



August 1, 2008

**TO: PARTIES INTERESTED IN SMOKE-CONTAINMENT SYSTEMS USED WITH FIRE-RESISTANCE-RATED ELEVATOR HOISTWAY DOORS AND FRAMES**

**SUBJECT: Proposed Revisions to the ICC-ES Acceptance Criteria for Smoke-Containment Systems Used with Fire-Resistance-Rated Hoistway Doors and Frames, Subject AC77-0808-R1 (ST/MB/DM)**

Dear Madam or Sir:

The revisions proposed to the subject acceptance criteria, as presented in the enclosed criteria draft, are being posted on the ICC-ES web site to allow for public comment. The revisions include the addition of Section 3.1.4 to allow for recognition of an additional type of rolling smoke-containment system. This additional system is similar in operation to the system currently recognized in Section 3.1.1.

You are cordially invited to submit written comments, within 30 days of the date of this letter. An explanation of the alternate criteria process can be found on our web site at [http://www.icc-es.org/Criteria\\_Development/alternative\\_criteria\\_process.shtml](http://www.icc-es.org/Criteria_Development/alternative_criteria_process.shtml).

All comments received in the 30-day comment period will be considered. During this same 30-day period, however, the draft criteria will be balloted to the Evaluation Committee. If the public comments raise major issues, generate controversy, or require the criteria to be substantially rewritten, then ICC-ES staff may decide to reballot the criteria; or place a revised draft on the web site for further public comment; or put the criteria on the agenda for a future Evaluation Committee meeting.

Correspondence received and a memo outlining staff's resolution of the comments in the correspondence will be posted on the web site shortly after the close of the comment period.

Your cooperation is requested in forwarding to the Los Angeles business/regional office all material directed to the Evaluation Committee. Parties interested in the deliberations of the committee should refrain from communicating, whether in writing or verbally, with committee members. The committee reserves the right to refuse communications that do not comply with this request.

Newly approved acceptance criteria may involve test methods or test protocols that are not currently included in the scope of testing services offered by accredited testing laboratories. As noted in the ICC-ES Rules of Procedure for Evaluation Reports, the scope of the laboratory's accreditation must include the type of testing that is to be reported to ICC-ES. We encourage accredited laboratories to expand their scopes of accreditation to include testing under newly approved acceptance criteria. Please note that testing laboratories must be accredited by the International Accreditation Service (IAS) or by another accreditation body that is a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement. For further information, please contact IAS at (562) 699-0541, extension 3309, or send an e-mail to [pmccullen@iasonline.org](mailto:pmccullen@iasonline.org).

If you have any questions, please contact the undersigned at (800) 423-6587, extension 4313. You may also reach us by e-mail at [es@icc-es.org](mailto:es@icc-es.org).

Yours very truly,



Steven R. Thorsell, AIA, CSI  
Director of Special Projects

SRT/raf

Enclosure

cc: Evaluation Committee



# PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR SMOKE-CONTAINMENT SYSTEMS USED WITH FIRE-RESISTANCE-RATED ELEVATOR HOISTWAY DOORS AND FRAMES

AC77

Proposed August 2008

Previously approved October 2007, October 2003, January 2001, September 1992

## 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*<sup>®</sup> 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.

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 proposed in this document, and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria proposed in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise meet the applicable performance requirements 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 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 for purposes of issuing ICC-ES evaluation reports.*

# PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR SMOKE-CONTAINMENT SYSTEMS USED WITH FIRE-RESISTANCE-RATED ELEVATOR HOISTWAY DOORS AND FRAMES (AC77)

## 1.0 INTRODUCTION

**1.1 Purpose:** The purpose of this criteria is to establish the basis for recognition in ICC Evaluation Service, Inc. (ICC-ES), evaluation reports of smoke-containment systems as tight-fitting, smoke and draft control assemblies under Section 715.4.3 of the 2006 *International Building Code*<sup>®</sup> (IBC), Section 1004.3.4.3.2.1 of the 1997 *Uniform Building Code*<sup>™</sup> (UBC), or Section 705.1.3.2 of the 1999 *Standard Building Code*<sup>®</sup> (SBC). The reason for this criteria is the absence of referenced standards within the IBC codes upon which to determine code compliance, therefore this subject is an alternative material to what is prescribed in the codes. Bases of recognition are IBC Section 104.11.

**1.2 Scope:** The systems are used with fire-resistance-rated elevator hoistway doors and frames or as smoke curtain systems installed remotely from the hoistway door at the intersection of the elevator lobby and corridor. Use of either type of system would permit deletion of the separated elevator lobby required under IBC Section 707.14.1, UBC Section 1004.3.4.5, or SBC Section 412.6.1. Recognition under the SBC is applicable to Group B and R high-rise buildings.

Smoke-protected elevator lobbies are not specifically required by the BOCA<sup>®</sup> *National Building Code/1999* (NBBC). However, where smoke-protected elevator lobbies are proposed to be provided as part of a building design, the smoke-containment system described in the ICC-ES evaluation report is permitted under the NBBC, when installation is in accordance with the evaluation report.

**1.3 Reference Standards:** Where standards are referenced in this criteria, these standards shall be applied consistently with the code (IBC, UBC or SBC) upon which compliance is based. Standard editions applicable to each code are summarized in Table 1.

**1.3.1** 2006 *International Building Code*<sup>®</sup>, International Code Council.

**1.3.2** 1997 *Uniform Building Code*<sup>™</sup>.

**1.3.3** 1999 *Standard Building Code*<sup>®</sup>.

**1.3.4** BOCA<sup>®</sup> *National Building Code/1999*.

**1.3.5** ASTM D 412, Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension, ASTM International.

**1.3.6** ASTM D 1434, Determining Gas Permeability Characteristics of Plastic Film and Sheeting, ASTM International.

**1.3.7** ASTM D 1876, Peel Resistance of Adhesives (T-Peel Test), ASTM International.

**1.3.8** ASTM E 84, Surface Burning Characteristics of Building Materials, ASTM International.

**1.3.9** UL 10B, Fire Tests of Door Assemblies, Underwriters Laboratories Inc.

**1.3.10** UL 1784, Air Leakage Tests of Door Assemblies, Underwriters Laboratories Inc.

**1.3.11** UL 228, Door Closers With and Without Integral Smoke Detectors, Underwriters Laboratories Inc.

**1.3.12** UL 268, Smoke Detectors for Fire Alarm Signaling Systems, Underwriters Laboratories Inc.

**1.3.13** UL 864, Standards for Control Units and Accessories for Fire Alarm Signaling Systems, Underwriters Laboratories Inc.

**1.3.14** NFPA 105, Installation of Smoke-Control Door Assemblies, National Fire Protection Association.

**1.3.15** NFPA 258, Determining Smoke Generation of Solid Materials, National Fire Protection Association.

**1.3.16** NFPA 70, National Electrical Code, National Fire Protection Association.

## 2.0 BASIC INFORMATION

**2.1 General:** The following information shall be submitted:

**2.1.1** General information on the manufacturing process.

**2.1.2** Dimensioned drawings and details noting size, component material types and materials, configuration and installation instructions.

**2.1.3** Method of field adjustment.

**2.1.4** Inspection and maintenance schedule.

**2.1.5** Maximum temperature exposure necessitating replacement.

**2.1.6** Installation instructions and details. The instructions shall address the need to field test the system for proper operation after installation.

**2.2 Product Identification:** Each smoke-containment system shall be identified as follows:

**2.2.1** The manufacturer's or private labeler's name.

**2.2.2** Reference to installation instructions.

**2.2.3** Maximum leakage rating at the specified pressure and temperature conditions (cfm/square foot of door opening).

**Exception:** Where information specified in Section 2.2.3 is in installation instructions attached to, or packaged with, the product, the above information need not be on the smoke-containment system.

**2.2.4** Type of door assembly for which smoke-containment system is intended.

**Exception:** If each product includes the information specified in Section 2.2.4 with installation instructions that are attached to, or packaged with, the product, the information need not be on the smoke-containment system.

**2.2.5** If a product is manufactured at several locations, each piece shall be distinctively marked to identify origin.

**2.2.6** Label of the approved inspection agency.

**2.2.7** Evaluation report number.

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**2.3 Testing Laboratories, Test Reports and Product Sampling:**

**2.3.1 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.

**2.3.2 Test Reports:** Test reports shall comply with AC85.

**2.3.3 Product Sampling:** Sampling of the smoke-containment system components for tests under this criteria shall comply with Section 3.1 of AC85.

**3.0 TEST AND PERFORMANCE REQUIREMENTS**

**3.1 Materials:** The smoke-containment system shall comply with the requirements of either Section 3.1.1, 3.1.2, or 3.1.3 or 3.1.4:

**3.1.1** The smoke-containment film shall be a minimum 1-mil-thick [0.001 inch (0.025 mm)] transparent polyamide meeting the following requirements:

**3.1.1.1** The film shall be reinforced with 100 denier nomex yarn spaced  $\frac{1}{4}$  inch (6.4 mm) each way. The reinforcing fill yarn shall be attached to the film and overlap the unadhered reinforcing warp yarn. The bond between the yarn and the film shall be at least 2 pounds per inch (0.35 N/mm) when tested according to ASTM D 1876.

**3.1.1.2** The film shall be connected along its length to a  $2\frac{1}{2}$ -inch-wide-by-0.125-inch-thick (63.5 mm by 3.2 mm) PM14 multi-pole flexible magnet of energized ferrite in a nitrile rubber binder exerting minimum 1.4 MGOe of force. The multipoles shall be oriented along the length, perpendicular to the magnet width.

**3.1.1.3** The film and magnets shall be connected with a 0.5-inch-wide-by-0.125-inch-thick (12.7 mm by 3.2 mm) continuous joint of low-modulus silicone.

**3.1.1.4** The smoke-containment film shall have a flame-spread index of 25 or less and a smoke-developed rating of 50 or less when tested in accordance with ASTM E 84 (IBC and SBC) or UBC Standard 8-1 (UBC).

**3.1.1.5** The film shall maintain its physical properties after exposure to accelerated aging and certain chemicals. The test methods shall be approved by ICC-ES before the tests are conducted.

**3.1.1.6** The smoke-containment system shall be tested and comply with the requirements set forth in Sections 3.2, 3.3, 3.4.1 and 3.5 through 3.8.

**3.1.2** The smoke-containment curtain shall be a minimum 2.5-mil-thick [0.0025 inch (0.64 mm)] silica cloth curtain coated with urethane-based resin on one side and complying with the following requirements:

**3.1.2.1** The curtain shall be comprised of silica fabric panels stitched together horizontally with twisted stainless steel threads. The stitched seams shall be able to withstand a minimum pressure of 3.1 pounds per square foot (150 Pa).

**3.1.2.2** The curtain shall have a flame-spread index of 25 or less and a smoke-developed rating of 50 or less when tested in accordance with ASTM E 84 (IBC and SBC) or UBC Standard 8-1 (UBC).

**3.1.2.3** The curtain shall be attached to a horizontal

steel winding shaft at the top and set in a frame assembly consisting of a horizontal steel bottom bar assembly and vertical steel guide rails that capture the edge of the curtain. Steel mounting plates attached at the tops of the guide rails support the winding shaft and provide a structure for the attachment of a sheet metal hood. A woven glass-fiber cloth smoke seal is provided on both sides of the head. Secondary components of the assembly include steel locking bolts at the edge of the curtain to retain it in the guides, steel bracket anchors and steel guide rail anchors.

**3.1.2.4** The smoke-containment system shall be tested and comply with the requirements set forth in Sections 3.2, 3.4.3 and 3.6 through 3.9.

**3.1.3** The smoke curtain system shall consist of a smoke-containment film that is a minimum 3-mil-thick [0.003 inch (0.076 mm)] PTFE-coated glass-fiber or para-aramid meeting the following requirements:

**3.1.3.1** The film shall consist of separate PTFE-coated glass-fiber or para-aramid sheets, joined horizontally by heat sealing.

**3.1.3.2** The smoke-containment film shall be connected to the drive system utilizing vertical edge containment loops on either side of the curtain. The loops slide over vertical guide rods contained within the side rails. A narrow vertical slot in each side rail prevents the screen/guide rod assembly from disengaging the side rail.

**3.1.3.3** The side rails attach from floor to ceiling on both sides of the opening to be protected. The top portion of the rails also attach to the units housing for the purpose of aligning drive components.

**3.1.3.4** The curtain is mechanically operated up and down by an electric drive motor that turns a bearing supported axle running the length of the housing, and pulleys engaging toothed drive belts and contained within the side rails adjacent to the screen guide rods. The toothed drive belt and pulleys at the end of the axle actuate loops in the drive belt. When the belt is activated, the bottom bar of the smoke curtain lowers from the housing as a screen roller tube feeds out the smoke curtain.

**3.1.3.5** An egress switch that complies with ANSI A 117.1 for operation of a powered door shall be located on both sides of the smoke curtain.

**3.1.3.6** The smoke-containment film shall have a flame-spread index of 25 or less and a smoke-developed rating of 50 or less when tested in accordance with ASTM E 84 (IBC and SBC) or UBC Standard 8-1 (UBC).

**3.1.3.7** The smoke-containment system shall be tested and comply with the requirements set forth in Sections 3.2, 3.4.1 and 3.5 through 3.8.

**3.1.4** The smoke containment curtain shall be a minimum 2.5-mil-thick [0.0025 inch (0.65 mm)] silica cloth, coated on one side with acrylic resin and complying with the following requirements:

**3.1.4.1** The curtain shall be comprised of silica cloth panels stitched together vertically with twisted stainless steel threads. The acrylic resin coating shall be applied to the corridor side of the curtain and shall have a minimum coverage of 2.36 ounces per square foot (80 g/m<sup>2</sup>). The stitched seams shall be able to withstand a minimum

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pressure of 3.1 pounds per square foot (150 Pa).

**3.1.4.2** The curtain material shall be connected along its length to a 3<sup>1</sup>/<sub>2</sub>-inch-wide-by-0.124-inch-thick (83 mm by 3.2 mm) multi-pole magnet of energized ferrite in an nitrile rubber binder exerting a minimum 1.4 MGOe force. The multipoles shall be oriented along the length perpendicular to the magnet width.

**3.1.4.3** The curtain material shall completely cover the magnets and shall be joined by stitching (2X) along the full length of the magnet.

**3.1.4.4** Between the magnet and the curtain material a 4<sup>3</sup>/<sub>4</sub>-inch-wide-by-5<sup>5</sup>/<sub>64</sub>-inch-thick heat expansion material consisting of intumescent graphite encapsulated in a butyl rubber sheet shall be enclosed along the full length of the magnet. The edges of the magnet shall be protected by 3<sup>3</sup>/<sub>4</sub>-inch-wide-by-5<sup>5</sup>/<sub>64</sub>-inch-thick (20 mm x 2 mm) of the same material. The heat expansion material shall have the capability of expanding a minimum of 10 times the original material thickness.

**3.1.4.5** At variable positions along the magnet length bi-metallic shape memory alloy strips consisting of Nickel – titanium and measuring 2<sup>3</sup>/<sub>4</sub>-inch-wide-by-3<sup>1</sup>/<sub>16</sub>-inch-high-by-1<sup>1</sup>/<sub>64</sub>-inch-thick (70mm by 5mm by 0.5mm) shall be riveted horizontally on the elevator side of the curtain. The bi-metallic strips shall activate at a maximum temperature of 212°F (100 °C). When heated, the bi-metallic strips shall expand differentially into a concave shape and grasp specially shaped auxiliary rails after which the intumescent material expands to protect the magnet and bimetallic strips.

**3.1.4.6** The curtain shall have a flame spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E 84 (IBC or SBC) or UBC Standard 8-1 (UBC).

**3.1.4.7** The smoke containment system shall be tested and comply with the requirements set forth in Sections 3.2, 3.4.1 (excluding Sections 3.4.1.6.1.3 through 3.4.1.6.1.6) and 3.6 through 3.9.

**3.2 Air Leakage:** The rate of air leakage through the smoke-containment system shall be determined at 0.1 inch (25 Pa), 0.2 inch (50 Pa) and 0.3 inch (75 Pa) water pressure differential when tested to the performance requirements of UL 1784 (IBC and SBC) or UBC Standard 7-2, Part II (UBC). Tests include cycling and air leakage at ambient and elevated [400°F (204°C)] temperatures.

**Conditions of Acceptance:** The air leakage rating at both ambient and elevated [400°F (204°C)] temperatures shall not exceed 3.0 cfm (14.16 × 10<sup>-4</sup>) per square foot of opening at 0.1 inch water pressure (25 Pa) difference.

**3.3 Expansion Characteristics:** The total expansion of the smoke-containment system shall be determined at 0.3 inch water pressure (75 Pa) differential at both ambient and elevated [400°F (204°C)] temperatures.

**Conditions of Acceptance:** The smoke-containment system cannot expand more than 6 inches (152 mm) at this pressure difference at ambient or elevated [400°F (204°C)] temperatures.

**3.4 Cycling:** The smoke-containment system shall be cycled according to one of the following methods.

**3.4.1 Standard Test Method for Cyclic Movement of Rolling Magnetic Gasket Systems:**

**3.4.1.1 Purpose:** To determine the cyclic movement of the rolling magnetic gasket system.

**3.4.1.1.1** This test method is applicable to rolling magnetic gasket systems used to prevent the infiltration of air and smoke through an entrance or exit way.

**3.4.1.2 Apparatus:**

**3.4.1.2.1** Any arrangement of equipment capable of performing the test procedure within the allowable tolerances is permitted.

**3.4.1.2.2 Mounting Frames:** No. 14 gage ferrous metal frames shall have a 2-inch-wide (51 mm) profile. Frame shall be blind attached to the wall.

**3.4.1.3 Test Specimens:** Three full size samples shall be used. The temperatures within the laboratory shall be 73.4°F ± 3.6°F (23°C ± 2°C).

**3.4.1.4 Mounting:** The system is mounted above test frame according to the manufacturer's written installation instructions. The resulting installation shall be plumb and square.

**3.4.1.5 Procedure:** Emergency alarm contacts are first energized, allowing the curtain to drop, completely covering the opening. The rewind contacts are next energized, allowing the curtain to roll into container, completely unseating the gasket material.

The door is closed. The curtain is visually inspected after each set of 50 full cycles. The container and frame are visually inspected after each set of 100 full cycles.

**3.4.1.6 Visual Inspection:**

**3.4.1.6.1** Immediately following each set of 50 full cycles, the curtain is visually inspected for the following signs of fatigue:

**3.4.1.6.1.1** Visual metal fatigue.

**3.4.1.6.1.2** Cracks or creases in film.

**3.4.1.6.1.3** Loss of reinforcing yarn adhesion.

**3.4.1.6.1.4** Loss of sealant joint adhesion.

**3.4.1.6.1.5** Stretching of sealant joint.

**3.4.1.6.1.6** Loss of laminating adhesive.

**3.4.1.6.1.7** Misalignment of curtain reel at threshold.

**3.4.1.6.1.8** Misaligned rolling relative to the test frame.

**3.4.1.6.2** Immediately following each set of 100 full cycles, the curtain is visually inspected for the following signs of fatigue:

**3.4.1.6.2.1** Visual metal fatigue.

**3.4.1.6.2.2** Warpage of door.

**3.4.1.6.2.3** Visual damage to hinge, latch or door stay.

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**3.4.1.6.3** Immediately following each set of 100 full cycles, the test frame is visually inspected for visual wear.

**3.4.2 Conditions of Acceptance:** The smoke-containment system shall demonstrate no fatigue after completing 100 cycles. The system shall continue to function without impairment.

**3.4.3 Standard Test Method for Cyclic Movement of Coiling Curtain Systems:**

**3.4.3.1 Purpose:** To determine the cyclic movement of the coiling curtain system.

**3.4.3.1.1** This test method is applicable to coiling curtain systems described in Section 3.1.2 used to prevent the infiltration of air and smoke through an entrance or exit.

**3.4.3.2 Apparatus:**

**3.4.3.2.1** Any arrangement of equipment capable of performing the test procedure within the allowable tolerances is permitted.

**3.4.3.2.2 Guide Rails:** Minimum No. 16 gage steel plate, of the manufacturer's standard profile and size. Frame shall be attached to the wall in accordance with the manufacturer's standard installation instructions.

**3.4.3.3 Test Specimens:** Three full-size samples shall be used. The temperature within the laboratory shall be 73.4°F ± 3.6°F (23°C ± 2°C).

**3.4.3.4 Mounting:** The system is mounted above the test frame according to the manufacturer's written installation instructions. The resulting installation shall be plumb and square.

**3.4.3.5 Procedure:** Emergency alarm contacts are first energized, allowing the curtain to drop, completely covering the opening. The alarm contacts are de-energized and the release mechanism is reset and the curtain is rolled back into the initial open position.

The door is closed. The curtain is visually inspected after each set of 50 full cycles. The container and frame are visually inspected after each set of 100 full cycles.

**3.4.3.6 Visual Inspection:**

**3.4.3.6.1** Immediately following each set of 50 full cycles, the curtain is visually inspected for the following signs of fatigue:

**3.4.3.6.1.1** Cracks or creases in the fabric.

**3.4.3.6.1.2** Curtain edge retention in the vertical guiderails.

**3.4.3.6.1.3** Misalignment of the bottom bar at threshold.

**3.4.3.6.1.4** Misaligned rolling relative to the test frame.

**3.4.3.6.2** Immediately following each set of 100 full cycles, the curtain is visually inspected for the following signs of fatigue:

**3.4.3.6.2.1** Cracks or creases in the fabric.

**3.4.3.6.2.2** Warpage of curtain or frame.

**3.4.3.6.2.3** Visual damage to entire assembly.

**3.4.3.6.3** Immediately following each set of 100 full cycles, the test frame is visually inspected for visual wear.

**3.4.4 Conditions of Acceptance:** The smoke-containment system shall demonstrate no fatigue after completing 100 cycles. The system shall continue to function without impairment.

**3.4.5 Standard Test Method for Cyclic Movement of Smoke Curtain Systems:**

**3.4.5.1 Purpose:** To determine the cyclic movement of the smoke-containment system.

**3.4.5.1.1** This test method is applicable to smoke-containment systems described in Section 3.1.3 used to prevent the infiltration of air and smoke through an entrance or exit.

**3.4.5.2 Apparatus:**

**3.4.5.2.1** Any arrangement of equipment capable of performing the test procedure within the allowable tolerances is permitted.

**3.4.5.2.2 Mounting Frames:** For systems described in Section 3.1.1, the frame shall consist of No. 14 gage ferrous metal frames having a 2-inch-wide (51 mm) profile. The frame shall be blind-attached to the wall. For the systems described in Sections 3.1.2 and 3.1.3, the system shall be mounted in accordance with the system manufacturer's instructions.

**3.4.5.3 Test Specimens:** Three full-size samples shall be used. The temperature within the laboratory shall be 73.4°F ± 3.6°F (23°C ± 2°C).

**3.4.5.4 Mounting:** The system is mounted above the test frame according to the manufacturer's written installation instructions. The resulting installation shall be plumb and square.

**3.4.5.5 Procedure:** Emergency alarm contacts are first energized, allowing the curtain to drop, completely covering the opening. The rewind contacts are next energized, allowing the curtain to roll into container, completely unseating the gasket material.

The curtain is visually inspected, with the curtain in the closed position, after each set of 50 full cycles. The container and frame are visually inspected after each set of 100 full cycles.

**3.4.5.6 Visual Inspection:**

**3.4.5.6.1** Immediately following each set of 50 full cycles, the curtain is visually inspected for the following signs of fatigue:

**3.4.5.6.1.1** Visual metal fatigue.

**3.4.5.6.1.2** Cracks or creases in film.

**3.4.5.6.1.3** Loss of fabric adhesion.

**3.4.5.6.1.4** Misalignment of curtain reel at threshold.

**3.4.5.6.1.5** Misaligned rolling relative to the test frame.

**3.4.5.6.2** Immediately following each set of 100 full cycles, the curtain is visually inspected for the following

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signs of fatigue:

**3.4.5.6.2.1** Visual metal fatigue.

**3.4.5.6.2.2** Warpage of door.

**3.4.5.6.2.3** Visual damage to operable components.

**3.4.5.6.3** Immediately following each set of 100 full cycles, the test frame is visually inspected for visual wear.

**3.4.6 Conditions of Acceptance:** The smoke-containment system shall demonstrate no fatigue after completing 100 cycles. The system shall continue to function without impairment.

**3.5 Motor:** The motor shall be evaluated and listed as required by NFPA70, the National Electrical Code.

**3.6 Release Mechanisms:** Components of release mechanisms shall be recognized by an independent testing agency accredited by the International Accreditation Service, Inc. (IAS). For the system described in Section 3.1.3, the integral battery backup system that is part of the releasing drive shall be tested and listed to UL 864.

**3.7 Smoke Detector:** The smoke detector to which the

smoke-containment system is connected shall be tested and listed according to UL 228 or UL 268.

**3.8 Opening Force:** The maximum force to disengage the gasketing system described in Section 3.1.1 is 15 lbf (67 N), and shall be verified by using a spring scale applied perpendicular to the plane of the film at the boundary. The maximum force to lift the curtain described in Section 3.1.2 is 15 lbf (67 N), and shall be verified by using a spring scale applied perpendicular to lower horizontal edge of the curtain assembly.

**3.9 Fire Test:** The smoke-containment system shall have a minimum 20-minute rating without hose stream when tested in accordance with UL 10B and IBC Section 715.4.2.

**4.0 QUALITY CONTROL**

**4.1** The products shall be manufactured under an approved quality control program with inspections by an inspection agency accredited by International Accreditation Service.

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

**TABLE 1—CROSS REFERENCE OF STANDARD EDITIONS**

<b>STANDARD</b>	<b>1997 UNIFORM BUILDING CODE™</b>	<b>2006 INTERNATIONAL BUILDING CODE®</b>	<b>1999 STANDARD BUILDING CODE®</b>
ASTM D 412	1988	1988	1988
ASTM D 1434	1988	1988	1988
ASTM D 1876	1983	1983	1983
ASTM E 84	UBC Standard 8-1	2004	1995
NFPA 70	1996	2005	1996
NFPA 105	1989	2003	1989
NFPA 228	1986	1986	1986
NFPA 258	1987	1987	1987
UL 10B	UBC Standard 7-2, Part I	1997 with revisions through October 2001	N/A
UL 228	1986	1986	1986
UL 268	N/A	1996 with revisions through January 1999	1989
UL 864	N/A	2003 with revisions through October 2003	N/A
UL 1784	UBC Standard 7-2, Part II	1995	1995