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ACCEPTANCE CRITERIA FOR PHOTOLUMINESCENT EGRESS SYSTEM ILLUMINATION

AC169

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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*[™] (UBC), Section 104.11 of the *International Building Code*[®] (IBC) and Section R104.11 of the *International Residential Code*[™] (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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1.0 INTRODUCTION

1.1 Purpose: The purpose of this criteria is to establish requirements for recognition of photoluminescent egress system illumination in ICBO ES Evaluation Service, Inc. (ICBO ES), evaluation reports under the 1997 *Uniform Building Code* (UBC) and the 2000 *International Building Code*[®] (IBC).

1.2 Scope: As an alternate to egress illumination required by Section 1003.2.9.1, Exception 2, of the UBC and Section 1003.2.11.1, Exception, of the IBC, photoluminescent egress system illumination, recognized under this criteria, is permitted to be used as means of illuminating path ways limited to aisles, cross aisles, and vomitories/exits during performances in the following assembly areas: auditoriums, theaters, concert or opera halls, stadiums, and similar assembly areas. In addition, the required illumination level of 1 foot-candle (10.76 lx), set forth in the above sections of the UBC and IBC, shall be automatically restored upon activation of a premise's fire alarm system, and this illumination shall be provided by an emergency power supply system set forth in UBC Section 1003.2.9.2 and IBC Section 1003.2.11.2.

1.3 Definitions:

1.3.1 Photoluminescent: Photoluminescent is the property of emitting visible light as a result of absorption of UV or visible light, the emissions continuing for a length of time after excitation.

1.3.2 Photoluminescent Egress System: For the purpose of this criteria, photoluminescent egress system is a system, characterized by its ability to emit light as described in Section 1.3.1 above, composed of stair nosing units (photoluminescent inserts and slip-resistant strips on aluminum extrusions), photoluminescent railings (where applicable), and photoluminescent directional signage.

1.3.3 Luminance: The measure of luminous intensity of a surface in a given direction to a unit projected area, in candela per square meter (cd/m^2).

1.4 Reference Documents:

1.4.1 1997 *Uniform Building Code* (UBC).

1.4.2 2000 *International Building Code* (IBC).

1.4.3 ICBO ES Acceptance Criteria for Laboratory Accreditation (AC89), dated September 1998.

1.4.4 ICBO ES Acceptance Criteria for Test Reports and Product Sampling (AC85), dated September 1998.

1.4.5 ASTM B 244-97, Test Methods for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.

1.4.6 ASTM B 137-95 (2000), Test Method for Measurement of Coating Mass per Unit Area of Anodically Coated Aluminum.

1.4.7 ASTM B 136-84 (1998), Standard Test Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.

1.4.8 ASTM B 117-97, Standard Practice for Operating Salt Spray (Fog) Apparatus.

1.4.9 ASTM D 1654-92, Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

1.4.10 ASTM G 155-00, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.

1.4.11 ASTM D 4828-94 (1999), Standard Test Methods for Practical Washability of Organic Coatings.

1.4.12 ASTM D 1242-95a, Standard Test Methods for Resistance of Plastic Materials to Abrasion.

1.4.13 ASTM D 3167-97, Standard Test Method for Floating Roller Peel Resistance of Adhesives.

1.4.14 ASTM E 2030-99, Guide for Recommended Uses of Photoluminescent Safety Markings.

1.4.15 ASTM E 2072-00, Standard Specification for Photoluminescent (Phosphorescent) Safety Markings.

1.4.16 ASTM E 2073-00, Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings.

1.4.17 ASTM E 1316-00, Standard Terminology for Non-destructive Examinations.

1.4.18 UL410 Standard for Slip Resistance for Floor Surface Materials.

2.0 REQUIRED BASIC INFORMATION AND TEST REPORTS

2.1 Product Description: Complete information, as applicable, regarding components, material specifications, and the manufacturing processes.

2.2 Installation Instructions: Installation description and detail drawings, noting installation requirements and limitations.

2.3 Operating Instructions: Complete operating instructions relating to the installation site, which include the type and luminance level of the activation light source provided by the site, and the duration of exposure period required for events up to 140 minutes. Alternative duration of exposure shall be provided for longer performances, if necessary.

2.4 Packaging and Identification: Description of the method of packaging and identification of the product. Product labeling must also include the evaluation report number.

2.5 Testing Laboratories, Reports of Tests and Product Sampling:

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

2.5.2 Test reports must comply with the ICBO ES Acceptance Criteria for Test Reports and Product Sampling (AC85). All test reports must be prepared by an ICBO ES accredited independent testing laboratory.

2.5.3 Test specimens must be sampled in accordance with the product sampling requirements of AC85.

3.0 REQUIRED DATA

3.1 Measurement of Luminance: Measurement of luminance of photoluminescent inserts and markings shall be as set forth in Section 4.1.

3.2 Aluminum Components:

3.2.1 Specification: Aluminum alloy must be 6063-T5 with minimum tensile strength of 21 ksi (150 MPa).

3.2.2 Anodic Coating Measurements: Report of thickness measurement test of anodic coatings in accordance with ASTM B 244-97, Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments. Coating mass shall be determined in accordance with ASTM B 137-95 (2000).

Condition of Acceptance: A minimum coating thickness of 18 μm and minimum coating mass of 2.45 mg/100 m^2 per 10 μm of coating measured, is required.

3.3 Stain Resistance: Report of stain resistance test of anodic coatings and photoluminescent inserts in accordance with ASTM B 136-84 (1998). Additional testing shall be conducted on representative beverage stains such as beer, cola, and coffee.

Condition of Acceptance: There shall be no visible stains after completion of the test.

3.4 Salt Spray Test (Optional): Egress system components shall be tested for salt spray as set forth in Section 4.2, and report of test must be submitted for system exposed to the exterior in open-atmosphere assemblies.

3.5 Weatherometer Test (Optional): Weatherometer test as set forth in Section 4.3 is required for system components, and report of tests must be submitted, for egress systems exposed to the exterior in open-atmosphere assemblies.

3.6 Washability Test: Report of washability test on organic coatings as set forth in Section 4.4.

3.7 Abrasion Test: Report of abrasion test as set forth in Section 4.5.

3.8 Peel Resistance Test: Report of peel resistance test on anti-slip strips as set forth in Section 4.6.

3.9 Slip Resistance Test: Report of slip resistance test as set forth in Section 4.7.

4.0 TEST METHODS

4.1 Measurement of Luminance: Five samples of the photoluminescent inserts or markings used in the egress system shall be tested in accordance with ASTM E 2073-00 with the following exceptions:

1. The photoluminescent inserts or markings shall be activated by a light source representative of that provided by the site. The level of supplied illumination on the inserts or markings, and the charging time, must be the same as those found at the installation site.
2. Measure of photopic luminance of the inserts or markings shall be measured after 10 minutes ± 10 seconds, and 140 minutes ± 10 seconds.

If the photoluminescent inserts or markings are used in exterior applications, measurement of luminance shall be conducted on the five samples after they are subjected to each of the tests in Sections 4.2 through 4.3.

Condition of Acceptance: After each test sample is charged to the prescribed illumination power and duration, the minimum average level of intensity shall be not less than the intensity as determined by the following equation:

$(1500/W)$ mcd/ m^2 , measured 10 minutes after activation has ceased.

$(220/W)$ mcd/ m^2 , measured 140 minutes after activation has ceased.

where, W = the total width of the inserts or markings in millimeters.

4.2 Salt Spray Test: Five samples of each egress system component shall be exposed for a period of 500 hours in accordance with ASTM B 117-97.

Conditions of Acceptance:

4.2.1 Photoluminescent Inserts, Markings and Slip-resistant Strips: The absence of deleterious effects from salt spray after 500 hours of exposure.

4.2.2 Aluminum Components: Results for coated-aluminum components are measured after 500 hours of exposure and determined in accordance with ASTM D 1654-92, Procedure A or B, with a minimum rating of 8.

4.3 Weatherometer Test: Five samples of each egress system component shall be tested for a period of 2,000 hours in accordance with ASTM G 155-00. The samples shall be subjected to Cycle 1 exposure condition noted in Table X3.1 of the standard.

Conditions of Acceptance:

4.3.1 Photoluminescent Inserts or Markings: There shall be no surface changes on the photoluminescent inserts or markings, when viewed under a minimum 5 \times magnification, such as cracking, checking, crazing, erosion, or other characteristics that may affect the insert's ability to absorb and emit light.

4.3.2 Other Components: There shall be no surface changes when viewed under a minimum 5 \times magnification, such as cracking, checking, crazing, and erosion.

4.4 Washability of Organic Coatings: Five samples of each egress system component shall be tested in accordance with ASTM D 4828-94 (1999).

Condition of Acceptance: There shall be no soil or stain residue after completion of the test on any part of the egress system components.

4.5 Abrasion Test: Five samples of the slip-resistant material must be tested in accordance with Method A of ASTM D 1242-95a for a period of 1000 revolutions under a 1000 gram loading with an aluminum oxide grit No. 80TP abradant or equivalent. Reduction in average thickness in mils, and percent reduction for each specimen must be reported.

Condition of Acceptance: Loss of thickness shall be no more than 40 mils (1.02 mm).

4.6 Peel Resistance Test: Five samples of anti-slip strips shall be tested in accordance with ASTM D 3167-97.

Condition of Acceptance: A minimum average peeling load of 2.5 pounds-force per inch (435 N/m) is required.

4.7 Slip Resistance Test: Five samples of the slip resistant material must be tested and found to comply with the requirements of UL410 Standard.

5.0 QUALITY CONTROL

Quality control procedures with monitoring inspections by an ICBO ES accredited quality control agency shall be developed for each fabrication facility based on production, volume of production, and application. The procedures shall be included in a quality control manual developed jointly by the manufacturer and an accredited quality control agency. The quality control agency shall be accredited in accordance with the ICBO ES Acceptance Criteria for Quality Control Agency Accreditation (AC98). Quality control manuals must comply with the ICBO ES Acceptance Criteria for Quality Control Manuals (AC10). The manual must include description of the system components, with specifications and material sources.

6.0 PERIODIC EVALUATION OF INSTALLED UNITS

The performance of the photoluminescent egress system illumination must be evaluated by an inspector or personnel approved by the system manufacturer and the fire code official every five years, or the life of the product, whichever comes first. The inspector shall verify and document any major defects such as from wear-and-tear, outdoor exposure, etc. The system shall be replaced if deemed necessary. The periodic evaluation program shall be documented by the system manufacturer, who will distribute these documents to affected parties. ■