



# ICBO Evaluation Service, Inc.

A subsidiary corporation of the International Conference of Building Officials

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## ACCEPTANCE CRITERIA FOR WALKING DECKS

### AC39

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### PREFACE

Evaluation reports issued by ICBO Evaluation Service, Inc. (ICBO ES), are based upon performance features of the Uniform family of codes and the International family of codes. Section 104.2.8 of the *Uniform Building Code*<sup>™</sup> (UBC), Section 104.11 of the *International Building Code*<sup>®</sup> (IBC) and Section R104.11 of the *International Residential Code*<sup>™</sup> (IRC) are the primary charging sections upon which evaluation reports are issued. Section 104.2.8 of the UBC reads as follows:

The provisions of this code are not intended to prevent the use of any material, alternate design or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with 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 suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

Similar provisions are contained in Sections 104.11 and R104.11 of the IBC and IRC, respectively.

The attached acceptance criteria has been issued to provide all interested parties with guidelines on implementing performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the 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 a previous edition, solid vertical lines (■) in the outer margin within the criteria indicate a technical change or addition from the previous edition. Deletion indicators (◆) are provided in the outer margins where a paragraph or item has been deleted if the deletion resulted from a technical change. This criteria may be further revised as the need dictates.

ICBO ES may consider alternate criteria, provided the proponent submits valid data demonstrating that the alternate criteria are at least equivalent to the attached criteria and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a material, type or method of construction, or equipment, meets the attached acceptance criteria, or that it can be demonstrated that valid alternate criteria are equivalent and otherwise meet the applicable performance requirements of the codes, if the material, product, system or equipment is such that either unusual care in its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use thereof, ICBO ES retains the right to refuse to issue or renew an evaluation report.

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# ACCEPTANCE CRITERIA FOR WALKING DECKS

## 1.0 INTRODUCTION

The purpose of this acceptance criteria is to provide a procedure for recognition of walking decks in ICBO Evaluation Service, Inc. (ICBO ES), evaluation reports under the 1997 *Uniform Building Code*<sup>™</sup>. For the purpose of this acceptance criteria, walking decks are defined as areas, in or adjacent to a building, used for foot traffic (areas such as exterior exit balconies, stairways, residential balconies, recreational decks, pedestrian bridges connecting buildings, etc.). Walking decks consist of plywood, cementitious or steel substrates covered by proprietary materials to comprise systems meeting the requirements of this acceptance criteria. Plywood sheathing must be exterior grade plywood complying with U.S. Department of Commerce Product Standard PS-1-95 (UBC Standard 23-2) or PS-2-92 (UBC Standard 23-3).

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

## 2.0 BASIC INFORMATION AND REPORT OF TESTS

The following basic information is required:

### 2.1 Product Description:

1. Description of components including density, thickness, etc., as applicable. All coating components to be expressed in terms of dry-film thickness, in mils, and in terms of gallons per 100 square feet (9.29 m<sup>2</sup>).
2. Mix proportions.
3. Type and gradation of aggregates.
4. Types of fillers or additives.
5. Adhesives or bonding agents.
6. Types and amounts of sealers.
7. Shelf and pot life of components.

### 2.2 Complete Installation Instructions:

1. Description and preparation of acceptable substrates.
2. Detailed information on mixing, forming, curing, and finishing, including ambient conditions during application.
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.
4. Methods of repair shall also be included in the installation instructions.

**2.3 Identification:** Identification of all components must be provided. Manufacturer's name and address, product name, shelf life, date of manufacture or lot number traceable to production date, name of the quality control agency and evaluation report number (ICBO ES ER-XXXX) must be included in the identification method.

### 2.4 Testing Laboratories and Reports of Tests:

Testing laboratories shall comply with the ICBO ES Acceptance Criteria for Laboratory Accreditation (AC89).

Test reports and test specimen sampling shall comply with the ICBO ES Acceptance Criteria for Test Reports and Product Sampling (AC85). The laboratory must witness sample preparation. The test report must be of sufficient detail to allow positive identification of the tested product.

**2.5 Quality Control:** The product must be manufactured under a quality control program with inspections by a quality control agency accredited by ICBO ES. A quality control manual, jointly developed by the applicant and the agency, complying with the ICBO ES Acceptance Criteria for Quality Control Manuals (AC10), must be submitted.

## 3.0 REQUIRED TESTS

The following must be conducted (see Section 4.0 for test procedures):

1. Weatherometer Test
2. Accelerated Aging Test
3. Fire-retardant Roof-covering Test
4. Tensile and Elongation Test
5. Bond-strength Test
6. Abrasion Test
7. Percolation Test
8. Water-absorption Test
9. Chemical-resistance Test
10. Freeze-thaw Test
11. Low-temperature Flexibility Test
12. Concentrated Load Test
13. Wind-uplift Test
14. One-hour Fire-resistive Construction (optional)

## 4.0 TEST PROCEDURES

**4.1 Weatherometer Test:** Report of weatherometer test conducted for 2,000 hours on five samples in accordance with ASTM D 1499 and ASTM G 23 with Model D or DH. After exposure, the specimens must be examined under 5× magnification. Specimens shall show no crazing, cracking, spalling, softening or other surface deteriorations. Additionally, for non-cementitious materials, tensile and elongation tests must 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 must undergo bond strength tests specified in Section 4.5.
2. For noncementitious systems, specimens must undergo tensile and elongation tests specified in Section 4.4.

**4.3 Fire-retardant Roof-covering Test:** Report of fire-retardant roof-covering tests in accordance with UBC Standard 15-2 is required. A minimum Class C classification is required.

**4.4 Tensile and Elongation Test:** Tensile and elongation tests are to be conducted on elastomeric systems only. Five control specimens and five specimens after weathering in accordance with the procedure 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 751-79. Loss in elongation is 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 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 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 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 is centered over the abraded surface and sealed. The tube is then filled with distilled water to a height of 48 inches (1219 mm). The water column is maintained at 75°F ± 5°F (23.8°C ± 2.8°C) at 50 percent ± 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 is 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 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 must be examined to determine extent of surface change. Cracking, softening, delamination, spalling, etc., must be reported. Results will be evaluated on a case-by-case basis. The following reagents must 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 is 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 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:** (For elastomeric deck coverings.) Five specimens are exposed to a temperature of 5°F (2.8°C) for two hours. The specimens are 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 5× magnification in the bent condition.

**4.12 Concentrated Load Tests:** 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 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 cover-

ing used in deck assemblies. Specimens must be continuously supported by a rigid backing such as concrete. The load is imposed on the plate centered on the specimen. The superimposed load is 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 Systems:** No wind-uplift test is required for bonded systems meeting the requirements set forth in Section 4.5 (bond-strength test).

**4.13.2 For Unbonded Systems:** Recognition may be granted for use in areas subject to a maximum basic wind speed of 80 mph (129 km/h) 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 Systems:** Systems bonded on perimeter and mechanically fastened in the field of the deck shall be qualified for wind uplift as for unbonded systems described in Section 4.13.2.

#### 4.14 One-hour Fire-resistive Construction (optional):

To qualify a walking deck system as an alternate to the double wood floor for one-hour fire-resistive construction described in Footnote 13 to Table 7-C of the code, compliance with this section of the acceptance criteria is required.

Full-scale tests must be conducted in accordance with UBC Standard 7-1. 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 26-2-1 of UBC Standard 26-2, 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 UBC Standard 7-1, 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 7-C of the code. 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.