UL 2007A

STANDARD FOR SAFETY

Shatter Containment Of Lamps For Use In Regulated Food Establishments

UL Standard for Safety for Standard for Shatter Containment Of Lamps For Use In Regulated Food Establishments, UL 2007A

First Edition, Dated June 21, 2011

Summary of Topics

This revision of ANSI/UL 2007A is being issued to reflect the latest Reaffirmation of ANSI approval. No changes have been made to the requirements within this Standard.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated June 13, 2015.

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a ″SUPERSEDED REQUIREMENTS″ notice.

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Standard for Shatter Containment Of Lamps For Use In Regulated Food Establishments

First Edition

June 21, 2011

This ANSI/UL Standard for Safety consists of the First Edition including revisions through June 22, 2016.

The most recent designation of ANSI/UL 2007A as an American National Standard (ANSI) occurred on June 22, 2016. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover shatter containment mechanisms for lamps, for use in food establishments, that are intended to prevent contamination of food.

1.2 Types of lamps covered by these requirements include incandescent, halogen, linear fluorescent, pin-base compact fluorescent, screwbase compact fluorescent, high intensity discharge (HID), and solid state.

1.3 These requirements do not apply to the lighting fixtures (luminaires), lamp holders or other apparatus that support the lamps and/or shatter containment mechanism.

1.4 Some types of lamps, including fluorescent and HID lamps, require small amounts of mercury to efficiently function. These requirements do not cover the containment or potential release of mercury upon lamp breakage.

1.5 HID lamps may experience what is known in the industry as a non-passive failure. These requirements do not cover the containment of glass should this occur.

2 Reference Publications

2.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

2.2 **ASTM Standards**

ASTM G151
Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices That Use Laboratory Light Sources

ASTM G153
Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

ASTM G155
Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials

2.3 **U.S. Code of Federal Documents**

FDA Food Code

U.S. Code of Federal Regulations, Title 21, Part 110

2.4 **NEMA Documents**

Lighting Systems Division Document LSD 9-2000
Compatibility of Add-on Tube Guards with T-8 Fluorescent Lamps Operating on High Frequency Electronic Ballasts

3 Definitions

3.1 COATED SHATTER CONTAINMENT LAMP – A lamp with an integral externally applied coating or film, constructed of polymeric materials or other suitable materials, that is intended to provide shatter containment.

3.2 GLOBE – A type of guarded shatter container that encloses a single base lamp by attachment to the luminaire. Also referred to as a ″jelly jar″.

3.3 GUARDED SHATTER CONTAINERS – A means of shatter containment whereby a shield, guard, globe, tube, or sleeve creates a barrier between the lamp and the surrounding environment, providing protection against lamp breakage or providing containment of broken lamp particles or both.

3.4 INDIRECT FOOD CONTACT – Surfaces and materials of commercial food equipment not intended to be in contact with food during normal use that are required to conform to regulations for indirect food additives. Such surfaces are determined by sanitary design and construction standards for commercial food equipment. Examples include the cavity of an oven and a refrigerated food storage compartment intended for the storage or display of unpackaged foods.

3.4 effective July 15, 2014

3.5 SHATTER CONTAINMENT MECHANISMS – Includes coated shatter containment lamps (3.1) and guarded shatter containers (3.3)

CONSTRUCTION

4 Materials

4.1 Products shall be constructed of materials that will not cause the adulteration or contamination of food during normal use, including conditions causing condensation. They shall be corrosion resistant, nontoxic and nonabsorbent.

4.2 Guarded shatter containers for T-8 fluorescent lamps shall have a melting point no less than 370°F (188°C) according to Compatibility of Add-on Tube Guards with T-8 Fluorescent Lamps Operating on High Frequency Electronic Ballasts, LSD 9-2000.

4.3 Materials used where indirect food contact may occur shall:

a) Conform with the U.S. Federal Food, Drug, and Cosmetic Act, 21 USC 301; or

b) Be regulated as indirect food additives per the Code of Federal Regulations, Title 21, Food and Drugs, Parts 174 through 189; or

c) Conform to the Code of Federal Regulations, Title 21, Part 170.39, Threshold of Regulation for Substances Used in Food Contact Articles; or

d) Conform with the food zone requirements of Food Equipment Materials, NSF/ANSI 51.

4.3 effective July 15, 2014

5 Design and Construction

5.1 General

5.1.1 Products shall be designed so that when installed as intended external surfaces are smooth, accessible and readily cleanable. Surfaces of screw-shells, pins and other electrical contacts are not considered external surfaces.

5.2 Joints, internal angels, corners, and grooves

5.2.1 Permanent joints and angles shall be sealed and smooth.

5.2.2 External surfaces shall be free of open seams and gaps, recesses, protruding ledges and dead space. Grooves shall be equal to or wider than their depth.

5.2.3 Internal corners or angles shall have smooth and continuous radii that are easily cleanable.

5.3 Fasteners

5.3.1 External surfaces shall be free of inside threads, inside shoulders, bolts and rivets.

5.3.2 Fasteners that may loosen and fall out due to vibration shall be captivated or additionally secured such that they cannot enter food.

PERFORMANCE

6 Pre-Impact Conditioning

6.1 General

6.1.1 Products intended for general use shall be conditioned according to 6.2. Products intended for specialized use – either the elevated heat of cooking equipment or the depressed temperatures of refrigerating and freezing equipment – shall be conditioned according to 6.3 or 6.4, as appropriate. Once conditioned, the specimens shall then be subjected to the performance tests of Sections 7 – 8. See Table 6.1 for a summary of specimens specified for the standard for conditioning and testing.

Table 6.1
Summary of specimens required for conditioning and testing

	Total number of specimens	Number of specimens conditioned	Number of specimens not conditioned	Drop test performance (Section 7)	Displacement impact test performance (Section 8)	Additional conditioned specimens available	Additional specimens not conditioned
General use (6.2)	24	18	6	6 conditioned and 2 not conditioned	6 conditioned and 1 not conditioned	6	3
Freezer temperature exposure (6.3)	24	18	6	6 conditioned and 2 not conditioned	6 conditioned and 1 not conditioned	6	3
Cooking temperature exposure (6.4)	24	18	6	6 conditioned and 2 not conditioned	6 conditioned and 1 not conditioned	6	3

6.1.2 Each method of conditioning shall be performed on a separate set of 15 specimens. An additional 6 conditioned specimens and an additional 3 unconditioned samples shall be available as replacement specimens.

6.2 General use

6.2.1 One set of 12 specimens shall be loaded into a circulating air conditioning chamber. Just prior to loading, the samples shall be coated on their external surfaces with a thin, transparent, uniform coating of sprayed-on melted lard. Position the samples horizontally on an elevated wire rack in the chamber with a space of at least one inch between each specimen to facilitate airflow. The temperature in the chamber shall be raised within three hours to the greater of:

a) 140 ±2°F (60 ±1°C); or

b) A temperature 10 ±2°F (6 ±1°C) greater than the average external surface temperature of the product under test, measured by means of thermocouple under normal operation. External surface temperature is obtained by operating three coated lamps or lamp protection devices with a lamp intended to be used with the product for a period of three hours at rated voltage or rated wattage, whichever results in the highest wattage. The average external surface temperature of the three specimens shall be calculated.

Maintain the temperature for 21 hours. Then, within three hours, lower the chamber temperature to 100 ±2°F (37.8 ±1°C), and 95 ±2 percent relative humidity. Maintain these conditions for 21 hours. This represents one complete cycle. Repeat this procedure for a total of 10 cycles.

6.2.2 At the completion of the tenth cycle, within three hours, lower the chamber conditions to 0 ±2°F (-17.8 ±1°C). Maintain this temperature for 21 hours, and then allow the chamber to return to ambient temperature with the chamber's door closed. Remove the specimens from the conditioning chamber. There shall be no visible deformation of the coating.

6.3 Freezer temperature exposure

6.3.1 One set of 12 specimens shall be loaded into a circulating air conditioning chamber, positioned horizontally on an elevated wire rack, with a space of at least one inch between each specimen to facilitate air flow. Within three hours, lower the temperature from ambient to -5 ±2°F (-20.5 ±1°C). Maintain the temperature for 21 hours. Then, within three hours, raise the chamber temperature to 25 ±2°F (-3.9 ±1°C). Maintain the temperature for 21 hours. This represents one complete cycle. Repeat this procedure for a total of 5 cycles.

6.3.2 Allow the chamber to return to ambient conditions with the chamber's door closed. Remove the specimens from the conditioning chamber. There shall be no visible deformation of the coating.

6.4 Cooking temperature exposure

6.4.1 One set of 12 specimens shall be coated on their external surfaces with a thin, transparent, uniform coating of sprayed-on melted lard. The specimens shall then be placed in a circulating air chamber. Position the samples horizontally on an elevated wire rack in the chamber with a space of at least one inch between each specimen to facilitate airflow. Within 30 minutes, raise the temperature from ambient to 400 ±2°F (204 ±1°C). Once this temperature is reached, allow the chamber to return on its own (i.e., with no added heating or cooling) to ambient temperature. The chamber door should remain closed. Hold the specimens at the ambient temperature for at least 60 minutes. This represents one complete cycle. Repeat this procedure for a total of 10 cycles.

6.4.2 After ten cycles, remove the specimens from the conditioning chamber. There shall be no visible deformation of the coating.

7 Drop Test

7.1 General

7.1.1 Six conditioned specimens and two unconditioned specimens will be dropped into an open-top box to help contain and collect for inspection any ejected portions of the specimen. The box shall be constructed to the following specifications:

a) Base: 0.25 in (6.4 mm) thick sheets of AISI 300 stainless steel with no overlapping seams, positioned to create a rectangle as follows:

1) 3 ft (0.91 m) by 10 ft (3.05 m); or

2) Using the dimensions of the lamp to be tested, dimension for the base can be determined by measuring the greatest length and width of the lamp in any plane and adding two feet to those values (for a lamp measuring 4 ft (1.22 m) by 2 in (50.8 mm), the sheet shall be 6 feet (1.83 m) by 26 in (0.66 m).

b) Walls: Constructed of 0.5 in (12.7 mm) plywood or other rigid, durable material, at least 3 ft (0.91 m) high, tight-fitting at their junctions to the other walls and to the junctions at the perimeter of the base. One or more of the walls may pivot on a hinge or be constructed with a door to gain access to the specimen and facilitate inspection for ejected particles. Paint the interior surfaces of the walls with a dark, washable paint.

The base may be lined with a single sheet layer of tissue paper of a contrasting color to improve visual inspection for ejected particles.

7.1.2 Prior to the test and after each drop, following the inspection of the contents of the box and the surrounding area as appropriate, thoroughly remove lamp materials from the base of the box and horizontal ledges of the walls, as well as from the area within five feet on any side of the box. If the tests will be performed in succession and contamination from foot traffic and other sources is restricted, it is only necessary to clean the five foot area around the box only once prior to commencement of the test. If using tissue paper for visual contrast, the paper may be reused. However, if the paper becomes damaged, discard the tissue paper and reline the base with new paper.

7.1.3 When handling the specimens prior to the test, hold them whenever possible at their edges or base(s) to minimize wear on the means of shatter containment.

7.2 Procedure

7.2.1 The test shall consist of drops of conditioned specimens (6.2 – 6.4, as appropriate). Specimens shall be released from a set height as follows:

a) Globes and heat lamps (lamps intended only to keep food warm, typically including, but not limited to, Lamp Shape R, Lamp Shape ER, Lamp Shape BR, and Lamp Shape PAR): The button contact at the screw shell base of the specimen shall be 6 ft (1.85 m) from the impact surface.

b) All other lamps: The uppermost point of the specimen shall be 12 ft (3.7 m) from the impact surface.

See Table 7.1 for the release positions for each lamp. Release each specimen to land at or near the center of the box. The specimen shall not be dropped directly onto the horizontal ledge of the box's wall, but may contact the wall after first striking the base. A spotter should be positioned in a protected location in proximity to the box, wearing appropriate safety apparel, including safety glasses, to witness any material that may eject itself from the box upon impact.

Table 7.1
Release position for each lamp specimen

	Globes and single-base lamps, such as incandescent and halogen lamps	Double-based lamps (such as tubular fluorescent lamps) and tubular guards for fluorescent lamps
Specimens #1, #2, #3, and one unconditioned specimen	Vertical plane with base pointing up	Horizontal plane with bases pointing 90 degrees to vertical plane
Specimens #4, #5, #6, and one unconditioned specimen	Horizontal with base pointing 90 degrees to vertical plane	45 degree angle to vertical and horizontal plane

7.2.2 When drop testing tubular guards for fluorescent lamps, a lamp of the type specified by the manufacturer for use with the guard shall be placed inside the guard. End caps or other end closure devices designed to be used with the product shall be fitted over the end openings of the guard as specified by the manufacturer.

7.2.3 Following drop impact, remove the specimen from the box, taking care not to strike it against the box. Inspect the box for materials that may have been ejected from the specimen. Inspect the specimen for visible signs of damage. Upon inspection:

a) Particles dislodged from the specimen shall not be larger than 0.04 in (1 mm) in any plane; and

b) Upon inspection, there shall be no cracks, splits, or holes, greater than 0.04 in (1 mm) by 0.08 in (2 mm).

7.2.4 If all eight original specimens meet the criteria of 7.2.3, then no additional testing is necessary.

7.2.5 If after the drop test, any of the eight original specimens tested do not meet the acceptance criteria of 7.2.3, additional specimens may be subjected to the test as follows:

a) If one, two, or three specimens do not meet the criteria of 7.2.3, then one additional replacement specimen may be subjected to the drop test for each noncompliant specimen. Conformity is demonstrated if all replacement specimens conform when examined in accordance with 7.2.3. The replacement specimen(s) shall be such that they are equivalent to the original in both specimen type (either conditioned or not conditioned) and drop position.

b) If more than three of the eight original specimens do not meet the criteria of 7.2.3, then the results are determined to be noncompliant.

8 Displacement Impact Test

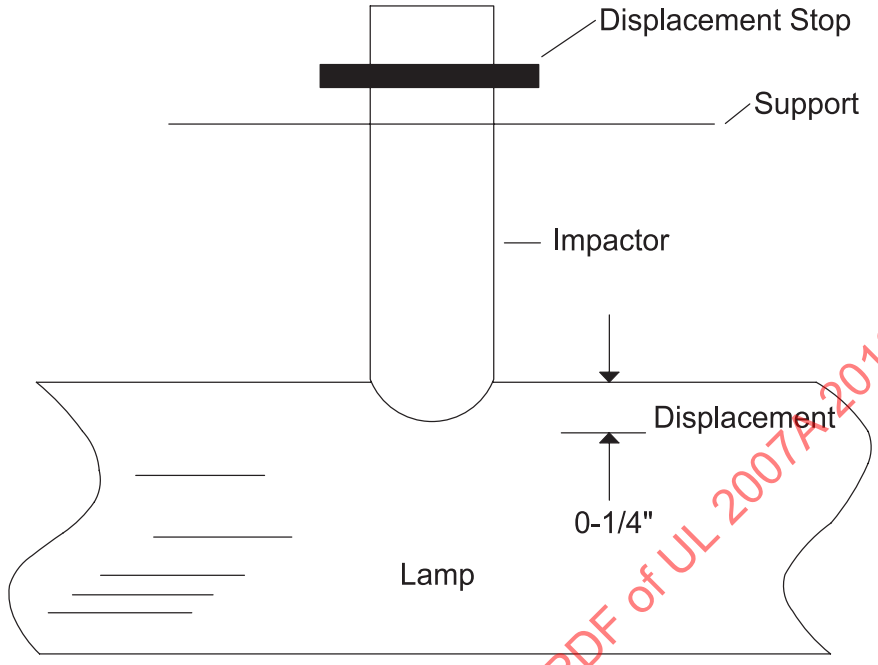
8.1 The test shall consist of impacts of six conditioned specimens (6.2 – 6.4, as appropriate), plus one additional unconditioned specimen. Each specimen shall be securely held in place in its intended lampholder(s) with the assembly positioned so it will not be dislodged during the test. The shatter protection means shall be arranged in accordance with the manufacturer's instructions.

8.2 An impact device, described in Figure 8.1, shall be positioned such that the maximum displacement distance is 0.25 in (6.4 mm) beyond the inside plane surface of the glass surface. The impact location shall be determined as follows:

a) For single base lamps and globes, the specimen shall be impacted at the center of the surface opposite the base, normal to the surface, with the force directed at the center of the specimen; or

b) For double base lamps and guarded shatter containers, the specimen shall be impacted at a point equidistant from the two bases, normal to the surface, with the force directed at the center of the specimen.

Figure 8.1
Displacement Impact Device



8.3 A single displacement impact shall be applied to each specimen with a 1 in (25 mm) diameter hemispherical tip metal probe, after which the specimen shall be examined. If for any reason the glass does not crack, the displacement distance can be increased in 0.25 in (6.4 mm) increments until the glass is broken.

8.4 Acceptance criteria is as follows:

a) Particles dislodged from the specimen shall not be larger than 0.04 in (1 mm) in any plane; and

b) Upon inspection, there shall be no cracks, splits, or holes, greater than 0.04 in (1 mm) by 0.08 in (2 mm).

8.5 If all seven original specimens meet the criteria of 8.4, then no additional testing is necessary.

8.6 If after the displacement impact test, any of the seven original specimens tested do not meet the acceptance criteria of 8.4, additional specimens may be subjected to the test as follows:

a) If one, two, or three specimens do not meet the criteria of 8.4, then one additional replacement specimen may be subjected to the drop test for each noncompliant specimen. Conformity is demonstrated if all replacement specimens conform when examined in accordance with 8.4. The replacement specimen(s) shall be such that they are equivalent to the original specimen type (either conditioned or not conditioned).