be then filled with distilled water to a height of 48 inches (1219 mm). The water column shall be maintained at $75^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($23.8^{\circ}\text{C} \pm 2.8^{\circ}\text{C}$) at 50 percent \pm 5 percent relative humidity for a period of 48 hours. The drop in water level is to be reported in hundredths of an inch. Moisture accumulation, if any, on the underside of the specimen is to be noted. A maximum water percolation equivalent to a 0.5-inch (12.7 mm) column height is permitted.

4.8 Water-absorption Test: Report of water-absorption test in accordance with ASTM D 570, paragraphs 5, 6.1.1, 7.1 and 9, on a minimum of five samples. The test shall be conducted on the decking system material only, not in conjunction with any substrate. Average water absorption shall not exceed 15 percent for cementitious systems and 5 percent for elastomeric or membrane systems.

4.9 Chemical-resistance Test: Report of chemical-resistance test conducted on surfacing material. The test in accordance with ASTM D 2299 shall be conducted on specimens without the seal coat. After testing, the exposed surfaces shall be examined to determine extent of surface change. Crazing, softening, delamination, spalling, etc., shall be reported. Results will be evaluated on a case-by-case basis. The following reagents shall be used: Industrial detergent solution (20 percent by volume), ammonia solution (5 percent by volume), salt solution (20 percent by volume), muriatic acid (10 percent by volume), chlorine solution (10 percent by volume), ethylene glycol anti-freeze, kerosene, turpentine, and paint thinner.

Exception: Testing with muriatic acid and chlorine solution shall be waived if recognition is not sought for decks adjacent to swimming pools, spas, etc.

4.10 Freeze-thaw Test: (For cementitious deck coverings) Freeze-thaw tests in accordance with ASTM C 67 on a minimum of five specimens. The test specimens shall be sealed on the back and all edges, and shall be frozen with the decking face immersed in water to a depth of $\frac{1}{4}$ inch (6.4 mm). There shall be no breakage and no greater than 1 percent loss in the dry weight of each specimen at the conclusion of the 50-cycle test. After completion of freeze-thaw tests, the specimens shall be subjected to the bond-strength test specified in Section 4.5.

4.11 Low-temperature Flexibility Test: (For elastomeric or membrane deck coverings) Five specimens shall be exposed to a temperature of 5°F (2.8°C) for two hours. The specimens shall be removed from the cold chamber, immediately positioned over a 1-inch-diameter (25.4 mm) mandrel 4 inches (102 mm) long with the weathering side of the membrane up and, over a period of 3 seconds, bent over the mandrel until the projected ends are parallel to each other, constituting an arc of 180 degrees. Conditions of acceptance are that none of the specimens show crazing or cracking upon visual examination under 5x magnification in the bent condition.

4.12 Concentrated Load Test: Five representative samples shall be used. A 1-inch-diameter (25.4 mm) steel plate with rounded edges having a 0.015-inch (0.38 mm) radius is used to apply a 300-pound (1.34 kN) load on elastomeric or membrane decking systems and a 500-pound (2.24 kN) load on cementitious decking systems. Load the specimens, with surface penetration measured to the nearest hundredth of an inch. Test specimens shall consist of representative walking deck covering used in deck assemblies. Specimens shall be continuously supported by a rigid backing such as concrete. The load shall be imposed on the plate centered on the specimen. The superimposed load shall be reduced to zero and reloaded a minimum of four additional times with penetration and residual readings taken each time without removing the plate. The specimen shall be inspected after testing and the condition of the surface noted.

4.13 Wind-uplift Test :

4.13.1 For Bonded Coating Systems: No wind-uplift test is required for bonded coating systems meeting the requirements set forth in Section 4.5 (bond-strength test).

4.13.2 For Unbonded Coating Systems: Recognition may be granted for use in areas subject to a maximum basic wind speed of 80 mph (129 km/h) under the UBC or a maximum 3-second gust basic wind speed of 100 mph (161 km/h) under the IBC on structures a maximum of 40 feet (12 192 mm) in height in Exposure B areas, provided the proponent can verify, in writing, that he has investigated and determined that his product will perform satisfactorily when installed under these conditions. Recognition beyond these limits will require wind-uplift tests such as the Factory Mutual I-52 test. A factor of safety of 3 will be applied for ultimate loads, provided the condition of the deck at factored load does not exhibit any cracking, spalling, tearing, delamination, or failure of fasteners.

4.13.3 For Partially Bonded Coating Systems: Systems bonded on perimeter and mechanically fastened in the field of the deck shall be qualified for wind uplift as for unbonded coating systems described in Section 4.13.2.

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4.13.4 For Membrane Systems: Systems shall be tested and evaluated in accordance with Section 3.1 of AC75.

4.14 One-hour Fire-resistance-rated Construction (Optional): To qualify a walking deck system as an alternative to the double wood floor for one-hour fire-resistance-rated construction described in Footnote 13 to Table 7-C of the UBC, full-scale tests shall be conducted in accordance with ASTM E 119 (IBC) or UBC Standard 7-1(UBC). Small-scale fire tests are permitted to be conducted as an alternate to the full-scale testing, provided the tests are conducted as described herein. The small-scale apparatus shall comply with Figure 1, except the furnace shall be of sufficient size to expose a sample measuring 60 inches (1524 mm) square, and furnace temperatures shall be measured by a minimum of six thermocouples. The test shall be conducted in accordance with the applicable sections of ASTM E 119 (IBC) or UBC Standard 7-1 (UBC), except the hose stream test and loading of the test assembly shall not be required. Conditions of acceptance are that the transmission of heat through the specimen during the classification period shall not have been such as to raise the average temperature on the specimen's unexposed surface more than 250°F (139°C) above its initial temperature. The test assembly shall consist of nominal 2-by-10 wood joists spaced at 16 inches (406 mm) on center. The unexposed surface shall consist of the walking deck system installed in accordance with the manufacturer's instructions over minimum ⁵/₈-inch-thick (15.9 mm) plywood.

The exposed surface shall consist of one layer of ¹/₂-inch-thick (12.7 mm), Type X gypsum wallboard attached to the joists in accordance with Item 13 of Table 720.1(3) of the IBC or Item 13 of Table 7-C of the UBC. The evaluation report will specify the size and spacing of floor joists and the floor covering material. As an alternative, small-scale tests may be conducted with nominal 2-by-8 wood joists. Recognition of the walking deck system assembly with 2-by-8 wood joists in the evaluation report shall limit bending design stress to 78 percent of the code-prescribed design values for the joists.

4.15 Impact Resistance: For walking decks to qualify for roof covering applications, testing for impact resistance

is required. Testing for impact damage shall be 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.

4.16 Physical Properties: For membrane systems to qualify for roof covering applications, systems shall be tested and evaluated in accordance with Section 3.2 of AC75.

5.0 QUALITY CONTROL

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

5.2 Except as noted in Section 5.3, third-party follow-up inspections are not required under this acceptance criteria.

5.3 Walking decks that are to be recognized as a classified roof covering (Class A, B or C) shall be produced 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.

6.0 EVALUATION REPORT RECOGNITION

The evaluation report shall include the following information:

6.1 Description of the Components: Information described in Section 2.1.1.

6.2 Installation Requirements: Information described in Section 2.1.2, including installation details.

6.3 Product Identification: Information described in Section 2.1.3.

6.4 Minimum Slope: The minimum slope shall be specified in the evaluation report, and shall be no less than ¹/₄:12.

6.5 Uses: The use of each system shall be clearly stated (walking deck only; walking deck and nonclassified roof covering; or walking deck and classified roof covering). ■