



UL 514D

STANDARD FOR SAFETY

Cover Plates for Flush-Mounted Wiring Devices

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UL Standard for Safety for Cover Plates for Flush-Mounted Wiring Devices, UL 514D

Second Edition, Dated June 28, 2013

Summary of Topics

This revision of ANSI/UL 514D dated May 18, 2023 includes the following changes in requirements:

- Added New Annex [E](#) for Spring-Tensioned Contacts for Illuminated Cover Plates; [5.1](#), [10.1](#), [10.2](#), [B.3.5](#) and [B.3.6](#)***
- Cover Plate Material (Nonmetallic) over the Face of a Receptacle; [4.3](#), [4.6](#), [5.1.5](#) and [5.5.6](#)***
- Clarification that Hot Wire Ignition method or the Glow-Wire Resistance Test are acceptable and that conducting both is not required; [7.3.1](#) – [7.3.13](#), Annex [A](#)***
- Spray Direction When Performing the Resistance to Moisture Tests Specified in Clauses [8.1.9](#) and [8.1.10](#) for Outlet Box Hoods Used with Raceway Supported Enclosures; [8.1.7](#)***
- Exposed Surface Areas of Hoods Do Not Have to have Flats to be Eligible for Impact Tests; [8.9.1.1A](#)***
- Increase in products that this standard does not apply to; [1.5](#)***

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated October 7, 2022 and March 3, 2023.

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CSA Group
CSA C22.2 No. 42.1-13
Second Edition



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Second Edition

Cover Plates for Flush-Mounted Wiring Devices

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ANSI/UL 514D-2023



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This UL Standard for Safety consists of the Second Edition including revisions through May 18, 2023. The most recent designation of ANSI/UL 514D as an American National Standard (ANSI) occurred on May 18, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), and Preface.

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Preface

This is the harmonized CSA Group and ULSE standard for Cover Plates for Flush-Mounted Wiring Devices. It is the Second edition of CSA C22.2 No. 42.1 and the Second edition of UL 514D. This edition of CSA-C22.2 No. 42.1 supersedes the previous edition(s) published in 2000. This edition of UL 514D supersedes the previous edition(s) published in 2000. This harmonized standard has been jointly revised on May 18, 2023. For this purpose, CSA Group and ULSE are issuing revision pages dated May 18, 2023.

This harmonized standard was prepared by CSA Group and ULSE. The efforts and support of the Technical Harmonization Subcommittee, 23BC, Wiring Devices of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

This Standard was reviewed by the CSA Integrated Committee on Wiring Devices under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Resource Group, and was approved by the CSA Technical Committee. This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This standard is published as an identical standard for CSA Group and ULSE.

An identical standard is a standard that is exactly the same in technical content except for national differences resulting from conflicts in codes and governmental regulations. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

This binational standard is not based on an IEC standard or IEC requirements. The Technical Harmonization Committee identified two main reasons the requirements in this standard were not harmonized with IEC requirements. First, for some products and assemblies covered by this standard, there are no corresponding IEC standards covering the specific products only. Instead, IEC requirements for these products are included under several separate IEC standards. The time required to research and identify specific requirements in each of the relevant IEC correlating standards would inhibit the completion of the harmonization project in a reasonable time period, and would negate the benefit of having harmonized North American requirements available presently.

The second reason for not harmonizing with IEC requirements is that the IEC standards specify different product and assembly configurations and installation requirements, that are not compatible with the North American product and assembly configurations and installation specifications.

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Cover Plates for Flush-Mounted Wiring Devices

1 Scope

1.1 This standard applies to metallic and nonmetallic cover plates and associated gaskets for flush-mounted wiring devices intended for installation in accordance with the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1, General Requirements – Canadian Electrical Code, Part II, CSA C22.2 No. 0-10.

1.2 This standard also applies to outlet box hoods that are either integral or not integral with a cover plate for flush-mounted wiring devices.

1.3 This standard also applies to cover plates for flush-mounted wiring devices intended for use in marine applications in accordance with the applicable requirements of the United States Coast Guard and the Canadian Coast Guard; IEEE Recommended Practice for Electrical Installation on Shipboard, IEEE 45; the American Boat and Yacht Council; and the Standard for Pleasure and Commercial Motor Craft, NFPA 302.

1.4 This standard also applies to illuminating cover plates for flush-mounted wiring devices.

1.5 This standard does not apply to:

- a) telephone wall plates;
- b) cover plates and associated gaskets intended for use in hazardous (classified) locations as defined in the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1;
- c) backplates, backplates intended to support live parts, or docking plates intended to support live parts;
- d) box partition; or
- e) cover plates or outlet box hoods intended to provide direct support of live parts, or parts that may become energized.

2 Normative References

2.1 For undated references to Standards, such reference shall be considered to refer to the latest edition and all revisions to that edition up to the time when this Standard was approved. Products covered by this standard shall comply with the referenced installation codes and standards noted in this clause.

In case where the editions listed below are amended, replaced by new editions, or superseded by another standard during the life of this referencing Standard, it is the responsibility of the users of this Standard to investigate the possibility of applying those amendments, new editions, or superseding standards.

CSA Group Standards

C22.1-12
Canadian Electrical Code, Part I

CSA C22.2 No. 0-10
Canadian Electrical Code, Part II

C22.2 No. 0.15-01 (R2012)
Adhesive Labels

CAN/CSA-C22.2 No. 0.17-00 (R2009)
Evaluation of Properties of Polymeric Materials

C22.2 No. 42-10
General Use Receptacles, Attachment Plugs, and Similar Wiring Devices

C22.2 No. 43-08
Lampholders

CAN/CSA-C22.2 No. 94.2-07 (R2012)
Enclosures for Electrical Equipment, Environmental Considerations

C22.2 No. 182.2-M1987 (R2009)
Industrial Locking Type, Special Use Attachment Plugs, Receptacles and Connectors

C22.2 No. 256-05 (R2010)
Direct Plug In Night Lights

UL Standards

UL 50E
Enclosures for Electrical Equipment, Environmental Considerations

UL 94
Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

UL 157
Gaskets and Seals

UL 496
Lampholders

UL 498
Attachment Plugs and Receptacles

UL 746A
Polymeric Materials – Short Term Property Evaluations

UL 746B
Polymeric Materials – Long Term Property Evaluations

UL 746C
Polymeric Materials – Use in Electrical Equipment Evaluations

UL 969
Marking and Labeling Systems

UL 1332
Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment

UL 1786
Direct Plug In Nightlights

UL 8750
Light Emitting Diode (LED) Equipment For Use In Lighting Products

ASME¹ Standard

B94.11
Twist Drills, Straight Shank and Taper Shank Combined Drills, and Countersinks

ASTM² Standards

B117
Standard Method of Salt-Spray (Fog) Testing

D573
Standard Test Method for Rubber Property – Durometer Hardness

D1654
Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

D2240
Standard Test Method for Rubber – Deterioration in an Air Oven

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

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

G155
Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

IEEE³ Standard

IEEE 45
Recommended Practice for Electric Installations on Shipboards

ISO⁴ Standards

ISO 4892-1
Plastics – Methods of Exposure to Laboratory Light Sources – Part 1: General Guidance

ISO 4892-2
Plastics – Methods of Exposure to Laboratory Light Sources – Part 2: Xenon-Arc Lamps
Note: ISO 4892-1 and ISO 4892-2 are considered equivalent to ASTM G151, G153 and G155.

ISO 9227
Corrosion Tests in Artificial Atmospheres – Salt Spray Tests

Note: The neutral salt spray (NSS) test in ISO 9227 is considered equivalent to ASTM B117.

NEMA⁵ Standard

WD6

Wiring Devices – Dimensional Requirements

NFPA⁶ Standard

NFPA 70

National Electrical Code

NFPA 302

Fire Protection Standard for Pleasure and Commercial Motor Craft

¹ American Society of Mechanical Engineers

² American Society for Testing and Materials

³ Institute of Electrical and Electronics Engineers

⁴ International Organization for Standardization

⁵ National Electrical Manufacturers Association

⁶ National Fire Protection Association

3 Terms and Definitions

3.1 Cover plate for flush-mounted wiring devices – a cover intended to close the flush-device box and cover the edges of the wall opening in which the box is located. The cover is either a blank plate or a plate intended to be fastened directly to a wiring device. See [Figure 1](#).

Note: In this standard, the term "cover plate" refers to "cover plate for flush-mounted wiring devices."

3.2 DEVICE: A unit of an electrical system that is intended to carry, not utilize, electrical energy.

3.3 DRIPPROOF: A designation of a marine-use product that is constructed or so protected that falling drops of liquid or solid particles striking the enclosure, from 0 – 15° downward from vertical, do not interfere with the intended operation of the equipment.

3.4 ELASTOMER: Rubber or any polymer that has properties similar to those of rubber (also referred to as solid elastomer in this standard).

3.5 FLUSH-DEVICE BOX: A box with provision for mounting one or more flush wiring devices.

3.6 OUTLET BOX HOOD: A product intended to fit over a cover plate for flush-mounted wiring devices, or an integral component of an outlet box or cover plate for flush-mounted wiring devices. The hood does not serve to complete the electrical enclosure; it reduces the risk of water coming in contact with electrical components housed within, such as attachment plugs, current taps, surge protective devices, direct plug-in transformer units, or wiring devices.

3.7 OUTLET BOX HOOD, REATTACHABLE: An outlet box hood that comes off without damage under a degree of force and can be reattached without the use of tools.

3.8 OUTLET BOX HOOD, RETRACTABLE: An outlet box hood that can be either in the extended position (when in use) or in the retracted position (when not in use).

3.9 RECEPTACLE: One or more female contact devices on the same yoke installed at an outlet for the connection of one or more attachment plugs.

3.10 RECEPTACLE, DUPLEX: Two female contact devices on the same yoke installed at an outlet for the connection of two attachment plugs.

3.11 RECEPTACLE, FLUSH: A receptacle provided with means for flush mounting on a standard flush-device box or cover plate.

3.12 RECEPTACLE, ISOLATED GROUND: A receptacle having the grounding terminal electrically isolated from the means to which it is mounted.

3.13 RECEPTACLE, SINGLE: One female contact device with no other contact device on the same yoke installed at an outlet for the connection of one attachment plug.

3.14 WATERTIGHT: A designation of a marine-use product that is constructed to prevent water from entering the enclosure under any condition other than submersion.

4 General Requirements

4.1 A component of a product covered by this standard shall comply with the requirements for that component.

4.2 The values given in SI (metric) units shall be normative. Any other values given shall be for information purposes only.

4.3 A cover plate or outlet box hood that is used with a receptacle shall not hinder the complete seating of an attachment plug of the type intended for use with the receptacle.

Exception: A kit or assemblies encompassing receptacles and nonmetallic faceplates that cover the receptacle face, where the plate cannot be installed on any other receptacle is permitted, provided all of the following conditions are met:

- a) The receptacle and cover shall be produced by the same manufacturer and evaluated as an assembly,
- b) The assembly shall be evaluated for compliance to requirements in this Standard, and also the Standard for Attachment Plugs and Receptacles, UL 498;
- c) The receptacle and cover shall be permanently attached or uniquely constructed by employing two keying methods to prevent securement of the non-metallic cover to any other receptacle; and
- d) The assembly shall be marked in accordance with [5.1.5](#), and provided with installation instructions in accordance with [5.5.6](#).

4.3A An outlet box hood that is intended for use with receptacles of 15 and 20 A in a wet location and marked according to either option in Clause [5.3.4](#), shall be of the extra-duty type and shall be marked in accordance with Clause [5.3.8](#).

4.4 A cover plate intended for use with a flush-mounted wiring device of the dimensions specified in ANSI/NEMA WD6 shall have cover plate dimensions that comply with ANSI/NEMA WD6 for features intended to accommodate the flush-mounted wiring device.

4.5 In applying the appropriate requirements in this standard, consideration shall be given to parts of assemblies as described in [Figure 1](#).

4.6 The cover plate may be constructed of one or more parts to complete the kit or assembly.

5 Marking and Instructions

5.1 General marking

Advisory Note: In Canada, there are two official languages, English and French. Annex D lists acceptable French translations of the markings specified in this standard. All markings required by this standard might have to be in other languages to conform with the language requirements where the product shall be used.

5.1.1 A cover plate or outlet box hood shall be plainly marked with the manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product is identified. The catalog number or an equivalent designation shall appear on the product, the smallest unit shipping carton, or other container in which the product is packaged.

5.1.2 In the case of a manufacturer that produces or assembles products at more than one factory, each finished product shall have a distinctive marking to identify it as a product of a particular factory.

5.1.3 A product that has been evaluated for environmental conditions shall be marked with the environmental type number or numbers, as specified in UL 50E and CAN/CSA C22.2 No. 94.2, indicating the external conditions for which it is rated.

5.1.4 All required markings shall be permanent and legible. The following types of markings or the equivalent are determined to be permanent:

- a) etched;
- b) molded;
- c) die-stamped;
- d) paint stenciled; or
- e) indelibly stamped on a pressure-sensitive label secured by adhesive and complying with UL 969 and CSA C22.2 No. 0.15 of a type appropriate for the application.

5.1.5 Assemblies encompassing receptacles and nonmetallic covers of the construction described in the Exception to [4.3](#), but which are not permanently attached receptacle/cover assemblies, shall be clearly and indelibly marked "CAUTION – Risk of Electric Shock or Fire Replace Receptacle only with Receptacle Model/Catalog Number _____", "Replace Receptacle only with Manufacturer's Specified Direct Replacement Receptacle (as Identified on Receptacle)" or the equivalent. The wording in parentheses is optional.

5.2 Marking for gaskets intended for use with cover plates in dry locations to reduce the flow of environmental air

5.2.1 A gasket that is not packaged with a cover plate shall be plainly marked with the manufacturer's name or identification.

5.2.2 The smallest unit shipping carton or other container in which a gasket is packed shall be marked as follows:

- a) For Use in Dry Locations Only;
- b) CAUTION;
- c) Risk of Fire; and
- d) Do Not Use With Dimmers.

5.3 Markings for cover plates and outlet-box hoods for use in wet and damp locations

5.3.1 The required markings in Clauses [5.3.2](#) to [5.3.6](#) shall be located where visible after installation. When a cover plate and an outlet box hood are shipped together, the markings required in Clauses [5.3.2](#) to [5.3.4](#) shall be placed on the cover plate, outlet box hood, or both.

5.3.2 A cover plate for use in wet locations shall be marked "Wet Locations." The cover plate may be additionally marked "Damp Locations."

5.3.3 A cover plate for use in wet locations only with the cover closed, shall be marked "Wet Location Only When Cover Closed" or the equivalent. The cover plate may be additionally marked "Damp Locations."

5.3.4 An outlet box hood for use in wet locations shall be marked (see Clause [8.1.2](#)) either:

- a) "Wet Locations" or the equivalent; or
- b) "Wet Locations Only When Hood Closed" or the equivalent.

An outlet box hood for use in wet locations may be additionally marked "Damp Locations."

5.3.5 An outlet box hood marked in accordance with Clause [5.3.4](#) (b), having a reattachable hood and tested according to Clauses [8.9.1.3](#) and [8.10.1.2](#), shall be additionally marked "Reattachable".

5.3.6 A cover plate or outlet box hood for use in damp locations only shall be marked "Damp Locations."

5.3.7 A cover plate or outlet box hood that complies with the performance requirements for the resistance to moisture test specified in Clause [8](#) due to its mounting orientation shall be marked with the proper mounting orientation. The marking is not required for products intended to be mounted with the hinge at the top.

5.3.8 An outlet box hood that is intended for use with receptacles of 15 and 20 A in a wet location shall be marked "Extra-Duty." Other outlet box hoods that comply with the applicable requirements in Clauses [8.9.1.4](#), [8.9.2](#), [8.9.3](#), [8.10.2](#), and [8.10.3](#) may be marked "Extra-Duty."

5.3.9 The smallest unit shipping carton for parts and installation materials for wet and damp location use that are shipped separately in bulk shall be marked "For Original Equipment Manufacturer Use Only," or the equivalent.

5.4 Markings for marine use

5.4.1 The cartons used to ship marine-use products, or the shipping labels, shall be marked "Rated For Marine Use," or the equivalent.

5.4.2 The product on the smallest unit shipping carton in which it is packed shall be marked with the terms "Watertight" or "Dripproof," as applicable.

5.5 General installation instructions

5.5.1 Cover plates for flush-mounted wiring devices and outlet box hoods shall be provided with legible instructions pertaining to proper assembly and installation.

5.5.2 All parts required for compliance with the applicable resistance to moisture requirements in Clause [8.1](#) shall be provided in a single unit carton with installation and assembly instructions, except as permitted in Clauses [5.5.3](#) and [5.5.4](#).

5.5.3 Parts that function to exclude water and installation material shipped separately from other parts of the assembly shall comply with Clause [5.5.2](#) when:

- a) the parts and installation material are specified in the installation instructions;
- b) the part is not a gasket that functions to exclude water; and
- c) the sealing compound is clearly and specifically identified in the installation instructions.

5.5.4 Parts and installation materials may be shipped separately in bulk when the smallest unit shipping carton is marked in accordance with Clause [5.3.9](#). At least one set of installation and assembly instructions shall be provided with the smallest unit shipping carton.

5.5.5 With reference to Clause [5.5.1](#), the installation instructions shall specify the appropriate mounting surface or surfaces and sealing method and indicate whether or not the outlet box hood or cover plate is intended for use with a box that is raceway supported.

5.5.6 Assemblies encompassing receptacles and nonmetallic receptacle covers that employ a construction as described in the Exception to [4.3](#) shall be provided with installation instructions for replacing the receptacles that include specific replacement receptacle specifications. The instructions shall also contain the following: "CAUTION – Risk of Electric Shock or Fire – Replace Receptacle only with Receptacle Model/Catalog Number _____", "Replace Receptacle only with Manufacturer's Specified Direct Replacement Receptacle (as Identified on Receptacle)" or the equivalent. The wording in parentheses is optional.

6 Metallic Cover Plates and Outlet Box Hoods

6.1 General

6.1.1 An opening for a receptacle shall be such that the face of the receptacle projects a minimum of 0.38 mm (0.015 inches) outside the outer plane of the opening. The receptacle used to determine compliance with this requirement shall comply with the receptacle dimension requirements in NEMA WD6 and in CSA C22.2 No. 42, CSA C22.2 No. 182.2, or UL 498.

6.1.2 The material thickness of a cover plate shall not be less than 0.76 mm (0.030 inches) for ferrous metal (including stainless steel) or 1.0 mm (0.040 inches) for nonferrous metal.

6.2 Corrosion protection

6.2.1 General

6.2.1.1 All ferrous metal surfaces shall have corrosion protection. The thickness of the coating on screws and on interior surfaces not accessible to a 19.1 mm (0.75 inches) diameter ball is not specified. The presence of a coating shall be determined by visual inspection.

6.2.1.2 With reference to Clause [6.2.1.1](#), stainless steel having a chromium content of not less than 16 percent is not required to be so protected.

6.2.1.3 With reference to Clause [6.2.1.1](#), cut edges and punched holes in a surface formed from galvanized stock are not required to be so protected.

6.2.1.4 With reference to Clause [6.2.1.1](#), spot or projection welds are not required to be protected, other than by a protective coating, as determined by visual inspection.

6.2.2 Zinc coatings

6.2.2.1 A zinc coating on an interior surface shall have an average thickness not less than 0.0038 mm (0.00015 inches) and a minimum thickness not less than 0.003 mm (0.0001 inches). A zinc coating on an exterior surface shall have an average thickness not less than 0.013 mm (0.0005 inches) and a minimum thickness not less than 0.0102 mm (0.0004 inches).

6.2.2.2 The thickness of a zinc coating on three samples of cover plate or outlet box hood shall be determined by the metallic coating thickness test specified in Clauses [6.2.2.3](#) to [6.2.2.11](#) or by an equivalent nondestructive test method. When a test method other than the test in Clauses [6.2.2.3](#) to [6.2.2.11](#) is used, the test in Clauses [6.2.2.3](#) to [6.2.2.11](#) shall be used whenever referee measurements are required.

6.2.2.3 The solution used for the test shall be made from distilled water and shall contain 200 g/L of American Chemical Society (ACS) reagent grade chromic acid (CrO_3) and 50 g/L of ACS reagent grade concentrated sulfuric acid (H_2SO_4). The latter is equivalent to 27 mL/L of reagent grade concentrated sulfuric acid, specific gravity 1.84, containing 96 percent of H_2SO_4 .

6.2.2.4 The test solution shall be contained in a glass vessel such as a separatory funnel with the outlet equipped with a stopcock and a capillary tube having an inside bore of 0.64 mm (0.025 inches) and a length of 140 mm (5.5 inches). The lower end of the capillary tube shall be tapered to form a tip, the drops of which are about 0.05 mL each. To preserve an effectively constant level, a small glass tube shall be inserted in the top of a funnel through a rubber stopper and its position shall be adjusted so that, when the stopcock is open, the rate of dropping is 100 ± 5 drops per minute. Use of an additional stopcock in place of the glass tube to control the rate of dropping shall comply with the requirement.

6.2.2.5 The samples and the test solution shall be kept in the test room long enough to acquire the temperature of the room, which shall be noted and recorded. The test shall be conducted at an ambient temperature of $21.0 - 32.0^\circ\text{C}$ ($70.0 - 90.0^\circ\text{F}$).

6.2.2.6 Each sample shall be cleaned before testing. All grease, lacquer, paint, and other nonmetallic coatings shall be removed completely by means of solvents. Samples shall then be thoroughly rinsed in water and dried with a clean cloth. Care shall be exercised to avoid contact of the cleaned surface with the hands or any foreign matter.

6.2.2.7 The sample to be tested shall be supported 17.8 mm – 25.4 mm (0.7 inches – 1.0 inches) below the orifice, so that the drops of solution strike the point to be tested and run off quickly. The surface to be tested shall be inclined 45° from the horizontal.

6.2.2.8 After cleaning, the sample to be tested shall be put in place under the orifice. The stopcock shall be opened and the time in seconds shall be measured until the dropping solution dissolves the protective metallic coating, exposing the base metal. The end point shall be the first appearance of the base metal, recognizable by the change in color.

6.2.2.9 Each sample shall be subjected to the test at three or more points, excluding cut, stenciled, and threaded surfaces on the inside surface, and at an equal number of points on the outside surface, at places where the metallic coating is expected to be the thinnest.

6.2.2.10 To calculate the thickness of the coating being tested, use [Table 1](#) to specify the thickness factor appropriate for the temperature at which the test was conducted, multiply by 0.0003 mm (0.00001 inches), and then multiply by the time in seconds required to expose the base metal as measured in [Clause 6.2.2.8](#).

6.2.2.11 The average zinc coating thickness shall be determined by averaging all readings on the three tested surfaces.

6.2.3 Coatings other than zinc

6.2.3.1 A cover plate or outlet box hood intended for use in wet locations shall comply with [Clauses 6.2.3.4](#) to [6.2.3.15](#). A cover plate or outlet box hood not intended for use in wet locations shall comply with [Clauses 6.2.3.7](#) to [6.2.3.15](#).

6.2.3.2 Fifty specimens of 102 mm x 305 mm (4 in x 12 inches) steel panels shall be prepared with the corrosion protection system. The thickness of the specimens is not specified. In the event steel panels are not available, the specimens shall be constructed of the finished product. Thirty specimens shall be tested. The additional specimens shall be used in case of damage to the original specimens during preparation or handling.

6.2.3.3 The edges or bare surfaces of all panels or finished products shall be covered with moisture-resistant tape or compound. Half of the specimens to be exposed shall be scribed in accordance with ASTM D1654. The specimens shall be free of grease or dirt. The coating thickness of each specimen shall be measured prior to exposing them to the test environments.

6.2.3.4 When subjected to the resistance to ultraviolet light and water test requirements in accordance with [Clause 6.2.3.5](#) to [6.2.3.6](#):

- a) the average creeping distance of corrosion products from the scribe of a scribed specimen shall not be greater than Rating No. 6 [1.6 mm – 3.2 mm (1/16 inches – 1/8 inches)] as designated in Procedure A, Method 2 of ASTM D1654 with maximum isolated spot not exceeding 9.5 mm (3/8 inches). There shall not be visual evidence of pitting of the substrate and only the beginning of a buildup of corrosion products beneath the coating uplifted from the scribe of a scribed specimen; and
- b) an unscribed specimen shall not show base metal corrosion or any blisters.

6.2.3.5 Three scribed and three unscribed specimens shall be exposed to ultraviolet light and water according to ISO 4892-2.

Note 1: General guidance is provided in ISO 4892-1.

The samples shall be exposed for 500 hours to xenon-arc, method A. There shall be continuous exposure to light and intermittent exposure to water spray. The cycle shall consist of 102 minutes without water spray and 18 minutes with water spray. The apparatus shall operate with an air or water-cooled xenon-arc lamp, borosilicate glass inner and outer optical filters, a spectral irradiance of 0.35 W/(m²·nm) at 340 nm and a black-panel temperature of (65 ±3)°C.

Note 2: Consideration should be given to prior evaluations using twin enclosed carbon-arc, Type DH, in accordance with ASTM G151 and ASTM G153, Method 1, specimens tested for exposure for a total of 360 hours as being equivalent to this test.

Note 3: Consideration should be given to prior evaluations using xenon arc in accordance with ASTM G151 and ASTM G155 as being equivalent to this test.

6.2.3.6 When subjected to the neutral salt spray (fog) test requirements in accordance with Clauses [6.2.3.7](#) to [6.2.3.9](#):

a) the average creeping distance of corrosion products from the scribe of a scribed specimen shall not be greater than Rating No. 5 [3.2 mm – 4.8 mm (1/8 in – 3/16 inches)] as designated in Procedure A, Method 2, of ASTM D1654 with maximum isolated spot not exceeding 9.5 mm (3/8 inches); and

b) an unscribed specimen shall not show more than a light corrosion beneath the coating system, with no visual pitting of the substrate and only the beginning of a buildup or weeping of corrosion products.

6.2.3.7 Six scribed and six unscribed specimens of each coating system shall be conditioned for 240 hours at a temperature of $87 \pm 2^{\circ}\text{C}$ ($189 \pm 4^{\circ}\text{F}$) in an air-circulating oven.

6.2.3.8 Six as-received and six air-oven conditioned specimens shall be exposed to the neutral salt spray (fog). Three of the as-received and three of the air-oven conditioned specimens shall be scribed as described in Clause [6.2.3.3](#).

6.2.3.9 The specimens shall be exposed to neutral salt spray (NSS) for 600 h in accordance with ISO 9227.

Note: Consideration should be given to prior evaluations using salt spray according to ASTM B117 as being equivalent to this test.

6.2.3.10 When subjected to the resistance to the moist carbon dioxide-sulfur dioxide-air test requirements in accordance with Clauses [6.2.3.11](#) to [6.2.3.14](#):

a) the average creeping distance of corrosion products from the scribe of a scribed specimen shall not be greater than Rating No. 6 [1.6 mm – 3.2 mm (1/16 in – 1/8 inches)] as designated in Procedure A, Method 2, of ASTM D1654 with maximum isolated spot not exceeding 9.5 mm (3/8 inches); and

b) an unscribed specimen shall not show more than a light corrosion beneath the coating system, with no visual pitting of the substrate and only the beginning of a buildup or weeping of corrosion products.

6.2.3.11 Six scribed and six unscribed specimens of each coating system shall be conditioned for 240 hours at a temperature of $87 \pm 2^{\circ}\text{C}$ ($189 \pm 4^{\circ}\text{F}$) in an air-circulating oven.

6.2.3.12 Six as-received and six air-oven conditioned specimens shall be exposed to the moist carbon dioxide-sulfur dioxide-air. Three of the as-received and three of the air-oven conditioned specimens shall be scribed as described in Clause [6.2.3.3](#).

6.2.3.13 The specimens shall be exposed to a mixture consisting of moist carbon dioxide-sulfur dioxide-air for 1200 hour. The apparatus used for this exposure shall consist of a chamber having a volume of at least 0.085 m^3 (3 feet³) with a water jacket and thermostatically controlled heater to maintain a temperature of $35 \pm 2^{\circ}\text{C}$ ($95 \pm 4^{\circ}\text{F}$).

6.2.3.14 The carbon dioxide and sulfur dioxide shall be supplied to the test chamber from commercial cylinders containing the gases under pressure. An amount of carbon dioxide equivalent to 1 percent of the volume of the test chamber and an equal volume of sulfur dioxide shall be introduced into the chamber each working day. Prior to introducing the new charge of gas each day, the remaining gas-air mixture from

the previous day shall be purged from the chamber. A small amount of water shall be maintained at the bottom of the chamber for humidity. This water shall not be changed during the exposure. The specimens shall be supported in plastic racks at an angle of 15° from the vertical.

6.2.3.15 A polymeric material used as a coating other than zinc coating shall be subjected to identification of the compound using infrared spectroscopy (IR), thermogravimetric analysis (TGA), and differential scanning calorimetry (DSC) in accordance with UL 746A or CSA C22.2 No. 0.17. A compound that has been subjected to a separate identification investigation need not be re-identified.

An organic material used as a coating other than zinc coating shall be subjected to identification of the compound using infrared spectroscopy (IR) in accordance with UL 1332. A compound that has been subjected to a separate identification investigation need not be re-identified.

6.3 Bonding

6.3.1 A cover plate or outlet box hood shall have provision for bonding to ground. Using the cover plate mounting means to accomplish this bonding shall comply with the requirement.

7 Nonmetallic cover plates and outlet box hoods

7.1 General

7.1.1 An opening for a receptacle shall be such that the face of a receptacle is flush with or projects from the outer plane of the opening in the cover plate. The receptacle used to determine compliance with this requirement shall comply with the receptacle dimension requirements in NEMA WD6 and in CSA C22.2 No. 42, CSA C22.2 No.182.2, or UL 498.

7.1.2 Tests conducted on a blank cover plate shall represent a line of cover-plate configurations of the same or greater dimensions. When a blank cover plate is not available in a line of cover plates, tests conducted on a device plate having the least device opening area of the available configurations shall comply with the requirement. When testing a device plate to the requirements of Clauses 7.5 and 7.6, the device opening shall be filled in with a material having a resistance to heat or flaming equal to or greater than that of the plate material – for example, sodium silicate. For the mechanical strength test specified in Clause 7.8 and the deformation resistance test specified in Clause 7.10, a single gang cover plate intended for mounting to standard duplex receptacles shall represent a line of cover plates.

7.1.3 For the mold stress relief test specified in Clause 7.9, a blank cover plate shall represent a line of cover plates of the same outside dimensions. A cover plate of phenolic or urea composition with a minimum thickness of 2.54 mm (0.1 inches) is not required to be tested.

7.2 Relative thermal index

7.2.1 A polymeric material that is used for a cover plate or outlet box hood shall have a relative thermal index electrical of 80°C, mechanical impact of 60°C, and mechanical strength (without impact) of 80°C minimum. The relative thermal index shall be determined in accordance with the method for relative thermal index, based upon long-term thermal-aging programs, described in UL 746B and CSA-C22.2 No. 0.17.

7.3 Resistance to ignition tests for cover plates

7.3.1 Deleted

7.3.2 Deleted

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7.3.7 Deleted

7.3.8 The resistance to ignition tests for cover plates shall be conducted using finished cover plates or samples of material representative of finished cover plates. Testing both the finished cover plates and cover plate material samples is not required. Therefore when required, only one of the resistance to ignition tests, either the glow-wire resistance to ignition test or the hot-wire resistance to ignition, is to be conducted.

7.3.9 A finished cover plate shall not ignite in less than 30 seconds when tested for glow-wire resistance to ignition as described in [7.3.10](#).

7.3.10 To test a sample of the material of the cover plate, two 12.7 mm x 127 mm (0.50 x 5.0 inches) specimens of the material in sheet form, having a thickness not more than the minimum thickness used for the cover plate, shall be tested in accordance with the requirements for glow-wire resistance to ignition described in UL 746A or CSA-C22.2 No. 0.17. To test a finished sample of the cover plate, the cover plate shall be tested in accordance with the glow-wire end-product test in UL 746A or CSA-C22.2 No. 0.17.

7.3.11 A finished cover plate of phenolic or urea composition with a minimum thickness of 2.54 mm (0.1 inches) is not required to be tested.

7.3.12 A polymeric material sample, representing a cover plate, shall not ignite in less than 15 seconds when tested for hot-wire resistance to ignition as described in [7.3.13](#).

7.3.13 Three 12.7 mm x 127 mm (0.50 x 5.0 inches) samples of the polymeric cover plate material in sheet form having a thickness of not more than the minimum thickness used for the cover plate shall be tested in accordance with the requirements for hot-wire ignition described in UL 746A and CSA-C22.2 No. 0.17.

7.4 Dielectric voltage-withstand test for cover plates

7.4.1 When subjected to the dielectric voltage-withstand test requirements in accordance with Clause [7.4.2](#), a molded material used for a cover plate shall withstand for 1 minute without breakdown the application of a 60 Hz, sinusoidal potential of 2500 V ac. A cover plate molded of a material that has been found to withstand a 60 Hz, sinusoidal potential of at least 2500 V ac, or a cover plate of phenolic or urea composition with a minimum thickness of 2.54 mm (0.1 inches), is not required to be tested.

7.4.2 Six cover plates shall be subjected to the application of a 60 Hz, sinusoidal potential of 2500 volts ac across the thinnest section of the cover plate. Each sample shall then be conditioned for 24 hour in moist air having a relative humidity of 85 ±5 percent at a temperature of 32 ±2°C (90 ±4°F). Following this conditioning, each sample shall again be subjected to the specified test potential.

7.5 Flame penetration for cover plates

7.5.1 When subjected to the flame penetration test requirements in accordance with Clause [7.5.3](#):

- a) a cover plate shall not openly flame for more than 1 minute after the fifth application of the test flame;
- b) there shall not be visible flame on the surface of the cover plate opposite the surface to which the test flame is applied; and
- c) there shall not be an opening through the cover plate after the test.

7.5.2 A material designated 5VA is not required to be tested.

7.5.3 Six cover plates shall be tested. Three shall be tested as-received and three shall be tested after being conditioned for 168 hours at a temperature of 90°C (194°F) in an air-circulating oven. Each sample shall be subjected to the test described in Clauses [7.6.5](#) to [7.6.9](#), except that the valve supplying the gas shall be opened for 5 seconds and closed for 5 seconds in each of the five applications of the flame.

7.6 Flammability

7.6.1 When subjected to the flammability test requirements in accordance with Clauses [7.6.4](#) to [7.6.9](#), a cover plate shall not openly flame for more than 1 minutes after the fifth application of a standard test flame. Penetration of the flame through the specimen is allowed.

7.6.2 A material designated 5VA or 5VB is not required to be tested.

7.6.3 An outlet box hood, removable appendage, hinged cover, boot, or similar part that is intended solely to restrict the exposure of a device opening to moisture shall be tested in accordance with the HB burning test described in UL 94 or CAN/CSA C22.2 No. 0.17. The material of an outlet box hood, removable appendage, hinged cover, boot, or similar part, that is designated HB and intended solely to restrict the exposure of a device opening to moisture is not required to be tested.

7.6.4 Six specimens shall be tested. Each specimen shall be one of the following:

- a) a square plaque having minimum dimensions 102 x 102 mm (4 x 4 inches) and a thickness not exceeding the minimum thickness of the cover plate;
- b) a circular plaque having a minimum diameter of 114 mm (4.5 inches) and a thickness not exceeding the minimum thickness of the cover plate; or
- c) a finished blank cover plate.

7.6.5 The test shall be conducted in a three-sided enclosure that is 305 mm (12 inches) wide, 356 mm (14 inches) deep, and 610 mm (24 inches) high. The top and front of the enclosure shall be open. The room or hood in which the enclosure is located for the test shall be ventilated, but drafts shall be prevented from affecting the test flame.

7.6.6 A Tirrill gas burner to which a gas pilot light is attached shall supply the test flame. The barrel of the burner shall extend 102 mm (4 inches) above the air inlets, and its inside diameter shall be 9.5 mm (3/8 inches). The gas supplied for the flame shall produce $37.63 \pm 0.37 \text{ MJ/m}^3$ ($1010 \pm 10 \text{ Btu/ft}^3$). With the barrel vertical, the overall height of the flame shall be adjusted to 127 mm (5 inches). The blue inner cone shall be 38.1 mm (1-1/2 inches) high. Without disturbing the adjustments for the height of the flame, the valves supplying gas to the burner and pilot flames shall be closed.

7.6.7 A wedge to which the base of the burner can be secured shall be provided for tilting the barrel 20° from the vertical while the longitudinal axis of the barrel remains in a vertical plane. The burner shall be secured to the wedge and the assembly shall be placed in an adjustable jig that is attached to the floor of the enclosure. The jig shall be adjusted laterally (see [Figure 6](#)) to place the longitudinal axis of the barrel in

the same vertical plane as the vertical axis of the specimen. The plane shall be parallel to the sides of the enclosure.

7.6.8 The jig shall be adjusted toward the rear or front of the enclosure (see [Figure 6](#)) to position point A, which is the intersection of the longitudinal axis of the barrel with the plane of the tip of the barrel 38.1 mm (1-1/2 inches) from the point B, at which the extended longitudinal axis of the barrel meets the front surface of the specimen. Point B is the point at which the tip of the inner blue cone will touch the specimen. The specimen shall be adjusted vertically to place point B at the center of the specimen. The specimen shall be located so that the test flame is directed at the outside of the cover plate and does not impinge on any edge or opening of the cover plate.

7.6.9 The valve supplying gas to the pilot shall be opened and the pilot flame lit. The valve supplying gas to the burner shall be opened to apply the flame to the specimen automatically. This valve shall be held open for 15 seconds and then closed for 15 seconds. The procedure shall be repeated four times for a total of five applications of flame to the specimen.

7.7 Aging

7.7.1 When subjected to the aging test requirements in accordance with [Clause 7.7.2](#), there shall not be evidence of cracking of a cover plate after the conditioning. A cover plate of phenolic or urea composition with a minimum thickness of 2.54 mm (0.1 inches) is not required to be tested.

7.7.2 Six samples of a cover plate shall be exposed for 168 hours at a minimum temperature of 90°C (194°F) in an air-circulating oven.

7.8 Mechanical strength for cover plates

7.8.1 When subjected to the mechanical strength test requirements in accordance with [Clauses 7.8.2](#) to [7.8.4](#), a cover plate shall not crack while subjected to the compressive force and shall not be permanently deformed such that the center of the plate is displaced more than 1.6 mm (0.0625 inches) from its initial position. A cover plate of phenolic or urea composition with a minimum thickness of 2.54 mm (0.1 inches) is not required to be tested.

7.8.2 Samples used for the mechanical strength test:

- a) shall be aged in accordance with [Clause 7.7.2](#) and shall be conditioned for 168 hours at 50 percent relative humidity at a minimum temperature of 23 ±2°C (73 ±4°F) in an air-circulating oven prior to the application of the compressive force; or
- b) shall be untested samples conditioned for 168 hours at a minimum temperature of 60°C (140°F) in an air-circulating oven prior to the application of the compressive force.

7.8.3 Each sample shall be placed face up and centrally located on two parallel 6.35 mm (0.250 inches) diameter steel rods of such length that they extend beyond the extremities of the plate, and are spaced 60 mm (2.375 inches) apart with the short edge of the plate parallel to the rods. A third, 6.35 mm (0.25 inches) diameter rod of similar length shall be placed on the face of the plate midway between and parallel to the other rods. The assembly shall be placed in a compression machine, the jaws of which close at the rate of 12.7 mm/minute (0.50 in per minute) (see [Figure 2](#)). The compressive force shall be applied until one of the following is obtained:

- a) a displacement of 6.35 mm (0.25 inches); or
- b) a force of 111 N (25 lb).

The test shall be repeated with the long edges parallel to the rods.

7.8.4 The displacement of the cover plate from its original position shall be measured when the force is removed.

7.9 Mold stress relief for dry locations cover plates

7.9.1 When subjected to the mold stress relief test requirements in accordance with Clause [7.9.2](#), a cover plate shall not show evidence of distortion by an amount greater than or equal to 1.6 mm (0.0625 inches).

7.9.2 Six samples of a cover plate shall be exposed for 7 hours to a temperature of 90°C (194°F) in an air-circulating oven. The distortion of the cover plate shall then be determined by placing the cover plate face up on a flat surface and comparing the plate to the surface.

7.10 Deformation resistance for cover plates

7.10.1 When subjected to the deformation resistance test requirements in accordance with Clauses [7.10.2](#) and [7.10.3](#), the displacement of a cover plate shall not exceed 15.2 mm (0.60 inches) during the application of the test force. The cover plate shall return to within 1.6 mm (0.0625 inches) of the face of the fixture when the test force is removed. A cover plate of phenolic or urea composition with a minimum thickness of 2.54 mm (0.1 inches) is not required to be tested.

7.10.2 Six samples conditioned in accordance with Clause [7.8.2](#), and not previously tested, shall be evaluated when mounted in the test fixture shown in [Figure 3](#). The cover plate shall be mounted to a duplex receptacle in the fixture with the cover plate screw or mounting means provided by the manufacturer. One corner of the plate shall then be subjected to a force of 8.9 N (2 lbs) tending to displace the cover plate from the face of the fixture. While the test force is applied, the displacement of the corner of the cover plate shall be measured. In the event that a duplex receptacle plate is not available, a configuration with the longest distance between the fastening point and a corner shall be used.

7.10.3 Within 10 to 15 seconds after the force is removed, the displacement of the cover plate from its original position shall be measured.

8 Wet and Damp Locations

8.1 Resistance to moisture

8.1.1 When subjected to the following resistance to moisture test requirements, samples of a cover plate intended for use in damp or wet locations shall exclude water from:

- a) the enclosure formed by a box and a cover plate; and
- b) the interior of a wiring device.

Resistance to moisture tests applicable to cover plate samples		
Intended installation	No provision for mounting to a receptacle	Provision for mounting to a receptacle
Marked " Wet Locations ", in accordance with Clause 5.3.2	8.2.2^c 8.8.1^d , 8.8.1.1^d , 8.8.1.2^d 8.1.6 8.1.7 (a) 8.1.7 (b)^e 8.1.8 8.1.9 , 8.1.9.1 (b) , 8.1.9.2 8.1.10 , 8.1.10.1 , 8.1.10.2 8.1.11 , 8.1.11.1 , 8.1.11.2 8.1.12	8.2.2^c 8.8.1^d , 8.8.1.1^d , 8.8.1.2^d 8.1.6 8.1.7(a) 8.1.7 (b)^e 8.1.8 8.1.9 , 8.1.9.1 (b) , 8.1.9.2 8.1.10 , 8.1.10.1 , 8.1.10.2 8.1.12
Marked " Wet Locations Only When Cover Closed^a ", in accordance with Clause 5.3.4	8.2.2^c 8.2.2^c 8.8.1^d , 8.8.1.1^d , 8.8.1.2^d 8.1.6 8.1.7(a) 8.1.7(b)^e 8.1.8 8.1.9 , 8.1.9.1(b) , 8.1.9.2 8.1.12	
Marked " Damp Locations^b " Only ^b , in accordance with Clause 5.3.6	8.2.2^c 8.8.1^d , 8.8.1.1^d , 8.8.1.2^d 8.1.6 8.1.7 (a) 8.1.7 (b)^e 8.1.8 8.1.9 , 8.1.9.1 (a) , 8.1.9.2 8.1.12	
<p>^a May be additionally marked "Damp Locations", as permitted by Clause 5.3.2 or Clause 5.3.3.</p> <p>^b Shall not be additionally marked "Wet Locations" or "Wet Locations Only When Hood Closed".</p> <p>^c Conducted on one of the samples, only if a component is positioned or moved in normal use.</p> <p>^d Conducted on ten of the samples, only if nonmetallic.</p> <p>^e Unless restricted by manufacturer's instructions only to mounting in accordance with Clause 8.1.7(a), as permitted by Clause 5.5.5.</p>		

8.1.2 When subjected to the following resistance to moisture test requirements, samples of an outlet box hood intended for use in damp or wet locations shall:

- a) exclude water from the enclosure formed by a box and a cover plate and from the interior of a wiring device; and
- b) prevent water from dripping down from the upper surface of an outlet box hood during the water exposure, as evidenced at the conclusion of the exposure by water droplets clinging to the upper edge of the test assembly or wetness on the uppermost surface of the attachment plug.

Resistance to moisture tests applicable to outlet box hood (assembly) samples		
Intended installation	No provision for mounting to a receptacle	Provision for mounting to a receptacle
Marked " Wet Locations ", in accordance with Clause 5.3.4 ^a	8.2.2 ^c 8.2.2 ^d , 8.8.2.1 ^d , 8.8.2.2 ^d 8.1.6 8.1.7 (a) 8.1.7 (b) ^e 8.1.8 8.1.9 , 8.1.9.1 (b), 8.1.9.2 8.1.10 , 8.1.10.1 , 8.1.10.2 8.1.12	8.2.2 ^c 8.2.2 ^d , 8.8.2.1 ^d , 8.8.2.2 ^d 8.1.6 8.1.7 (a) 8.1.7 (b) ^e 8.1.8 8.1.9 , 8.1.9.1 (b), 8.1.9.2 8.1.10 , 8.1.10.1 , 8.1.10.2 8.1.11 , 8.1.11.1 , 8.1.11.2 8.1.12
Marked " Wet Locations " ^a , in accordance with Clause 5.3.4 a), and marked " Extra Duty ", in accordance with Clause 5.3.8	8.2.2 ^c 8.2.2 ^d , 8.8.2.1 ^d , 8.8.2.2 ^d 8.1.6 8.1.7 (a) 8.1.7 (b) 8.1.8 8.1.9 ^f , 8.1.9.1 (b) ^f , 8.1.9.2 ^f 8.1.10 ^f , 8.1.10.1 ^f , 8.1.10.2 ^f 8.1.12	8.2.2 ^c 8.2.2 ^d , 8.8.2.1 ^d , 8.8.2.2 ^d 8.1.6 8.1.7 (a) 8.1.7 (b) 8.1.8 8.1.9 ^f , 8.1.9.1 (b) ^f , 8.1.9.2 ^f 8.1.10 ^f , 8.1.10.1 ^f , 8.1.10.2 ^f 8.1.11 ^f , 8.1.11.1 ^f , 8.1.11.2 ^f 8.1.12
Marked " Wet Locations Only When Hood Closed " a), in accordance with Clause 5.3.4 (b)	8.2.2 ^c 8.2.2 ^d , 8.8.2.1 ^d , 8.8.2.2 ^d 8.1.6 8.1.7 (a) 8.1.7 (b) ^e 8.1.8 8.1.9 , 8.1.9.1 (b), 8.1.9.2 8.1.12	
Marked " Wet Locations Only When Hood Closed " ^a , in accordance with Clause 5.3.4 b) marked " Wet Locations Only When Hood Closed " ^a , in accordance with Clause 5.3.4 (b) and marked "Extra Duty", in accordance with Clause 5.3.8	8.2.2 ^c 8.8.2 ^d , 8.8.2.1 ^d , 8.8.2.2 ^d 8.1.6 8.1.7 (a) 8.1.7 (b) 8.1.8 8.1.9 ^f , 8.1.9.1 (b) ^f , 8.1.9.2 ^f 8.1.12	
Marked " Damp Locations " ^b ONLY, in accordance with Clause 5.3.6	8.2.2 ^c 8.8.2 ^d , 8.8.2.1 ^d , 8.8.2.2 ^d 8.1.6 8.1.7 (a) 8.1.7 (b) 8.1.8 8.1.9 , 8.1.9.1 (a), 8.1.9.2 8.1.12	

^a May be additionally marked "Damp Locations", as permitted by Clause [5.3.4](#).

Resistance to moisture tests applicable to outlet box hood (assembly) samples		
Intended installation	No provision for mounting to a receptacle	Provision for mounting to a receptacle
<p>^b Shall not be additionally marked "Wet Locations" or "Wet Locations Only When Hood Closed".</p> <p>^c Conducted on one of the samples, only if a component is positioned or moved in normal use.</p> <p>^d Conducted on three of the samples, only if nonmetallic.</p> <p>^e Unless restricted by manufacturer's instructions only to mounting in accordance with Clause 8.1.7 (a), as permitted by Clause 5.5.5.</p> <p>^f If tested on previously-tested samples as permitted by Clause 8.1.4, this test shall be conducted on the sample after conducting tests for Impact Resistance For Outlet Box Hood, Clause 8.9, and Hinge Stress Resistance For Outlet Box Hood Assemblies, Clause 8.10.</p>		

8.1.3 An assembly that includes a cover plate and an outlet box hood may be tested together (see [Figure 1](#)). Consideration shall be given to the requirements in both Clauses [8.1.1](#) and [8.1.2](#).

8.1.4 With the agreement of all parties concerned, samples used previously in non-destructive tests may be used for resistance to moisture tests in Clauses [8.1.9](#) to [8.1.11](#). Samples of an extra duty outlet box hood (see Clause [5.3.8](#)) when subjected to the resistance to moisture tests following the hinge stress tests and impact tests for extra duty outlet box hoods are considered to comply with the requirements in Clause [8.1.2](#) without testing additional samples.

8.1.5 When the resistance to moisture tests specified in Clauses [8.1.9](#) and [8.1.10](#) result in condensation on the inside of the test samples, the test shall be repeated using water of a temperature within 2°C (3.6°F) of the room air temperature to reduce the possible effects of the condensation.

8.1.6 The cover plate or outlet box hood sample shall be installed in accordance with the assembly and installation instructions. A box or enclosure that is used for the test assembly shall have all openings in the sides or back surfaces sealed to trap any water entering the assembly and to preclude the entry of water into the assembly from other than the surface being tested.

8.1.7 When carrying out the tests in Clauses [8.1.9](#) and [8.1.10](#), unless specifically restricted in the manufacturer's instructions according to Clause [5.5.5](#), an outlet box hood shall be tested:

- a) when installed to a flush-mounted box or enclosure in a wall assembly; and
- b) when installed on a raceway supported box or enclosure identified for use in wet locations.

An outlet box hood permitted to be marked "extra duty" according to Clause [5.3.8](#) shall always be tested in both conditions (a) and (b).

An outlet box hood permitted to be marked "extra duty" according to [5.3.8](#) and intended to be used with a raceway-supported enclosure, shall always be subjected to the resistance to moisture tests specified in [8.1.9](#) and [8.1.10](#) with the spray directed at the front of the test assembly and then repeated on a previously untested sample, with the spray directed at the rear of the assembly.

8.1.8 Any convenient method intended to indicate the presence of water, including the use of absorbent paper, shall be used to determine whether water has entered an enclosure or wiring device. A wiring device used in the test assembly shall be modified so that it can be disassembled to facilitate interior inspection after the water exposure.

8.1.9 Cover plates and outlet box hoods for use with or without a receptacle – wet or damp locations downward water spray test

8.1.9.1 In preparation for the test, the cover of a cover plate, or a hood of an outlet box hood:

- a) for use in damp locations only, shall be manually closed and latched where a latch is provided (See Clause [5.3.6](#)); and
- b) for use in wet locations, shall be opened completely and then shall assume its natural position. (See Clauses [5.3.2](#) to [5.3.4](#)).

For a cover plate or outlet box hood intended to be used with a receptacle, the test shall be conducted without an attachment plug in the receptacle.

8.1.9.2 One previously untested cover plate or outlet box hood sample shall be located under three spray heads constructed in accordance with [Figure 4](#) and mounted in a water-supply pipe rack as illustrated in [Figure 5](#). The water pressure at each spray head shall be maintained at 34.5 kPa (5 psi). The sample shall be brought into the focal area of the three spray heads. A flat surface, 0.3 m (1 foot) wide by 0.6 m (2 feet) long, shall be positioned so that the surface is horizontal and 0.3 m (1 foot) below the center line of the sample. A water spray from the spray heads shall be applied to the sample for 1 hour.

8.1.10 Cover plates and outlet box hoods for use with or without a receptacle – wet locations upward water spray test

8.1.10.1 In preparation for the test, the cover of a cover plate marked according to Clauses [5.3.2](#) or [5.3.3](#), or hood of an outlet box hood marked according to Clause [5.3.4](#)(a), shall be opened completely and then shall assume its natural position.

For a cover plate intended to be used with a receptacle, the test shall be conducted without an attachment plug in the receptacle.

8.1.10.2 One previously untested cover plate or outlet box hood sample shall be located 0.9 m (3 feet) horizontally from and 0.6 m (2 feet) above a single spray head constructed in accordance with [Figure 4](#). The water pressure at the spray head shall be maintained at 103.4 kPa (15 psi). The spray head shall be positioned so that the spray is aimed directly at the sample. A water spray from the spray head shall be applied to the sample for 1 hour.

8.1.11 Cover plates and outlet box hoods for use with a receptacle – wet locations water spray tests, supply cord connected

8.1.11.1 For a cover plate marked according to Clause [5.3.2](#) and an outlet box hood marked according to Clause [5.3.4](#)(a) intended to be used with a receptacle in a wet location, the test described in Clause [8.1.9.2](#) shall be repeated on one previously untested sample with a power supply cord connected to the receptacle. A power supply cord of the size specified by the manufacturer shall be installed with the attachment plug completely inserted into the receptacle. Any convenient method of determining the presence of water on the uppermost surface of the attachment plug, such as securing absorbent paper on this surface or using a chemical indicator, shall be used. The cover or hood shall be manually closed and latched where a latch is provided. When a duplex receptacle is used, the test shall be conducted with only one attachment plug. For a vertically oriented duplex receptacle, the attachment plug shall be inserted into the lower receptacle. For a horizontally oriented duplex receptacle, the attachment plug shall be inserted into either outlet. The plug used for the test shall be of the type intended for use with the receptacle.

8.1.11.2 For a cover plate marked according to Clause [5.3.2](#) and an outlet box hood marked according to Clause [5.3.4](#)(a) intended to be used with a receptacle, the test described in Clause [8.1.10.2](#) shall be

repeated on one previously untested sample with a power supply cord connected to the receptacle as described in Clause [8.1.10.2](#).

8.1.12 Immediately following the water spray tests, the outside of the test assembly shall be wiped dry. The test assembly shall be opened and the plug (when used) removed in such a manner that the water does not enter the assembly. The samples shall then be inspected for the presence of moisture according to Clauses [8.1.1](#) or [8.1.2](#) as appropriate.

8.2 Cycling

8.2.1 When subjected to the cycling test requirements in accordance with Clause [8.2.2](#), one sample of a cover plate or outlet box hood with a component that requires positioning or movement in normal use shall not crack, deform, or allow the entrance of water. See Clauses [8.1.1](#) or [8.1.2](#). A cover plate or outlet box hood that cracks, deforms, or is otherwise damaged during the cycling test shall comply with the applicable resistance to moisture tests as specified in Clause [8.1](#) following the cycling test.

8.2.2 A component of a cover plate or outlet box hood that is positioned or moved in normal use shall be subjected to 1000 cycles of operation.

8.3 Mold stress relief

8.3.1 When subjected to the mold stress relief test requirements in accordance with Clause [8.3.2](#), a nonmetallic cover plate, nonmetallic outlet box hood, or any nonmetallic component of a cover plate or outlet box hood shall:

- a) not have any dimension change by more than 10 percent from as-received; and
- b) not undergo warping to the extent that a 1.6 mm (1/16 in) opening exists between the face of a box and the cover or hood.

8.3.2 Six samples of the cover plate or outlet box hood shall be conditioned for 7 hours at a minimum temperature of 90°C (194°F) in an air-circulating oven. The samples shall be mounted to a flush-device box for this test, and gaskets shall not be used for this conditioning. After cooling to room temperature, the samples shall be evaluated.

8.4 Sealing compounds

8.4.1 When tested in accordance with Clauses [8.4.2](#) and [8.4.3](#), a sealing compound provided or specified by the manufacturer to prevent the entrance of water between a cover plate or outlet box hood and the mounting surface shall remain adhered to the surfaces and shall not show evidence of cracking or hardening. A sealing compound that cracks or hardens shall comply with the requirements for the resistance to moisture test specified in Clauses [8.1.1](#) to [8.1.4](#), following the conditioning.

8.4.2 Three test assemblies, each consisting of a cover plate or outlet box hood, an enclosure and/or mounting surface with which it is intended to be used, and the sealing compound, shall be tested. The test assemblies shall be installed in the intended manner. Each assembly shall be conditioned for 168 hours at a minimum temperature of 90°C (194°F) in an air-circulating oven. Following the conditioning, each assembly shall be examined.

8.4.3 Three test assemblies shall be mounted on plywood with a 0.8 mm (1/32 inches) diameter wooden rod, which projects at least 12.7 mm (1/2 inches) beyond the edge of each test assembly, and between the test assembly and the plywood at the center of each side. The compound shall be applied as specified in the installation instructions. The assemblies shall be conditioned for 24 hours at a temperature of minus 20°C (minus 4°F) in an air-circulating oven. Following the conditioning, each assembly shall be examined.

8.5 Resistance to ultraviolet light and water

8.5.1 When subjected to the resistance to ultraviolet light and water test requirements in accordance with Clauses [8.5.3](#) to [8.5.5](#), a nonmetallic cover plate or outlet box hood or any nonmetallic component of a cover plate or outlet box hood that can be exposed to sunlight shall not exhibit deterioration, such as cracking, crazing, or warping, after exposure. This requirement does not apply to the edges of a gasket.

8.5.2 A cover plate molded of a material that is in accordance with the requirements for the ultraviolet light exposure test in UL 746C or the weatherometer test in CSA-C22.2 No. 0.17 is not required to be tested.

8.5.3 A nonmetallic cover plate or outlet box hood or a nonmetallic component of a cover plate or outlet box hood shall be exposed to ultraviolet light and water according to ISO 4892-2.

Note: General guidance is provided in ISO 4892-1.

The samples shall be exposed for 1000 hours to xenon-arc, method A. There shall be continuous exposure to light and intermittent exposure to water spray. The cycle shall consist of 102 minutes without water spray and 18 minutes with water spray. The apparatus shall operate with a water-cooled xenon-arc lamp, borosilicate glass inner and outer optical filters, a spectral irradiance of 0.35 W/(m²·nm) at 340 nm and a black-panel temperature of 63 ±3°C.

Note: Prior evaluations using twin enclosed carbon-arc, Type DH, in accordance with ASTM G151 and ASTM G153, Method 1, specimens tested for exposure for a total of 360 hours are considered to be equivalent to this test.

8.5.4 Three samples or specimens in each color required by Clause [8.5.5](#) shall be mounted or placed in the ultraviolet-light apparatus in such a way that they do not touch each other. After the exposure, the samples or specimens shall be removed from the cylinder and visually compared to unconditioned samples or specimens.

8.5.5 For a material that is to be evaluated in a range of colors, samples or specimens in the natural (when used in this color) and in the most heavily pigmented light and dark colors shall be provided to represent the color range. The test results for all the samples or specimens shall be the same.

8.6 Water absorption

8.6.1 When subjected to the water absorption test requirements in accordance with Clause [8.6.2](#), conditioning of the nonmetallic material in a cover plate, outlet box hood, or component of a cover plate or outlet box hood shall not result in:

- a) any dimension of a specimen, including thickness, changing by more than 3 percent; or
- b) the weight of a specimen increasing by more than 3 percent.

8.6.2 Three specimens of a cover plate or outlet box hood material, each 25.4 mm (1 inches) wide, 76.2 mm (3 inches) long, and having a thickness not more than the minimum thickness of the nonmetallic part, shall be tested. Each specimen shall be dried for 24 hours in a calcium-chloride desiccator. Following the drying, each specimen shall be scribed and then immersed in distilled water at a temperature of 23 ±2°C (73 ±4°F) for 24 hours. After removal from the water, each specimen shall be wiped dry of excess moisture, and the change in the dimensions and weight shall be determined. The percentage of change shall then be calculated in accordance with the method for measuring water absorption of plastics in UL 746A.

8.7 Compression

8.7.1 When subjected to the compression test requirements in accordance with Clause [8.7.2](#), a nonmetallic cover plate, nonmetallic outlet box hood, or any nonmetallic component of a cover plate or outlet box hood shall withstand, without cracking, a compressive force of 1779 N (400 lbs).

8.7.2 Three samples of the cover plate or outlet box hood shall be tested. Each sample shall be conditioned for 7 hours at a temperature of 90°C (194°F) in an air-circulating oven. After removal from the oven, each sample shall be cooled to room temperature for not less than 16 hours and not more than 96 hours. Each sample shall then be placed between two rigid, flat, steel plates of such an area that the face and back of the sample are covered. The sample and the steel plates shall then be placed in a testing machine so that a compressive force is applied in a direction from the face of the sample towards the back. The testing machine shall be such that the jaws close at a rate of 2.54 mm (0.1 inches) per minute. The compression shall be continued until the sample cracks, or until a force of 1779 N (400 lbs) is applied to the sample, whichever occurs first.

A retractable outlet box hood shall be tested with its hood in the extended position. The hood is permitted to retract as a result of the applied force.

8.8 Cold impact

8.8.1 Cold impact for cover plates

8.8.1.1 When subjected to the cold impact test requirements in accordance with Clause [8.8.1.2](#), eight of ten nonmetallic cover plates shall:

- a) not crack to the extent such that a 0.8 mm (1/32 inches) diameter rod can be inserted through the crack; or
- b) comply with requirements in the resistance to moisture test specified in Clauses [8.1.1](#) to [8.1.4](#) as applicable.

8.8.1.2 Ten samples of the cover plate shall be conditioned for 5 hours at a temperature of minus 20°C (minus 4°F) or lower in an air-circulating oven. Within 15 seconds after removal from the conditioning chamber, each sample shall be subjected to the impact described as follows. Each sample shall be placed on 12.7 mm (1/2 inches) thick marine plywood supported by a rigid flat metal plate. The sample shall be placed so that the mounting surface rests on the plywood and the face is exposed to the impact at the location with the greatest potential to incur damage. The impact shall be produced by dropping a cylindrical steel weight 28.6 mm (1-1/8 inches) in diameter and weighing 1.36 kg (3 lbs), through a vertical distance of 279 mm (11 inches). One end of the weight shall have a flat impact surface at least 25.4 mm (1 inches) in diameter and without any sharp edges. A means shall be employed so that the center of the impact surface of the weight is located above the center of the impact location.

8.8.2 Cold impact for outlet-box hoods

8.8.2.1 A non-metallic outlet box hood or an outlet box hood with a non-metallic component shall be subjected to the cold impact test in accordance with Clause [8.8.2.2](#). As a result of the test, the product shall not crack or break.

8.8.2.2 Three samples of the outlet box hood, hinged to the cover plate, shall be tested in accordance with Clause [8.8.1.2](#).

8.8.2.3 A separate set of conditioned cover plates, no hood, shall be impacted in accordance with Clause [8.8.1](#).

8.9 Impact resistance for outlet box hoods

8.9.1 General

8.9.1.1 When subjected to the impact resistance test in accordance with Clauses [8.9.2](#) and [8.9.3](#), an outlet box hood shall remain able to function as intended, and one sample shall be subjected to the applicable resistance to moisture tests specified in Clause [8.1](#). Prior to the tests, the samples of an outlet box hood of nonmetallic material having nonmetallic components, or tested in conjunction with another nonmetallic component such as a nonmetallic cover plate, shall be conditioned for 168 hours at a minimum temperature of 60°C (140°F) in an air-circulating oven. The samples shall then be allowed to cool at room temperature for a minimum of 4 hours before the impact tests.

8.9.1.1A When it is evident after mounting and positioning an outlet box hood as described in Clause [8.9.2](#) and Clause [8.9.3](#), that there is inadequate exposed surface on an outlet box hood for the impact load to strike due to the products design profile, the test is not required to be conducted.

Outlet box hoods intended to be marked "Extra-Duty" per [5.3.8](#) shall be tested for impact resistance without exception.

8.9.1.2 Separate sets of test samples of an outlet box hood that is identified for optional mounting orientations shall be tested in each optional mounting orientation.

8.9.1.3 A reattachable outlet box hood that comes off during the impact resistance test may be reattached prior to additional testing when the product remains operable and undamaged. The outlet box hood shall be marked according to Clause [5.3.5](#).

8.9.1.4 An extra-duty outlet box hood, marked in accordance with Clause [5.3.8](#), shall not come unhinged from its mating part during the impact resistance test even though it can be replaced without impairment of its function. See [Figure 1](#) for a typical assembly employing an outlet box hood.

8.9.1.5 The test fixture shall be of substantially rigid construction to support the unit under test, the additional weight of the test apparatus, and to not lessen the energy during the test. The mounting means to the test fixture, including a box, is not the subject of this test.

8.9.2 Top impact test

8.9.2.1 Three outlet box hoods shall be assembled and mounted as intended and according to the manufacturer's instructions, when provided, to the appropriate enclosure as described in Clause [8.1.6](#). Alternatively, the outlet box hood and cover assembly shall be mounted directly to the test fixture without use of an enclosure. The hoods shall be closed without latching when a latch is provided. No cords or plugs shall be attached.

Note: Mounting of the assembly to the appropriate enclosure described in Clauses [8.1.6](#) to [8.1.12](#) is necessary for conducting the resistance to moisture test.

8.9.2.2 The assembly shall be positioned so that the striking face of the test weight shall impact the top of the hood in front of any hinges or molded collar on the hood. Hinges shall be oriented in the direction where the hood is most likely to be affected by the impact. See [Figure 7](#). The appropriate test weight in (a) or (b) with a 9.5 mm (3/8 inches) by 19.1 mm (3/4 inches) by 152 mm (6 inches) polyurethane striking face shall be dropped from a height of 457 mm (18 inches). The polyurethane striking face shall have a Shore durometer reading of not less than 90 on an A scale:

- a) for extra-duty outlet box hoods the test weight shall be 5.44 kg (12 lbs); and

b) for all other outlet box hoods the test weight shall be 2.72 kg (6 lbs).

8.9.3 Side impact test

8.9.3.1 Following the test in Clause [8.9.2.2](#), the same sample assemblies shall be rotated 90 degrees so that the hinge is on the side with the hood unlatched. The assembly shall be positioned so that the striking face of the test weight shall impact the side of the hood. Hinges shall be oriented in the direction where the hood is most likely to be affected by the impact. The test procedure according to Clause [8.9.2.2](#) shall then be repeated striking the side of the hood in front of any hinges or molded collar using the same test weight. See [Figure 8](#).

8.10 Hinge stress resistance for outlet box hood assemblies

8.10.1 General

8.10.1.1 When subjected to the hinge stress tests in accordance with Clauses [8.10.2](#) and [8.10.3](#), an outlet box hood shall remain able to function as intended, and one sample shall be subjected to the resistance to moisture test specified in Clause [8.1.3](#). Prior to the tests, the samples shall be conditioned for 168 hours at a minimum temperature of 60°C (140°F) in an air-circulating oven. The samples shall then be allowed to cool at room temperature for a minimum of 4 hours before the impact tests.

8.10.1.2 A hood that is designed to be reattachable and that comes off during the hinge stress tests as a result of the tests in either Clause [8.10.2](#) or Clause [8.10.3](#), but shows no visible damage to the hood or the hinge assembly, shall comply with the requirements in Clause [8.10.4](#) using a new set of samples. The hood shall be marked in accordance with Clause [5.3.5](#).

8.10.1.3 An extra-duty outlet box hood shall not come off as a result of the hinge stress tests.

8.10.1.4 Three outlet box hoods shall be assembled and mounted as intended and according to the manufacturer's instructions, when provided, to the appropriate enclosure described in Clause [8.1](#). Alternatively, the outlet box hood and cover assembly shall be mounted directly to a test fixture without use of an enclosure.

8.10.1.5 The test fixture shall be of substantially rigid construction to support the unit under test, the additional weight of the test apparatus, and to not lessen the energy during the test. The mounting means to the test fixture, including a box, is not the subject of this test.

8.10.1.6 The terms horizontal and vertical in Clause [8.10.2](#) and Clause [8.10.3](#), respectively, are intended solely to specify specimen orientations when performing the Hinge Stress Test, and are not intended to specify the manufacturer's intended hinge orientation of the installed product.

8.10.2 Horizontal axis hinge stress test

8.10.2.1 Each sample assembly shall be mounted to the test fixture so that the hinge axis is horizontal, the plane of the outlet box hood is horizontal, and the hood is completely open to its stop or until it will not open any further without undue force. Clearance between the hood and the test fixture shall be such that when the test force is applied, the hood will not contact the test fixture. See [Figure 9](#) or [Figure 10](#).

8.10.2.2 The appropriate force in (a) or (b) below shall be suspended for 5 seconds from the outlet box hood at a location perpendicular to the hinge axis at approximately the farthest point from the center of the hinge and central to the width of the hinge as shown in [Figure 9](#) or [Figure 10](#). The force shall be gradually applied without shock:

a) for extra-duty outlet box hoods the force shall be 18 kg (40 lbs); and

b) for all other outlet box hoods the force shall be 9.0 kg (20 lbs).

8.10.3 Vertical axis hinge stress test

8.10.3.1 The vertical axis hinge stress test shall be conducted on the same samples following completion of the horizontal axis hinge stress test in Clause [8.10.2](#).

8.10.3.2 Each sample assembly shall be mounted to the test fixture so that the hinge axis is vertical, the plane of the outlet box hood is vertical, and the hood is completely open to its stop without undue force. Hinges shall be installed in the direction where the hood is most likely to come apart. Clearance between the hood and the test fixture shall be such that when the test force is applied, the hood will not contact the test fixture. See [Figure 11](#) or [Figure 12](#).

8.10.3.3 The appropriate force in (a) or (b) below shall be suspended for 5 seconds from the outlet box hood at a location parallel to the hinge axis at approximately the farthest point from the center of the hinge as shown in [Figure 11](#) or [Figure 12](#). The force shall be gradually applied without shock:

a) for extra-duty outlet box hoods the force shall be 18 kg (40 lbs); and

b) for all other outlet box hoods the force shall be 9.0 kg (20 lbs).

8.10.4 Minimum hinge stress removal for reattachable outlet box hoods

8.10.4.1 A new set of three outlet- box hoods that are intended to come off when subjected to excessive hinge stress shall be subjected to the horizontal axis hinge stress test in Clause [8.10.2](#) followed by the vertical axis hinge stress test in Clause [8.10.3](#). The test force applied for both tests shall be 2.3 kg (5 lbs). The hood shall not come off as a result of this test force. Following the test, the outlet box hood shall be removed and reassembled five times without damage.

9 Gaskets

9.1 Compression set

9.1.1 When subjected to the compression set test requirements in accordance with Clause [9.1.2](#), the thickness of a gasket shall not be less than five-sixths of its original (before conditioning) thickness. A gasket that complies with the compression set test specified in UL 157 is not required to be tested.

9.1.2 Three specimens, each 29.0 ± 0.5 mm (1.14 ± 0.02 inches) in diameter and 12.7 ± 0.5 mm (0.50 ± 0.02 inches) thick, shall be prepared using as many thicknesses of the material as required. Each specimen shall be conditioned for 24 hours at a temperature of $23 \pm 2^\circ\text{C}$ ($73 \pm 4^\circ\text{F}$) in an air-circulating oven while compressed by one-third its original thickness between flat steel plates. At the end of this period, the specimens shall be removed from between the plates. After an additional 24 hours, the thickness shall be measured at the center of each specimen.

9.2 Hardness

9.2.1 When subjected to the hardness test requirements in accordance with Clause [9.2.2](#), a solid elastomer gasket shall not show apparent deterioration and shall not change in hardness by more than 10 units. A gasket that complies with the hardness test as specified in UL 157 is not required to be tested.

9.2.2 Three samples of a gasket shall be conditioned for not less than 30 minutes at $23 \pm 2^\circ\text{C}$ ($73 \pm 3.6^\circ\text{F}$) and tested as specified in ASTM D2240. The samples shall then be aged for 70 hours at $100 \pm 1^\circ\text{C}$ ($212 \pm 1.8^\circ\text{F}$) in accordance with ASTM D573, conditioned for not less than 16 hours and not more than 96

hours at $23 \pm 2^\circ\text{C}$, and tested again as specified in ASTM D2240. The hardness shall be the average of the three samples.

9.3 Flammability

9.3.1 When subjected to the flammability test requirements in accordance with Clauses [9.3.2](#) to [9.3.4](#), a gasket shall not openly flame for more than 1 minute, and the top edge shall not be consumed after the application of the test flame. A gasket material having a designation HB, HBF, HF-1, HF-2, V-0, V-1, V-2, 5VA, or 5VB, or a gasket that functions only to exclude water from the installed assembly, is not required to be tested.

9.3.2 A gasket intended for use with a flush device shall be installed and secured between a metal cover plate and a flush device.

9.3.3 A gasket intended for use with a blank cover plate shall be installed and secured between a flush-device box and a metal blank cover plate. The box shall be modified so that the test flame can be applied to the gasket.

9.3.4 Three assemblies shall be tested. The test shall be conducted using apparatus in accordance with UL 94 and CSA-C22.2 No. 0.17. The overall height of the flame shall be adjusted to 19 mm (3/4 inches), with no blue inner cone. The flame shall be applied for 5 seconds to the lower corner of the gasket away from any gasket edge.

9.4 Dielectric voltage withstand

9.4.1 When subjected to the dielectric voltage-withstand test requirements in accordance with Clause [9.4.2](#), a gasket shall withstand for 1 minute without breakdown the application of a 60 Hz, sinusoidal potential of at least 1500 V ac. A gasket that functions only to exclude water from the installed assembly, or a gasket of a material that has been found to withstand a 60-Hz, sinusoidal potential of at least 1500 V ac, is not required to be tested.

9.4.2 One sample of the finished gasket or a 102 x 102 mm (4 x 4 inches) square plaque of the gasket material shall be placed between and in contact with two metal plates under minimal compressive force. The voltage shall be increased to 1500 V ac at a rate not exceeding 500 V/seconds and maintained at 1500 V ac for 1 minute.

9.5 Insulation resistance

9.5.1 When subjected to the insulation resistance test requirements in accordance with Clause [9.5.2](#), the resistance between the metal plates shall not be less than 25 M Ω . A gasket that functions only to exclude water from the installed assembly is not required to be tested.

9.5.2 One sample of the finished gasket or 102 x 102 mm (4 x 4 inches) square plaque of the gasket material shall be placed between metal plates as specified for the dielectric voltage-withstand test in Clause [9.4.2](#). The resistance between the plates shall be measured with a 500 V dc megohmmeter at room temperature. Alternatively, a 2500 V dc megohmmeter at room temperature may also be used.

10 Illuminating Cover Plates For Flush-Mounted Wiring Devices

10.1 An illuminating cover plate shall be evaluated in accordance with Annex [B](#).

10.2 An illuminating cover plate with spring-tensioned contacts as defined in Annex [E](#), for flush-mounted receptacles, shall be additionally evaluated in accordance with Annex [E](#).

11 Marine Use

11.1 Watertight

11.1.1 When a cover plate or outlet box hood is subjected to the watertight test in accordance with Clauses [11.1.2](#) and [11.1.3](#), there shall not be evidence of water leakage, and the cover plate or outlet box hood shall be marked as watertight.

11.1.2 One sample of the cover plate or outlet box hood shall be mounted as intended in service, including the method of wiring. A solid stream of water from a 25.4 mm (1 inches) diameter nozzle and at a flow rate of 256 L (65 gallon) per minute, measured at the nozzle, shall be directed at the enclosure from a distance of 3.1 m (10 feet) for 5 minutes.

11.1.3 At the conclusion of the water exposure, any water on the exterior of the test assembly shall be removed with a cloth and the enclosure then opened and examined for any evidence of water.

11.2 Dripproof

11.2.1 When a cover plate or outlet box hood is subjected to the dripproof test requirements in accordance with Clause [11.2.2](#), there shall not be accumulation of water in the enclosure at the conclusion of the test, and the cover plate or outlet box hood shall be marked as dripproof.

11.2.2 One sample of the cover plate or outlet box hood shall be mounted as intended in service, beneath a drip pan that produces both splashing and dripping and extends beyond all exposed sides of the box. The bottom of the drip pan shall be equipped with uniformly distributed spouts; one spout for each 129 cm² (20 in²) of pan area. Each spout shall drip water at a rate of 20 drops per minute. The box to which the cover plate or outlet box hood shall be mounted shall be completely sealed and shall be oriented from 0 – 15° from the vertical, and shall be subjected to continuously dripping water for 30 minutes.

11.3 Gaskets – air oven conditioning

11.3.1 When conditioned in an air oven in accordance with Clause [11.3.2](#), an elastomer shall not crack or show visible evidence of deterioration.

11.3.2 One sample of the elastomer shall be conditioned for 168 hours at a minimum temperature of 100°C (212°F) in an air-circulating oven. At the conclusion of the conditioning, the elastomer shall be removed from the oven, manually flexed, and examined for evidence of visible deterioration.

Table 1
Coating thickness factors

(See Clause [6.2.2.10](#).)

Temperature, degrees		Thickness factors
C°	(F°)	Zinc platings
21.1	(70)	0.980
21.7	(71)	0.990
22.2	(72)	1.000
22.8	(73)	1.010

Table 1 Continued on Next Page

Table 1 Continued

Temperature, degrees		Thickness factors
C°	(F°)	Zinc platings
23.3	(74)	1.015
23.9	(75)	1.025
24.4	(76)	1.033
25.0	(77)	1.042
25.6	(78)	1.050
26.1	(79)	1.060
26.7	(80)	1.070
27.2	(81)	1.080
27.8	(82)	1.085
28.3	(83)	1.095
28.9	(84)	1.100
29.4	(85)	1.110
30.0	(86)	1.120
30.6	(87)	1.130
31.1	(88)	1.141
31.7	(89)	1.150
32.2	(90)	1.160

Figure 1

Typical assembly employing an outlet-box hood

(See Clauses 3.1, 4.5, and 8.1.3.)

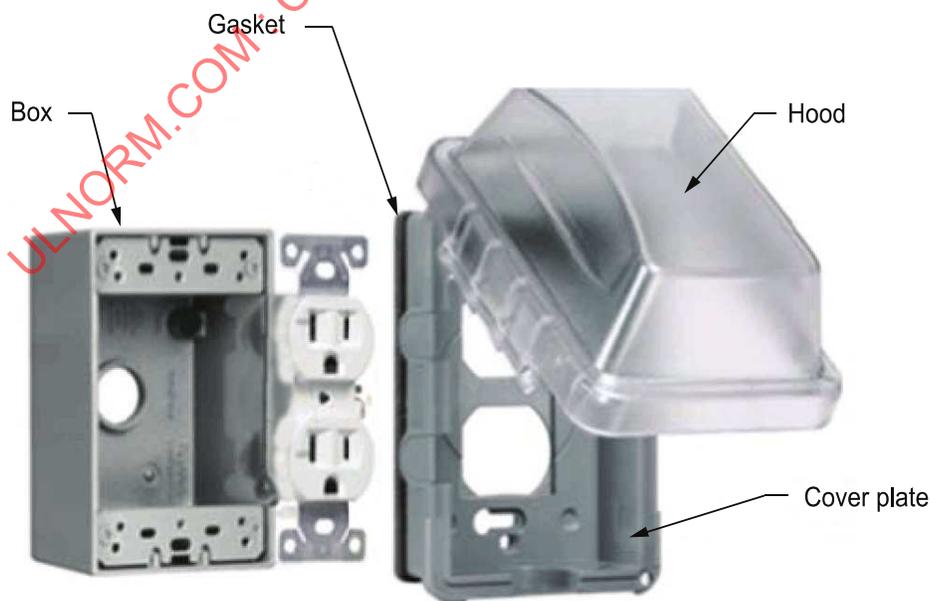
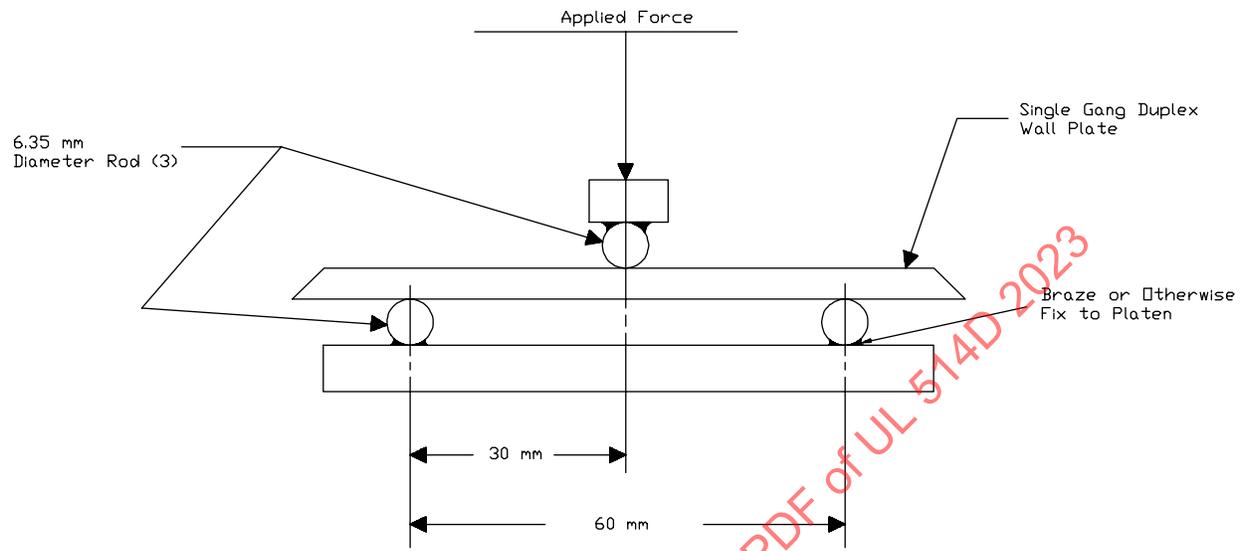


Figure 2
Mechanical strength test

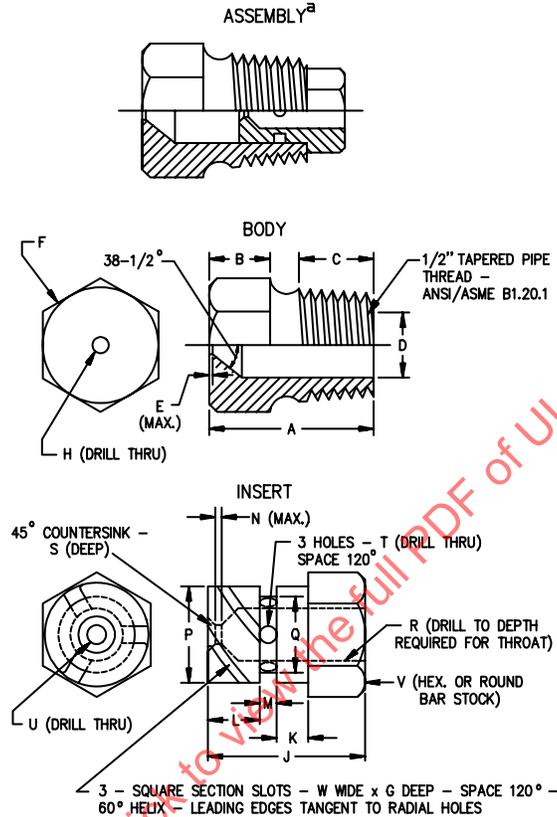
(See Clause [7.8.3.](#))



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Figure 4
Resistance to moisture test – spray head

(See Clauses [8.1.9.2](#) and [8.1.10.2](#).)



RT100C

Item	mm	(inch)	Item	mm	(inch)
A	31.0	(1-7/32)	N	0.80	(1/32)
B	11.0	(7/16)	P	14.61	(0.575)
C	14.0	(9/16)		14.53	(0.576)
D	14.68	(0.578)	Q	11.51	(0.453)
	14.73	(0.580)		11.53	(0.454)
E	0.40	(1/64)	R	6.35	(1/4)
F	c	c	S	0.80	(1/32)
G	1.52	(0.06)	T	2.80	(No. 35) ^b
H	5.0	(No. 9) ^b	U	2.50	(No. 40) ^b
J	18.3	(23/32)	V	16.0	(5/8)
K	3.97	(5/32)	W	1.52	(0.06)
L	6.35	(1/4)			
M	2.38	(3/32)			

^a Nylon Rain – Test spray Heads are available from Underwriters Laboratories

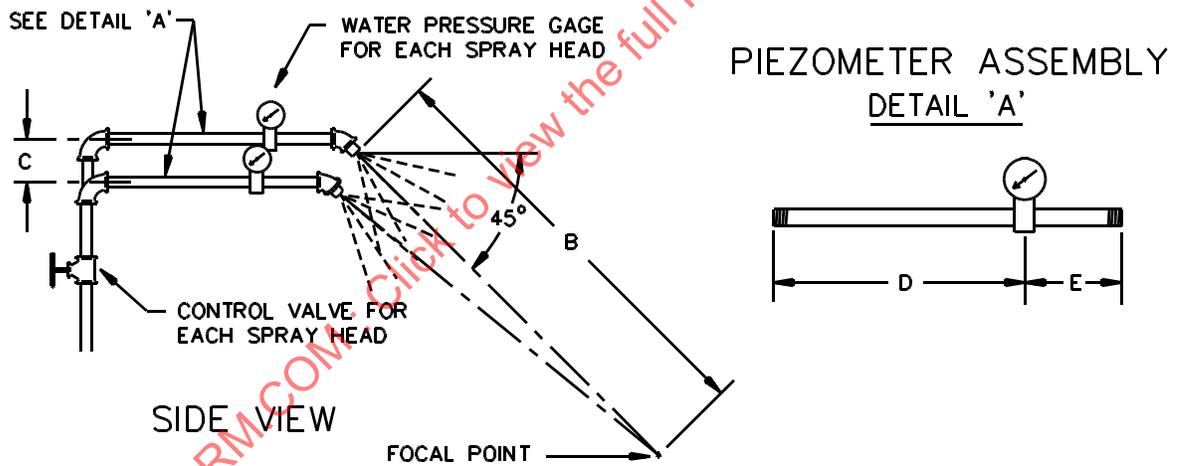
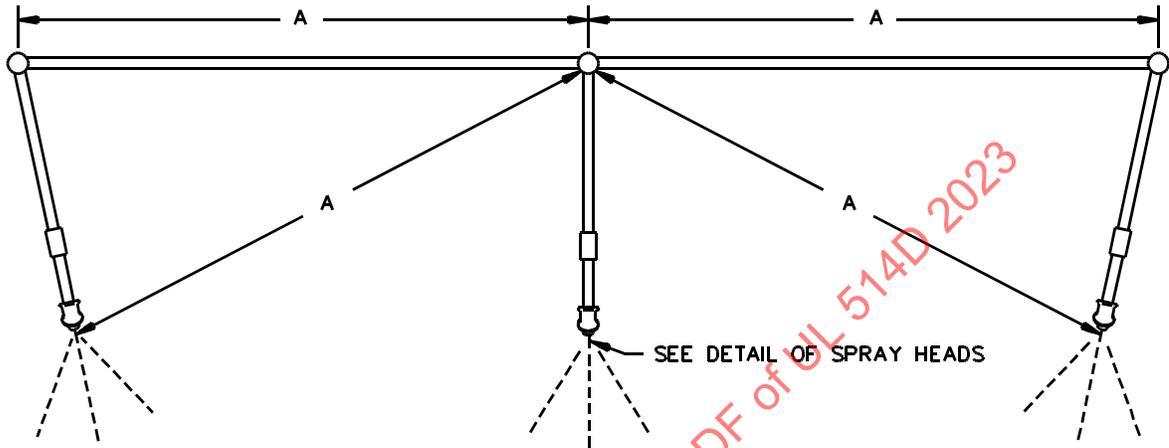
^b ASME B94.11M Drill Size

^c Optional – To serve as a wrench grip.

Figure 5
Resistance to moisture test – spray-head piping

(See Clause 8.1.9.2.)

PLAN VIEW

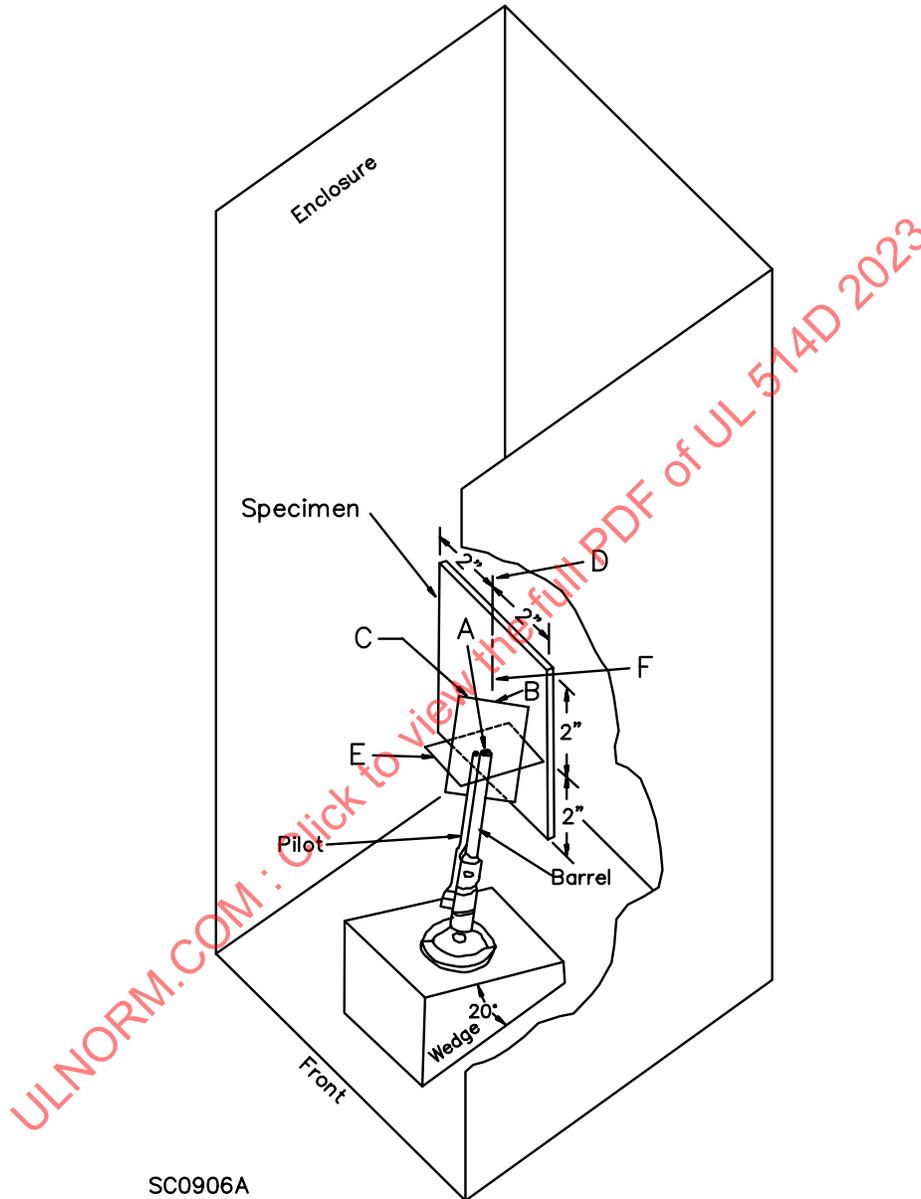


RT101C

Item	mm	(inch)
A	710	(28)
B	1400	(55)
C	55	(2-1/4)
D	230	(9)
E	75	(3)

Figure 6
Flammability test apparatus

(See Clauses [7.6.7](#) and [7.6.8](#).)



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Note – SI units for the values specified are:

102 mm (4 in); 50.8 mm (2 in); 38.1 mm (1-1/2 in)

C Vertical plane parallel to sides of enclosure and containing vertical axis of specimen and longitudinal axis of barrel

D Vertical axis of specimen in center of enclosure and parallel to back of enclosure

E Plane of the tip of the barrel

F Longitudinal axis of barrel

Figure 7
Top impact test for outlet box hoods

(See Clause [8.9.2.2](#).)

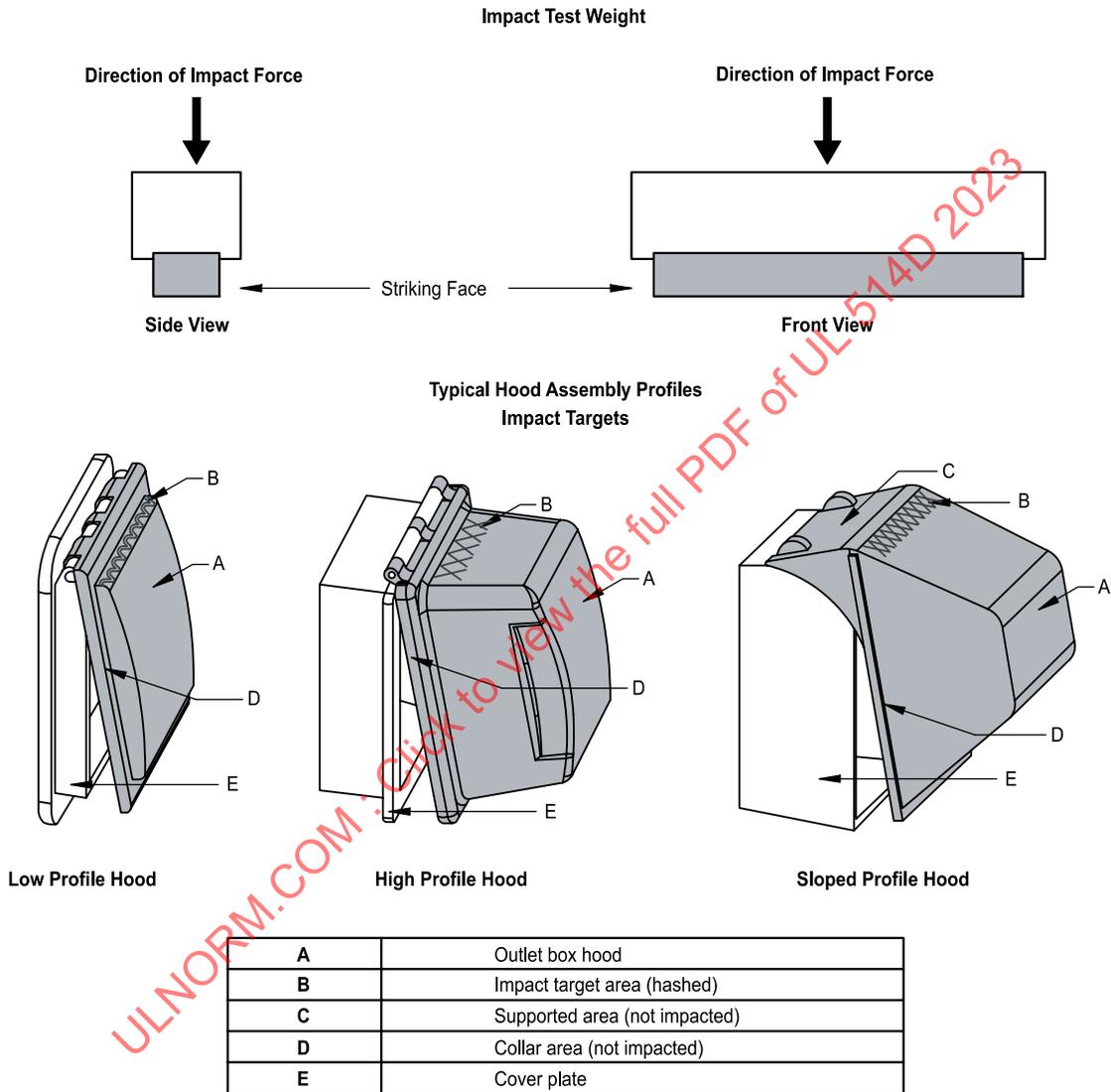
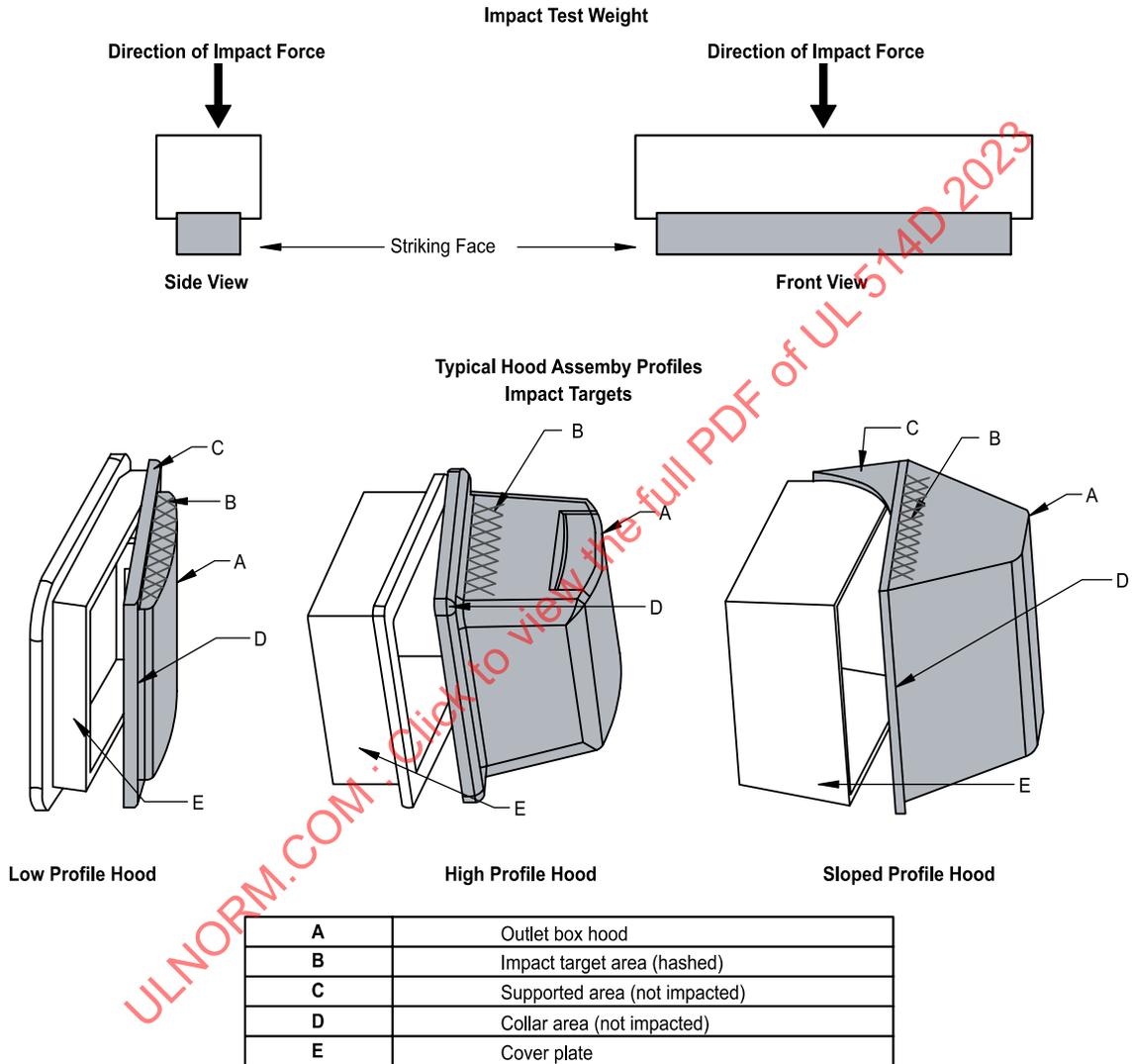


Figure 8
Side impact test for outlet box hoods

(See Clause [8.9.3.1](#).)



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Figure 9
Horizontal orientation load test – side hinge

(See Clauses [8.10.2.1](#) and [8.10.2.2](#).)

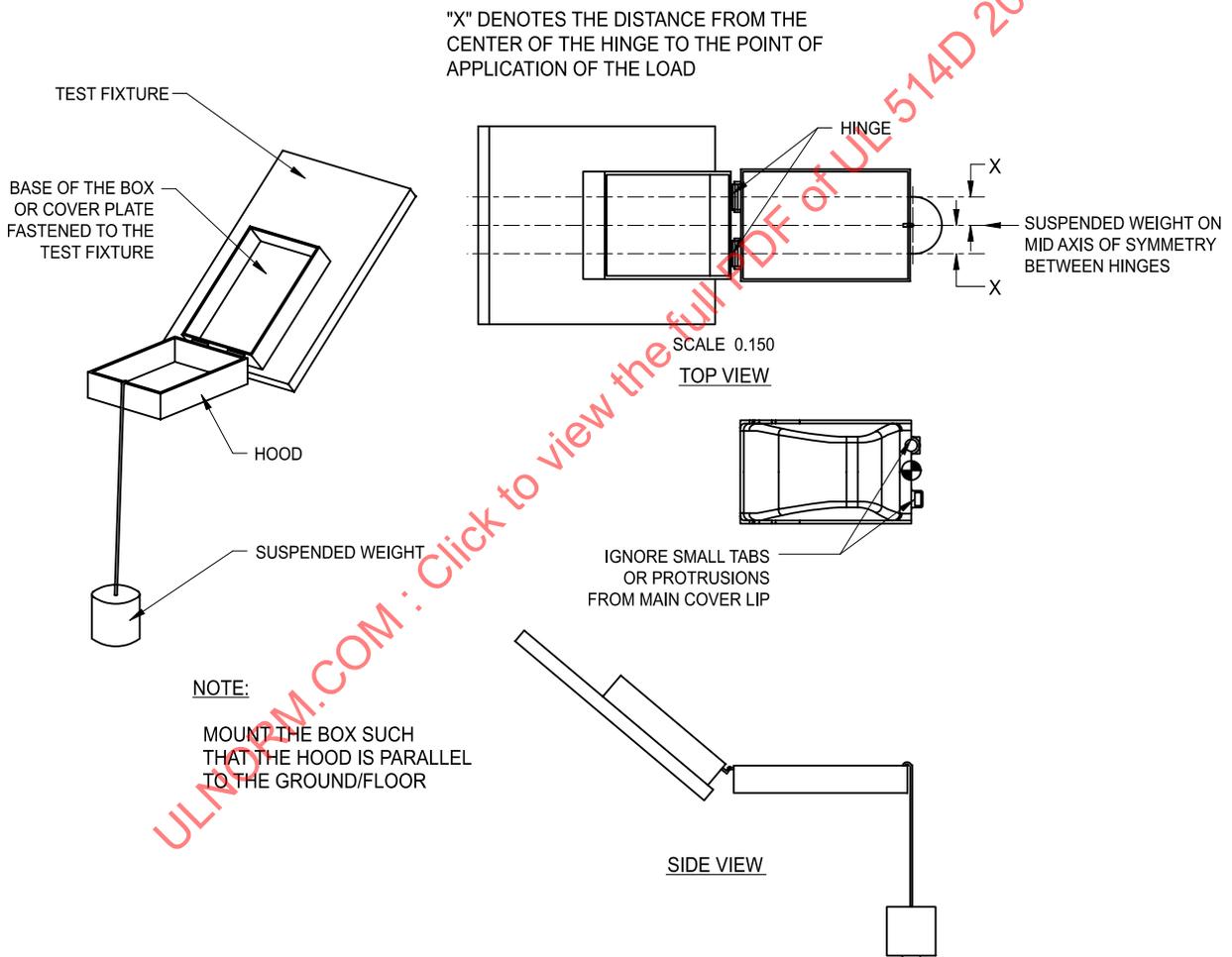


Figure 10
Horizontal orientation load test – corner hinge

(See Clauses [8.10.2.1](#) and [8.10.2.2](#).)

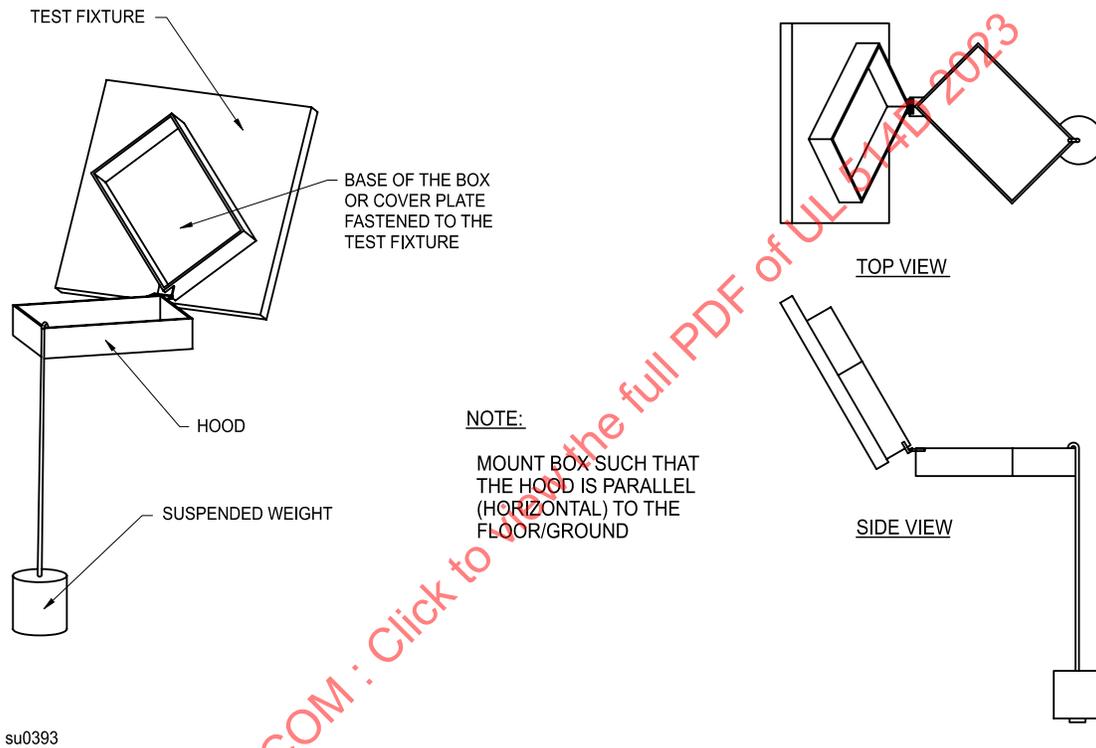
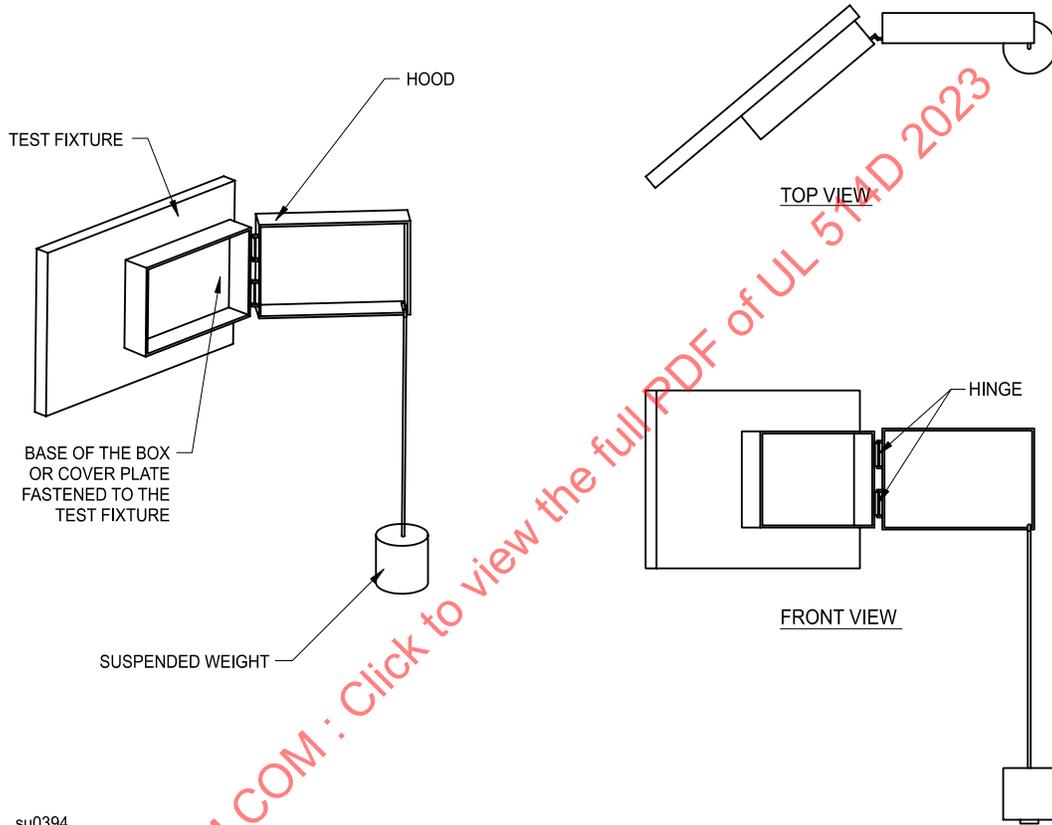


Figure 11
Vertical orientation load test – side hinge

(See Clauses [8.10.3.2](#) and [8.10.3.3](#).)

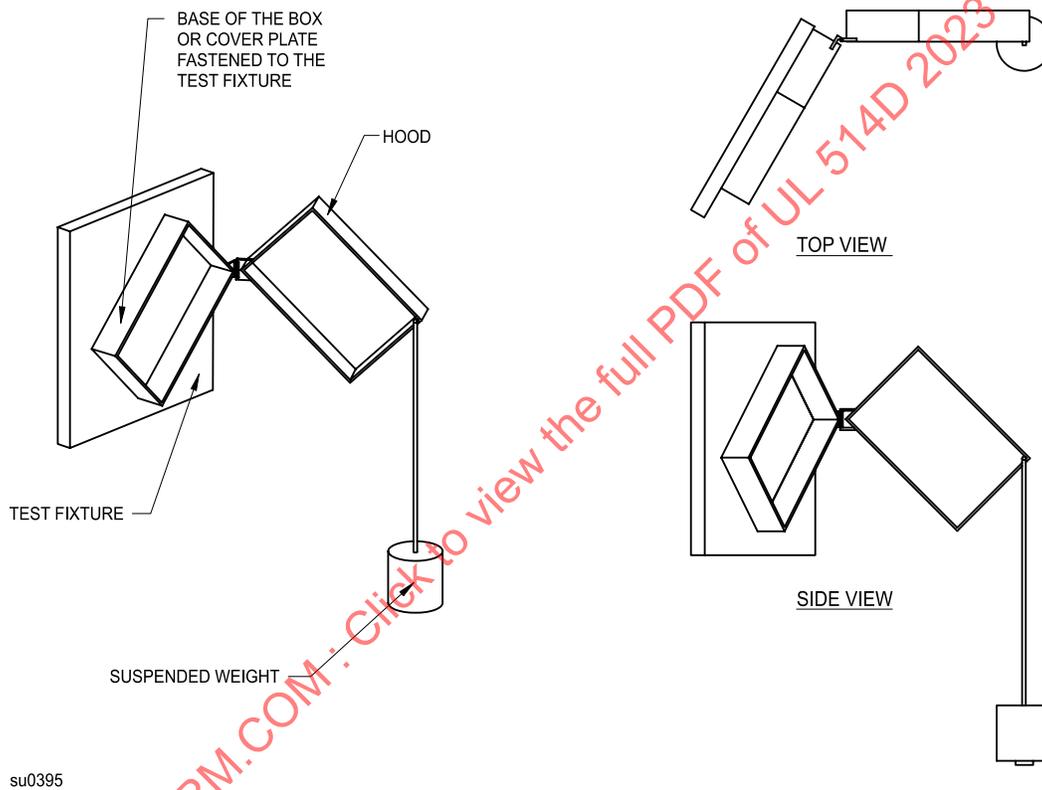


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Figure 12
Vertical orientation load test – corner hinge

(See Clauses [8.10.3.2](#) and [8.10.3.3](#).)



Annex A (Informative)

Minimum sample and specimen quantities for tests

Clause	Test description	Metallic cover plates	Nonmetallic cover plates	Metallic outlet box hoods ^a	Nonmetallic outlet box hoods ^a	Gaskets	Products for marine use
6.2.2	Zinc coatings	3 samples		3 samples			
6.2.3	Coatings other than zinc	50 specimens		50 specimens			
6.3	Bonding	1 sample		1 sample			
7.2	Relative thermal index		3 specimens				
7.3.12	Hot-wire ignition		3 specimens				
7.3.9	Glow-wire ignition		2 specimens				
7.4	Dielectric voltage-withstand test		6 samples				
7.5	Flame penetration		6 samples				
7.6	Flammability		6 specimens or samples				
7.7	Aging		6 samples				
7.8	Mechanical strength test		6 samples from 7.8.2(a) or 7.8.2(b)				
7.9	Mold stress relief dry locations		6 samples				
7.10	Deformation resistance test		6 samples from 7.8.2(a) or 7.8.2(b)				
8.1	Resistance to moisture (samples as received and from 8.2 , 8.3 , 8.8)	1 sample per exposure	1 sample per exposure	1 sample per exposure	1 sample per exposure		
8.2	Cycling test	1 sample	1 sample	1 sample	1 sample		
8.3	Mold stress relief test		6 samples		6 samples		
8.4	Sealing compounds test	3 samples	3 samples	3 samples	3 samples		
8.5	Resistance to ultraviolet light and water		3 samples or specimens		3 samples or specimens		
8.6	Water absorption		3 specimens		3 specimens		
8.7	Compression		3 samples		3 samples		
8.8.1	Cold impact test for cover plates		10 samples		10 samples		

Clause	Test description	Metallic cover plates	Nonmetallic cover plates	Metallic outlet box hoods ^a	Nonmetallic outlet box hoods ^a	Gaskets	Products for marine use
8.8.2	Cold impact test for outlet box hoods		3 samples		3 samples		
8.9.2	Top impact test			3 samples	3 samples		
8.9.3	Side impact test			3 samples (same samples from test in 8.9.2)	3 samples (same samples from test in 8.9.2)		
8.10.2	Horizontal axis hinge stress test			3 samples	3 samples		
8.10.3	Vertical axis hinge stress test			3 samples (same samples test in 8.10.2)	3 samples (same samples test in 8.10.2)		
8.10.4	Minimum hinge stress removal for reattachable outlet box hoods			3 samples	3 samples		
9.1	Compression set					3 specimens	
9.2	Hardness					3 samples	
9.3	Flammability					3 samples	
9.4	Dielectric voltage-withstand					1 sample or specimen	
9.5	Insulation resistance					1 sample or specimen	
10.1	Illuminating cover plate	Refer to Annex B					
11.1	Watertight						1
11.2	Dripproof						1
11.3	Gaskets – Air oven conditioning						1

^a When an outlet box hood is integral with a cover plate, samples and specimens shall be provided as specified for outlet box hoods and cover plates.

ANNEX B (Normative)

Illuminating Cover Plates For Flush-Mounted Wiring Devices

B.1 General

B.1.1 These requirements apply to an illuminating cover plate for flush-mounted wiring devices, with integral non-relampable light sources such as neon, light emitting diode, or electroluminescent panel, intended to be connected to a nominal 120-V, 15-or 20-A branch circuit.

B.1.2 These requirements do not apply to cover plates that are used with light sources that are not integral to the cover plate or to light sources that are relampable.

B.2 Reference Standards

B.2.1 The cover plate portion of an illuminating cover plate shall comply with the requirements in this standard, as applicable.

B.2.2 The light source and internal components, including printed wiring board spacing, shall comply with UL 1786/CSA C22.2 No. 256, as applicable.

B.2.3 In the United States, a light emitting diode light source shall comply with UL 8750, as applicable.

In Canada, this requirement does not apply.

B.2.4 Field wiring terminals, push-in connections and supply conductors shall comply with the UL 496/CSA C22.2 No. 43, as applicable for flush-mounted devices.

B.3 Construction

B.3.1 Internal conductors shall be routed and secured so that all conductors will be enclosed within the outlet box when the illuminating cover plate is mounted as intended. Conductors from the cover plate shall be provided with strain relief and be mechanically secured before soldering.

B.3.2 Electrical components shall be reliably mounted to the illuminating cover plate so that electrical spacing can be maintained, components are suitably enclosed and protected from incidental contact, and conductors will not be damaged during installation of the cover plate to outlet box.

B.3.3 A minimum through air and over surface spacing of 6.35 mm (0.25 inches) shall be provided between uninsulated live parts of the device and the dead metal parts of the outlet box when the illuminating cover plate is mounted as intended.

B.3.4 An illuminating cover plate with accessible dead metal parts shall have a discrete means of grounding that is redundant to its bonded mounting means, either to wiring devices and deviceless mounting yokes, or to outlet boxes. A grounding lead shall be insulated and rated 600 V minimum.

B.3.5 Deleted

B.3.6 Deleted

B.4 Markings and Installation Instructions

B.4.1 The illuminating cover plate shall be clearly legible and durably marked with the manufacturer's name, catalog number and the electrical rating of the light source, including input voltage and either input amperes or watts.

B.4.2 The illuminating cover plate shall be provided with legible instructions pertaining to proper assembly and installation, including:

- a) The installation instructions shall provide electrical wiring and grounding instructions, including polarization if applicable, and appropriate connection means.
- b) The grounding instructions shall include the following text "CAUTION: Risk of Shock. Mounting does not insure grounding continuity of this illuminating cover plate. The grounding jumper MUST be connected DIRECTLY to the grounding terminal (conductor) of the illuminating cover plate."
- c) The instructions shall indicate all of the following or equivalent wording:
 - 1) "Only a single conductor shall be terminated under the head of each wiring device terminal screw."
 - 2) "The conductors of the illuminating cover plate shall terminate directly to the unused device screw head of the same polarity."
 - 3) "If the wiring device terminal screw head already has a single conductor, then that conductor of the illuminating cover plate shall terminate indirectly to conductors of the same polarity spliced together by a wiring connector certified for field installation." Also to be included for the wire connector information is the conductor number and size along with the identifier of the certification organization.
- d) The instructions shall indicate how to dress the conductors so that they are suitably enclosed and not damaged during installation.
- e) The instructions shall indicate that illuminating cover plate shall not be used with boxes containing telephone, data, or TV antenna circuits.

B.4.3 The installation instructions shall indicate how to install the cover plate to an outlet box.

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Annex C (Normative)

Tamper-Resistant Cover Plates

C.1 Scope

C.1.1 This annex applies to tamper-resistant cover plates for 125 volt, 15 and 20 A flush-mounted receptacles.

C.1.2 These tamper-resistant cover plates are not intended for use in patient care areas of health care facilities.

C.1.3 These requirements do not cover kits or assemblies comprising receptacles and nonmetallic cover plates that cover the receptacle face and where the cover plate cannot be installed on any other receptacle. Such assemblies are specifically evaluated for compliance with all applicable requirements for receptacles and cover plates.

C.2 Definitions

C.2.1 TAMPER-RESISTANT COVER PLATE: A cover plate used with a standard flush-mounted receptacle to provide a level of protection against shock for young children who attempt to insert a foreign object, such as a key, into the receptacle opening.

C.3 General

C.3.1 Unless otherwise specified, a tamper-resistant cover plate shall also comply with all the requirements of this standard.

C.4 Construction Requirements

C.4.1 A tamper-resistant cover plate shall not hinder the complete seating of an attachment plug of the type intended for use with the receptacle.

C.4.2 Area A as defined in [Figure C.1](#) shall be free of any obstructions that would prevent the full seating of an attachment plug on the face of an installed receptacle. Any obstructions outside the defined area shall have a feature that extends 12 mm (-0 mm +0.8 mm) from the face of a receptacle to preclude partial engagement of an oversized plug, adaptor, or similar device.

C.4.3 A tamper-resistant cover plate for duplex receptacles or multi-gang installations shall provide independent protection for each receptacle outlet.

C.4.4 A tamper-resistant cover plate shall require a minimum force or multiple motions to "unlatch" a tamper-resistant feature to gain access to the live receptacle slots for insertion of an attachment plug. The minimum force or multiple motions shall be determined in accordance with the access test in [Clause C.5.2](#). Insertion of the attachment plug is not considered one of the multiple motions.

C.4.5 A tamper-resistant cover plate shall return to the tamper-resistant condition upon removal of the attachment plug without requiring any action from the user.

C.5 Test Method for Tamper-Resistant Cover Plates

C.5.1 Probe test

C.5.1.1 Twelve previously untested cover plates shall be used for this test. When subjected to the probe tests specified in Clauses [C.5.1.2](#) and [C.5.1.3](#), the tamper-resistant cover plate shall prevent contact with live receptacle parts.

A tamper-resistant cover plate for a duplex receptacle shall be tested at only one outlet face; six of the plates shall be tested at one outlet face, the other six at the other outlet face. The cover plates shall be installed as intended on flush-mounted receptacles using a plywood surface.

C.5.1.2 The probe shown in [Figure C.2](#) shall be applied to each cover plate with a force of 2.2 N (8 ounces) in an attempt to bypass the tamper-resistance mechanism and contact live parts of the receptacle. A suitable indicating device (such as an ohmmeter, battery-and-buzzer combination, or the like) shall be used to determine whether contact is made. The probe shall be manipulated in any orientation that permits access to live parts within the receptacle.

C.5.1.3 The test shall be repeated using the probe shown in [Figure C.3](#) with a force of 45 N (10 pounds).

C.5.2 Access test

C.5.2.1 Six previously untested cover plates shall be used for this test. The cover plates shall be installed as intended on flush-mounted receptacles using a plywood surface. The action necessary to release or unlatch the tamper-resistant feature to gain access to the energized receptacle contacts shall require a minimum of 45 N (10 pounds) force or shall require 2 or more motions. Insertion of an attachment plug is not considered one of the multiple motions.

C.5.3 Ball-pendulum impact test

C.5.3.1 Six cover plates which were previously subjected to the probe test shall be used. When subjected to the ball-pendulum impact test of Clauses [C.5.3.2](#) to [C.5.3.5](#), a tamper-resistant cover plate shall exhibit no breakage of the plate or tamper-resistance mechanism or any other damage that could increase the risk of fire or electric shock. The plate shall be capable of functioning as intended after completion of the test.

C.5.3.2 The center of the face of each of the six devices shall be subjected to a single impact by a steel sphere, 50.8 mm (2 inches) in diameter, and weighing 0.535 kg (1.18 lbs). For cover plates intended for duplex receptacles, three devices shall be tested with the impact centered over one outlet face previously subjected to the probe tests in Clause [C.5.1](#), and three centered over the other outlet face previously subjected to the probe tests in Clause [C.5.1](#).

C.5.3.3 Each cover plate shall be mounted to a suitable receptacle installed in a single gangable metallic flush outlet box fastened to a frame as shown in [Figure C.4](#). The frame shall be clamped firmly in place or otherwise provided with rigid support to not permit movement during the application of the impact force.

C.5.3.4 The steel sphere shall be suspended by a cord and swung as a pendulum as shown in [Figure C.5](#) dropping through a vertical distance of 1295 mm (51 inches) to strike the face of the cover plate with an impact of 6.8 J (5.0 ft-lb).

C.5.3.5 Upon completion of this test, each plate shall:

- a) be capable of completely accepting the intended attachment plugs; and
- b) comply with the repeated probe tests of Clause [C.5.1](#).

For cover plates intended for duplex receptacles, the outlet faces previously subjected to the initial probe tests and ball-pendulum impact test of Clauses [C.5.3.1](#) to [C.5.3.4](#) shall be the outlet face subjected to the repeated probe tests in Clause [C.5.1](#).

C.5.4 Mechanical endurance test

C.5.4.1 Six cover plates which were previously subjected to the probe test in Clause [C.5.1](#) shall be used. When subjected to the mechanical endurance test in Clauses [C.5.4.2](#) and [C.5.4.3](#), a tamper-resistant cover plate shall exhibit no breakage of the plate or tamper-resistance mechanism or any other damage that could increase the risk of fire or electric shock. The plate shall be capable of functioning as intended after completion of the test.

C.5.4.2 The cover plate shall be tested by inserting and withdrawing 5,000 times a mating attachment plug, releasing the tamper-resistant feature after each insertion and allowing it to reset on withdrawal. For cover plates intended for duplex receptacles, three devices shall be tested using one outlet face previously subjected to the probe tests in Clause [C.5.1](#), and three using the other outlet face previously subjected to the probe tests in Clause [C.5.1](#).

Tamper-resistance mechanisms shall not be adjusted, lubricated, or otherwise conditioned before or during the test. The attachment plug used for this test may be changed if necessary.

C.5.4.3 Upon completion of this test, each plate shall:

- a) be capable of completely accepting the intended attachment plugs; and
- b) comply with the repeated probe tests specified in Clause [C.5.1](#).

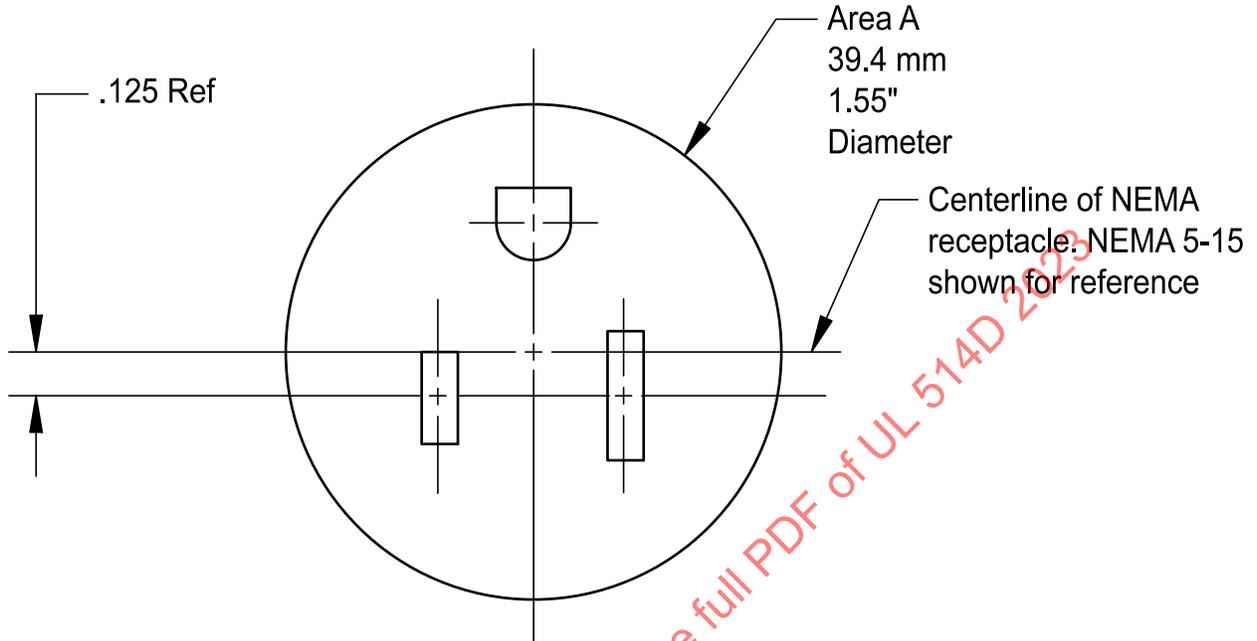
For cover plates intended for duplex receptacles, the outlet faces previously subjected to the initial probe tests in Clause [C.5.1](#) and the mechanical endurance test in Clauses [C.5.4.1](#) and [C.5.4.2](#) shall be the outlet face subjected to the repeated probe tests in Clause [C.5.1](#).

C.6 Marking for tamper-resistant cover plate

C.6.1 A tamper-resistant cover plate shall be marked, where visible after installation, with the phrase "tamper-resistant" or the letters "TR". The letters shall be a minimum of 4.8 mm (3/16 inches) in height.

Figure C.1
Area of tamper-resistant cover plate free of plug-seating obstructions

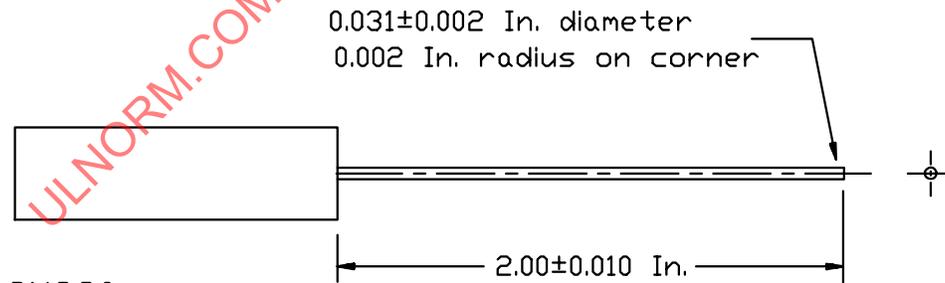
(See Clause [C.4.2.](#))



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Figure C.2
Small test probe

(See Clause [C.5.1.2.](#))



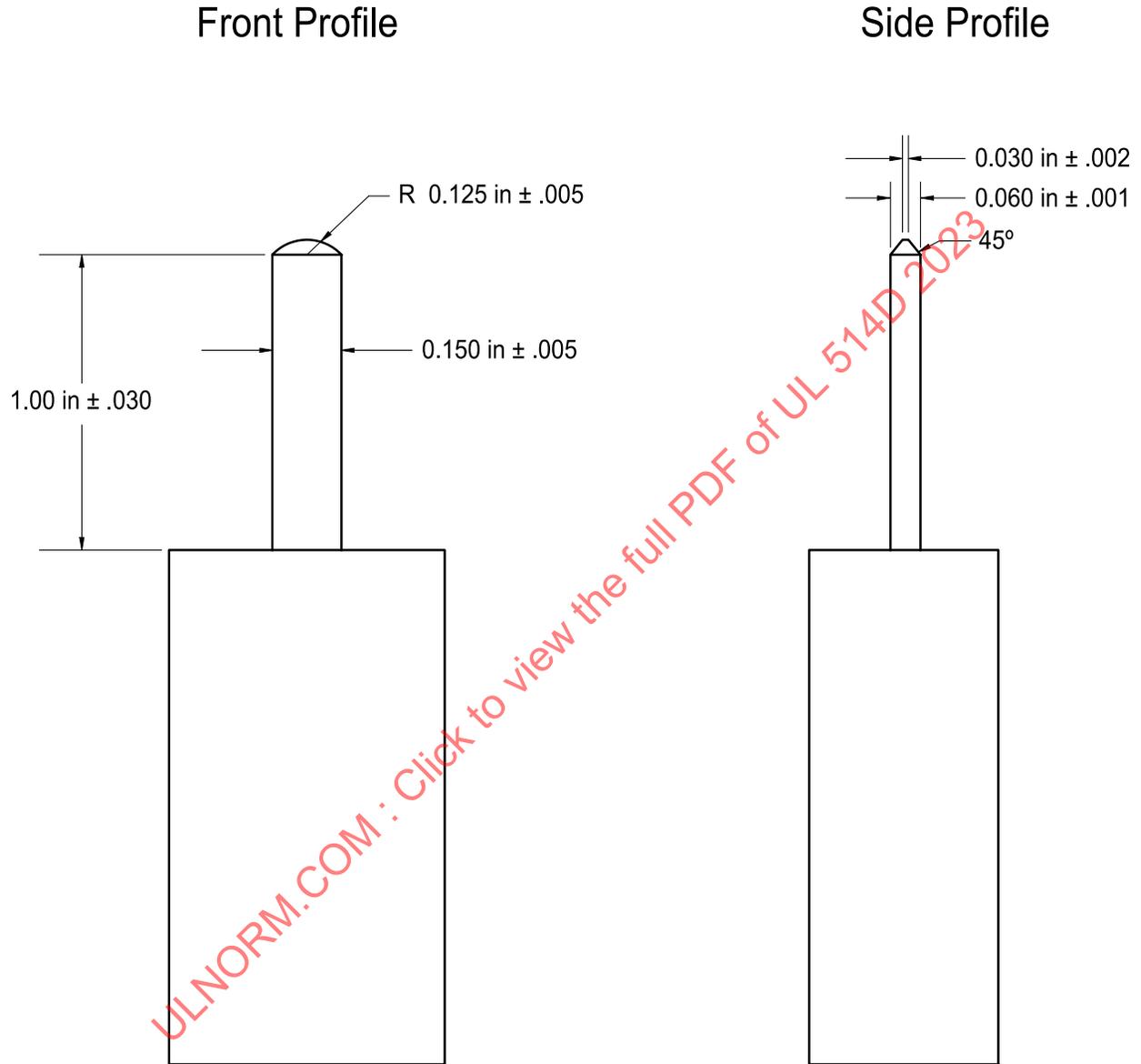
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MATERIAL Tool Steel, Rockwell Hardness C58 to C60

inch	0.031 ± 0.002	2.00 ± 0.010
mm	0.787 ± 0.051	50.8 ± 0.25

Figure C.3
Large test probe

(See Clause [C.5.1.3.](#))



su0196

MATERIAL Tool Steel, Rockwell Hardness C58 to C60

mm	0.762 ± 0.508	1.524 ± 0.0254	3.175 ± 0.127	3.81 ± 0.127	25.4 ± 0.762
inch	0.030 ± 0.002	0.060 ± 0.001	0.125 ± 0.005	0.150 ± 0.005	1.00 ± 0.030