UL 496

STANDARD FOR SAFETY

Lampholders

UL Standard for Safety for Lampholders, UL 496

Fourteenth Edition, Dated September 5, 2017

Summary of Topics

This revision of ANSI/UL 496 dated March 28, 2022 includes the following changes in requirements:

Update ANSI C81.63 Gauge references; Table 13 – Table 16

Screwshell and device screw base material options; 4.10.3.1, 4.10.3.2, 4.10.3.4, Clause 5.2.19, Table 8, Table 9, Table 13, Table 21, Table 22, Annex A

Editorial corrections; 1.1, 1.14, 2.41, 3.1.1, 3.3.2, 4.4.6.1, 4.4.7.3, 5.1.3.1, 5.2.2.1, Table 6, Table 20, Figure 1, SC2.1

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

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated December 4, 2020.

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CSA Group
CSA C22.2 No. 43-17
Seventh Edition

Underwriters Laboratories Inc.
UL 496
Fourteenth Edition

Lampholders

September 5, 2017

(Title Page Reprinted: March 28, 2022)

Approved American National Standard

ANSI/UL 496-2022

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as "CSA Group") and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

ISBN 978-1-4883-0204-6 © 2017 Canadian Standards Association

This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the Fourteenth Edition including revisions through March 28, 2022.

The most recent designation of ANSI/UL 496 as an American National Standard (ANSI) occurred on March 28, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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NOTE – The user's attention is called to the possibility that compliance with this standard may require use of an invention covered by patent rights.

By publication of this standard, no position is taken with respect to the validity of this claim or of any patent rights in connection there with. The patent holder has, however, filed a statement of willingness to grant a license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license. Details may be obtained from UL.

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Preface

This is the harmonized CSA Group and UL standard for lampholders. It is the seventh edition of CSA C22.2 No. 43, and the fourteenth edition of UL 496. This edition of CSA C22.2 No. 43 supersedes the previous editions published in 2008, 2004, 1984, 1965, 1958, and 1937. This edition of UL 496 supersedes the previous edition published in 2008. This harmonized standard has been jointly revised on March 28, 2022. For this purpose, CSA Group and UL are issuing revision pages dated March 28, 2022.

This harmonized standard was prepared by a task force comprising members representing CSA Group, Underwriters Laboratories Inc. (UL), NEMA (National Electrical Manufacturers Association), and EFC (Electro-Federation Canada). The efforts and support of the Technical Harmonization Committee for Lampholders 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 Lighting Products, under the jurisdiction of the CSA Technical Committee on Consumer and Commercial Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

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 uses the IEC format but is not based on, nor is it to be considered equivalent to, an IEC standard. This standard is published as an identical standard for CSA and UL.

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 standard provides requirements for Lampholders in accordance with the codes of Canada and USA. At present there is no IEC standard for Lampholders for use in accordance with these codes. Therefore, this standard does not employ any IEC standard for base requirements.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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1 Scope

1.1 The requirements of this standard cover holders and connectors for electric lamps, including incandescent, fluorescent, and other electric-discharge-type lamps, rated as indicated in Clause 6, to be used in accordance with CSA C22.1, Canadian Electrical Code (CE Code), Part I, and the National Electrical Code (NEC), ANSI/NFPA 70.

1.2 These requirements cover screw lampholders, including those intended to be mounted directly on an outlet-box, lampholders for special uses, lampholders for electric signs, and adapters that convert one lampholder size to another.

1.3 These requirements also cover holders for automatic starters used with fluorescent lamps.

1.4 These requirements also cover GU24 and GU24-1 holders for fluorescent and LED self-ballasted lamps and fluorescent lamp adapters with mating pin bases.

1.5 These requirements also cover indicator lamps.

1.6 These requirements also cover lampholder inserts.

1.7 These requirements also cover naval-use lampholders. See Supplement SB.

1.8 These requirements do not cover fluorescent self-ballasted lamps and fluorescent lamp adapters covered in UL 1993.

1.9 These requirements do not cover seasonal-lighting lampholders, which are covered in UL 588, and CSA C22.2 No. 37.

1.10 These requirements do not cover electrode receptacles for use in gas-tube signs, which are covered in UL 879 and CSA C22.2 No. 34.

1.11 These requirements do not cover devices requiring a cross-bar, mounting strap, or other mounting means; such devices are considered to be luminaires.

1.12 These requirements do not cover nightlights, which are covered in UL 1786 and CSA C22.2 No. 256.

1.13 These requirements do not cover ceiling outlet-box lampholders that incorporate one or more of the following features:

a) more than one lampholder;

b) provisions for conduit connection such as openings or knockout;

c) an integral ballast, transformer or power supply; or

d) a lamp shade or lamp guard that completely encloses the lamp.

Such devices are covered by UL 1598 and CSA C22.2 No. 250.0.

1.14 In Canada, general requirements applicable to these products are provided in CSA C22.2 No. 0.

2 Definitions

2.1 For the purpose of this standard, the following definitions apply:

2.2 Actuating member – the part of a switch actuator that extends outside the body and is exposed to contact by the user.

2.3 Actuator – the part that drives a switch mechanism into action.

2.4 Adapter – a device that adapts one form or size of connecting means to another, and in some cases incorporates circuits or controls such as a dimmer or photo-control or a switch.

2.5 Base – that part of a lampholder that is used for mounting of the device.

2.6 Cap – a component of screw-type lampholders that is provided to supply a mounting means for the lampholder, enclose live or current-carrying parts, and/or prevent inadvertent accessibility to live parts.

Note: Internationally, the word “cap” is used in place of the North American term “base” to describe the means of connection of the lamp to the lampholder.

2.7 Center contact – a contact used in a screw lampholder to engage the center contact of a lamp base.

2.8 Current tap – an adapter that is screwed into a base-supply lampholder and provides multiple outlets of the lampholder or slotted receptacle type.

2.9 Damp location – an interior or exterior location that is normally or periodically subject to condensation of moisture. Damp locations include partially protected locations under canopies, roofed open porches, and similar locations.

2.10 Device screw base – a cylindrical component of a screw device having an external male thread or form for engaging a corresponding lampholder.

2.11 Dry location – a location not normally subject to dampness. Dry locations include locations subject to temporary dampness, as in the case of a building under construction, provided ventilation is adequate to reduce the likelihood of accumulation of moisture.

2.12 Enclosure – that part or parts of a lampholder that:

a) renders inaccessible all or any parts of the equipment that may otherwise present a risk of electric shock; or

b) retards propagation of flame caused by electrical disturbances occurring within.

2.13 General-use – suitable for direct installation in the field.

2.14 Holder, GU24 and GU24-1 – a holder with a twist and lock bi-pin configuration that is intended to supply power to fluorescent and LED self-ballasted lamps and fluorescent lamp adapters with mating pin bases. This holder is not intended for use with incandescent lamps.

2.15 Husk – a covering over a screwshell, usually of paper, that renders the screwshell and terminals inaccessible.

2.16 Indicator lamp – an indicating device consisting of a lamp, with or without a lampholder, that is provided with leads or terminals. In some cases indicator lamp also incorporates a bracket or other mounting provision.

2.17 Insulating link – a section of the chain of a pull-type switching mechanism intended to prevent the accessible portion of the chain from becoming energized.

2.18 Interior – a component of an screw metal shell lampholder that engages the threads of the lamp base and that supports live parts, such as lamp contacts, switch contacts, and actuators, and that is intended to be enclosed within a body.

2.19 Intermediate contact – a contact used in an E26d or E39d double-contact lampholder to engage the ring contact of a double-filament lamp.

2.20 Isolated screwshell – a mechanical device for engaging the threads of a screw base lamp that supports the lamp but is not conductively connected to the supply circuit.

2.21 Lamp base – the part of a lamp that engages the lampholder and makes contact with the electrical circuits of the lampholder.

2.22 Lamp cavity – that portion of the lampholder which is provided for the insertion of the lamp.

2.23 Lamp connector – a set of contacts provided with flexible conductors which provides for electrical connection to a lamp but does not provide support.

2.24 Lampholder – a wiring device intended for making connection to the electrical circuits of a lamp and, in some cases, providing support.

2.25 Lampholder, bayonet – a device equipped with retaining slots in the shell for holding the lamp base.

2.26 Lampholder, candle-type (stem type) – a screw lampholder having an insulating covering (husk), such as paper, over the screwshell and terminals, which in some cases provides the required depth of lamp cavity. In some cases the lampholder also has a close-fitting, nonmetallic outer decorative casing.

Note: These lampholders are commonly used in luminaires and portable luminaires to give the appearance of a candle.

2.27 Lampholder, ceiling outlet-box – a lampholder intended for mounting to a ceiling outlet-box that also serves as the outlet-box cover.

2.28 Lampholder, circuit-interrupting – a fluorescent-type lampholder that incorporates a switch to de-energize a circuit when the lamp is removed.

2.29 Lampholder, cleat-type – a lampholder used for open wiring on insulators that in some cases have exposed wiring terminals prior to installation.

2.30 Lampholder, flush-type – a lampholder intended for mounting in an outlet-box with a cover plate, usually serving as a pilot or indicator light.

2.31 Lampholder insert – a device that is interposed between the base of a screw lamp and the lampholder center contact.

Note: Such devices are commonly used to reduce the lamp power consumption or for remote control such as dimming.

2.32 Lampholder, metal cap and shell – a lampholder type consisting of a metal cap and shell, an interior, and an insulating lining.

2.33 Lampholder, open-rated – a screw lampholder with an EX26 medium base or EX39 mogul base and intended for use with a “Type O” metal halide lamp. These lampholders have a physical means that only allows the use of a lamp that is “Type O” and excludes lamps with an E26 or E39 base.

2.34 Lampholder, pendant-type (cord-grip lampholder) – a lampholder intended to be supported and suspended by a flexible cord.

2.35 Lampholder, pulse-rated – a lampholder or lamp connector intended for use with a lamp that requires a starting pulse in excess of 600 Vpk.

2.36 Lampholder, refrigeration – a lampholder intended to be installed in a refrigerated compartment of refrigerators or freezers.

Note: The interior of a refrigerated compartment is considered an indoor damp location.

2.37 Lampholder, screw – a lampholder employing a threaded screwshell.

Note: Standardized screw types include the following bases:

a) E10 (miniature);

b) E11 (mini can);

c) E12 (candelabra);

d) E17 (intermediate);

e) E26 (medium);

f) E29 (admedium) (not standardized);

g) E39 (mogul).

2.38 Lampholder, screw-ring – an externally threaded lampholder intended for mounting in a panel opening by means of a threaded ring.

2.39 Lampholder, seasonal-lighting – a lampholder that is restricted for use with Christmas-tree and decorative lighting outfits and which by its construction and application is not suitable for general use.

2.40 Lampholder, skeleton-type – a screw lampholder that does not use conductive screwshell threads to make electrical contact with the lamp screw base. Electrical contact with the lamp screw base is made with one or more separate contacts in the side wall of the lamp cavity or a ring contact in the bottom of the lamp cavity.

2.41 Lampholder, temporary use – a lampholder intended for installation and use in accordance with Article 527 of the National Electrical Code, ANSI/NFPA 70, and Section 76 of the Canadian Electrical Code, Part I, CSA C22.1.

2.42 Lampholder, weatherproof – a lampholder intended for direct exposure to the weather.

2.43 Lamplock – a feature intended to keep a lamp from being removed except by a person having a key or special tool.

2.44 Lining – an intermediate piece of insulating material constructed to prevent electrical contact between live parts, such as the screwshell, and the outer shell, cap, or cover.

2.45 Live part – a part that is energized during normal operation.

2.46 Normal hand tools – any standard American or metric wrench or screwdriver (straight blade, Phillips (cross point) or Robertson head (square)).

2.47 Ratcheting mechanism – a device mechanism that does not permit removal of the lamp or lamp adapter.

2.48 Rated operating temperature – the highest temperature for which the device is rated.

2.49 Rated voltage – the voltage declared by the manufacturer to indicate the highest working voltage for which the device is rated.

2.50 Screwshell – a cylindrical component of a screw lampholder having an internal thread or form for the retention of the corresponding lamp.

Note: In some constructions, the screwshell is permanently fixed to or integral with the outer shell.

2.51 Screw types – a trade name (e.g., medium-screw) or designation (e.g., E26) assigned to a standardized lamp and lampholder configuration to control their interchangeability. Lamp base and holder designations, where referenced in this standard, are those assigned by the International Electrotechnical Commission (IEC).

Note: They may be followed by the commonly used trade name in parentheses.

2.52 Sealing compound – an insulating material that may be used to insulate live parts on the underside of a lampholder from the surface to which it is intended to be mounted or used to fill a void for the purpose of reducing clearances.

2.53 Set screw – a threaded device for securing a lampholder to its support or for securing leads within a terminal assembly.

2.54 Shell – a component of a screw metal shell lampholder that serves as the enclosure. A shell may also serve as the mounting surface for reflectors or guards.

2.55 Terminal – provision for the connection of supply conductors.

2.56 Terminal, insulation-piercing – a terminal having a contact pin that punctures the conductor insulation and penetrates between the conductor strands.

Note: Stripping the insulation from the conductor is not required for this type of connection.

2.57 Terminal, push-in – a terminal in which the stripped end of a conductor is pushed into the terminal and the clamping pressure is maintained by a spring mechanism without the use of screws.

2.58 Terminal, screw – a terminal in which the conductor is bent around the screw and clamped directly under the head of the screw when it is tightened.

2.59 Upset – a process for peening, staking, cross threading, or rounding, for example, a screw's shaft end to prevent it from loosening or being backed out.

2.60 Vulcanized fiber – a material normally used as electrical insulation, made by combining layers of chemically jelled paper.

Note: "Fish paper" is a designation commonly used in the trade to refer to thin sheets of electrical grade vulcanized fiber.

2.61 Wet location – a location in which uncontrolled liquids may drip, splash, or flow on or against electrical equipment.

3 General

3.1 Components

3.1.1 Except as indicated in Clause 3.1.2, a component of a product covered by this standard shall comply with the requirements for that component. See Annex A for a list of standards covering components generally used in products covered by this standard. A component shall comply with the Underwriters Laboratories Inc. or CSA Group standards as appropriate for the country where the product is to be used.

3.1.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

3.1.3 A component shall be used in accordance with its rating established for the intended conditions of use.

3.1.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3.2 Units of Measurement

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

3.3 Reference Publications

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

3.3.2 This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below.

CSA Group

CSA C22.1
Canadian Electrical Code (CE Code), Part I

CSA C22.2 No. 0
General Requirements – Canadian Electrical Code, Part II

CSA C22.2 No. 0.3
Test Methods for Electrical Wires and Cables

CSA C22.2 No. 0.15
Adhesive Labels

CAN/CSA-C22.2 No. 0.17
Evaluation of Properties of Polymeric Materials

CSA C22.2 No. 18.1
Metallic Outlet Boxes

CSA C22.2 No. 34
Electrode Receptacles, Fittings, and Connectors for Gas Tubes

CSA C22.2 No. 37
Christmas Tree and Other Decorative Lighting Outfits

CAN/CSA-C22.2 No. 38
Thermoset-Insulated Wires and Cables

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

CSA C22.2 No. 49
Flexible Cords and Cables

CSA C22.2 No. 75
Thermoplastic-Insulated Wires and Cables

CSA C22.2 No. 127
Equipment and Lead Wires

CSA C22.2 No. 153
Quick-Connect Terminals

CSA C22.2 No. 158
Terminal Blocks

CSA C22.2 No. 256
Direct Plug-In Nightlights

UL (Underwriters Laboratories Inc.)

UL 44
Thermoset-Insulated Wires and Cables

UL 62
Flexible Cords and Cables

UL 83
Thermoplastic-Insulated Wires and Cables

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

UL 310
Electrical Quick-Connect Terminals

UL 486E
Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors

UL 498
Attachment Plugs and Receptacles

UL 514A
Metallic Outlet Boxes

UL 588
Seasonal and Holiday Decorative Products

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 879
Electric Sign Components

UL 969
Marking and Labeling Systems

UL 1581
Reference Standard for Electrical Wires, Cables, and Flexible Cords

UL 1786
Direct Plug-In Nightlights

UL 1993
Self-Ballasted Lamps and Lamp Adapters

ASTM International

ASTM B858
Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys

ASTM E28
Standard Test Methods for Softening Point of Resins Derived from Pine Chemicals and Hydrocarbons, by Ring-and-Ball Apparatus

ANSI/ASTM E230/E230M
Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples

NEMA (National Electrical Manufacturers Association)

NEMA C78.901
Single-Based Fluorescent Lamps – Dimensional and Electrical Characteristics

NEMA ANSLG C81.61
Electrical Lamp Bases – Specifications for Bases (Caps) for Electric Lamps

NEMA ANSLG C81.62
Electric Lampholders

NEMA ANSLG C81.63
Gauges for Electric Lamp Bases and Lampholders

National Fire Protection Association (NFPA)

ANSI/NFPA 70
National Electrical Code (NEC)

3.4 Terminology

3.4.1 Where the term "lampholder" is used in this standard, it applies equally to lampholders and lamp connectors unless otherwise indicated.

4 Construction

4.1 Enclosures

4.1.1 A lampholder enclosure shall have the necessary strength and rigidity to resist the abuses likely to be encountered during normal service. The degree of resistance inherent in the unit shall preclude breaking, warping, or cracking without the required spacings being reduced or parts becoming loosened or displaced.

4.1.2 A lampholder enclosure shall not warp, creep, crack, or distort under conditions of arcing, temperature, and mechanical stress that are likely to occur in service.

4.1.3 Polymeric enclosure materials shall comply with the requirements in Clause 4.2.

4.2 Insulating Materials

4.2.1 Thermoset and Inorganic

4.2.1.1 Insulating material used for the support of, or as the retaining means for, live parts shall be porcelain, glass, urea composition, or other equivalent insulating material.

4.2.1.2 Phenolic composition may be used in a lampholder that is rated at not more than 1000 V.

4.2.1.3 A supporting base on which uninsulated live parts are mounted shall be of porcelain, cold-molded or phenolic composition, or other insulating material that is acceptable for the particular application.

4.2.1.4 Vulcanized fiber may be used for insulating washers, separators, and barriers, but not as the sole support for uninsulated live parts.

4.2.2 Thermoplastic

4.2.2.1 General

4.2.2.1.1 A thermoplastic material used in a lampholder shall comply with Clauses 4.2.2.2.1 – 4.2.2.4.1 and the mold stress-relief distortion test specified in Clause 5.2.17.

4.2.2.2 Flammability

4.2.2.2.1 A thermoplastic (polymeric) insulating material used to enclose electrical parts or used to provide direct or indirect support of live parts shall be classed either V-2, V-1, V-0, 5VA, or 5VB, by the burning tests described in UL 94 and CAN/CSA-C22.2 No. 0.17. Outlet-box mounted ceiling lampholders shall be rated 5VA.

4.2.2.3 Electrical properties

4.2.2.3.1 A thermoplastic (polymeric) insulating material used to enclose electrical parts or used to provide direct or indirect support of live parts for outdoor applications shall have a minimum comparative tracking index (CTI) of 175 as determined in accordance with the methods described in UL 746A, UL 746B, and CAN/CSA-C22.2 No. 0.17.

4.2.2.4 Thermal index

4.2.2.4.1 A thermoplastic insulating material used to enclose electrical parts or used to provide direct or indirect support of live parts shall possess a minimum relative thermal index (RTI) determined in accordance with the methods described in UL 746B and CAN/CSA-C22.2 No. 0.17, as follows:

a) 150 °C (302 °F) for a screw-type lampholder;

b) 90 °C (194 °F) for a fluorescent-type lampholder; or

c) 90 °C (194 °F) for an incandescent pilot type lampholder or indicator type light.

Note: A minimum RTI is not required for a pilot type lampholder or indicator type light intended for use with neon or LED light sources.

4.2.2.4.2 Lampholders marked with a temperature rating in accordance with Clause 7.5 shall possess a minimum relative thermal index (RTI) of at least their marked rating.

4.3 Sealing Compound

4.3.1 The depth or thickness of sealing compound over a live nut, screw head, or rivet shall not be less than 1.6 mm (1/16 in). If the underside of the base is not recessed and if in some cases it will be in contact with the surface upon which the lampholder is mounted, the depth or thickness of the sealing compound shall not be less than 3.2 mm (1/8 in).

4.3.2 Sealing compound shall be insulating and shall not soften at a temperature of 100 °C (212 °F). Compliance shall be determined by the sealing compound softening test specified in Clause 5.2.2.

4.3.3 Sulfur shall not be acceptable as a sealant.

4.4 Mounting

4.4.1 Bracket

4.4.1.1 A mounting bracket for a bayonet or screw lampholder shall be attached to the lampholder such that it cannot rotate during installation or removal of a lamp. A single rivet or screw shall not be considered to prevent rotation unless additional means such as projections, keys, or the like are provided to restrict movement.

Note: A lamp connector need not be prevented from turning during installation or removal of a lamp.

4.4.1.2 A mounting hole tapped to receive a screw shall be acceptable if it contains no fewer than two threads for the screw if in metal, or no fewer than five threads if in insulating material. Spring clips, clamps, or other means that provide equivalent support and restriction of rotation may also be used.

4.4.2 Cord pendant

4.4.2.1 The cap of a pendant-type lampholder shall have provision for strain relief such that a pull exerted on the flexible cord is not transmitted directly to the wiring terminals. If a knot is provided for strain-relief, all surfaces of the cap that a knot can touch shall be smooth and well insulated.

4.4.2.2 Hard fiber shall be acceptable as the insulating material employed if the bushing is not less than 1.2 mm (3/64 in) thick and if it is formed and secured in place such that it cannot be affected by conditions of ordinary moisture.

4.4.2.3 A threaded, insulating bushing shall not be used in a threaded nipple to form a pendant cap if the pipe size of the nipple is smaller than 9.5 mm (3/8 in).

4.4.2.4 A cord-grip shall be provided on a pendant lampholder designed for use with a jacketed flexible cord such as Type S, SJ, or SV.

4.4.3 Cap and shell

4.4.3.1 The cord-inlet hole in a metal pendant cap shall be provided with a bushing of porcelain, phenolic or cold-molded composition, or other insulating material that is acceptable for the purpose. An insulating bushing shall not soften at a temperature of 90 °C (194 °F). Hot-molded shellac or tar composition shall not be used in an insulating bushing.

4.4.3.2 A metal eyelet or grommet may be used as a side outlet for flexible cord in a metal cap, provided that all edges against which the cord may bear are smooth and well rounded, and provided that the eyelet

is insulated from the metal of the cap at all points by fiber or other acceptable insulating material not less than 0.8 mm (1/32 in) thick.

4.4.3.3 A means shall be provided for securely attaching the bracket or cap of a cap and shell lampholder to the supporting base. The bracket or cap shall be prevented from turning with respect to the body or outer shell after assembly.

4.4.4 Screw-ring

4.4.4.1 A screw-ring lampholder, when mounted as intended, shall be secured such that it cannot be turned relative to the mounting surface. Compliance may be accomplished by a lug or recess in the rim of the lampholder base, or other equivalent means.

4.4.5 Surface (Cleat-type)

4.4.5.1 Live screw heads or nuts on the underside of a base designed for surface mounting shall be countersunk not less than 3.2 mm (1/8 in) in the clear, and then covered with a waterproof, insulating, sealing compound that does not soften at a temperature of 100 °C (212 °F) as determined by the sealing compound softening test specified in Clause 5.2.2.

Note: If such parts are staked, upset, or otherwise secured so they cannot loosen, they may be insulated from the mounting surface by material other than sealing compound or by 12.7 mm (1/2 in) or more air separation from the mounting surface.

4.4.6 Outlet-box

4.4.6.1 A metal base in the form of an outlet-box cover shall comply with UL 514A and CSA C22.2 No. 18.1.

4.4.6.2 A mounting screw provided with a ceiling outlet-box lampholder shall not project more than 22.2 mm (7/8 in) beyond the strap or cover and shall have a flat or blunt end. The end of the screw may have thread-cleaning slots or grooves but shall not have any burrs, fins, or other sharp edges that can damage wiring.

4.4.7 Flush-type

4.4.7.1 A flush-type lampholder shall be provided with means for mounting in a standard flush-device box or on a standard outlet-box cover.

4.4.7.2 A metal yoke, strap, or mounting ears shall not be less than 1.02 mm (0.040 in) or more than 2.3 mm (0.09 in) thick. If a nonferrous metal is used, it shall be of sufficient thickness to provide mechanical strength and rigidity not less than that of 1.02 mm (0.040 in) thick steel. The yoke, strap, or mounting ears may be provided with extension plaster ears, which may be scored or perforated so that they can be broken off when not needed. See Clause 7.1.2.

4.4.7.3 With reference to Clause 4.4.7.2, if a yoke, mounting ears, or strap is made of steel, the corrosion protection for a lampholder for use in a flush-device box or on an outlet-box cover shall be a zinc or equivalent coating not less than 0.0038 mm (0.00015 in) thick in accordance with the method for determining protection against corrosion in UL 514A and CSA C22.2 No. 0, or other coatings determined to be acceptable for the particular application.

4.4.7.4 A nonmetallic yoke, strap, or mounting ears shall be of a material and construction determined to be acceptable for the intended use.

4.4.7.5 A flush-type lampholder shall have a means for grounding the yoke or strap that is independent of the mounting means.

4.4.7.6 With regard to Clause 4.4.7.5, a wire-binding screw intended for the field connection of an equipment-grounding conductor shall have a green-colored head that is hexagonal shaped, slotted, or both. A wire-binding screw shall be an M4 (No. 8) or larger. A sheet metal screw is not acceptable for this purpose.

4.4.7.7 With regard to Clause 4.4.7.6, a grounding screw shall be provided with a means to retain the wire under the head of the screw, such as:

a) a cupped washer; or

b) a minimum of two “dimples” raised 1.02 mm (0.040 in) above the metal surface and spaced to position the wire under the screw head; or

c) any equivalent means that accomplishes the same function.

4.4.7.8 A flush-type lampholder with which in some cases a metal flush plate is used shall be constructed such that the metal flush plate is bonded to the grounded outlet-box when the lampholder is installed in the intended manner.

4.4.7.9 A flush plate provided with a lampholder or as an integral part thereof shall be:

a) 0.76 mm (0.030 in) or thicker ferrous metal, of 1.02 mm (0.040 in) or thicker nonferrous metal, or of 2.5 mm (0.10 in) or thicker nonconductive, noncombustible material; or

b) thinner than 2.5 mm (0.10 in) at a break-off line and at a restricted area involving decorative lines or the like, provided that the strength of the plate as a whole is not adversely affected.

4.4.8 Threaded nipple

4.4.8.1 The female nipple integral with the lampholder cap shall have no fewer than five full clean-cut threads of standard pitch as indicated in Table 1.

4.4.8.2 The female nipple in a mogul-, admedium-, or medium-screw lampholder cap shall be provided with a No. 8-40 setscrew. The setscrew shall not be required if:

a) the nipple of a cap is of the 1/2 in trade size pipe or larger, has a tapered thread, and is designed to be tightened with a wrench;

b) the nipple is on the support of a candle-type lampholder; or

c) the nipple of the cap of a lampholder is intended for factory use only when assembled in a luminaire or portable luminaire.

4.4.8.3 A minimum No. 5-40 setscrew may be employed in the nipple or the support of a lampholder of the intermediate-base or smaller size.

4.4.8.4 A No. 6-32 or No. 8-32 setscrew may be employed in a nipple of nonmetallic material.

4.4.8.5 A cap with a threaded nipple for attachment to rigid metal conduit of the 1/2 in or larger trade size shall be provided with a positive end stop for the conduit and a bushing or an equivalent smooth, well-rounded surface to prevent damage to insulated wires entering the cap from the conduit.

4.5 Accessibility of Live Parts

4.5.1 General

4.5.1.1 Except as provided in Clause 4.5.3.1, accessibility to uninsulated live parts of a lampholder shall be determined while the lampholder is completely assembled and mounted as intended:

a) without a lamp;

b) with the appropriate lamp inserted; and

c) during the insertion or removal of a lamp.

4.5.1.2 The probes specified in Table 2 shall not contact live parts when inserted through any openings in an enclosure, with the probe in every possible position. The probes shall be used as measuring instruments to judge accessibility and not as instruments to judge the strength of the material. Where necessary, an electrical indicator may be used to determine whether contact is made with live parts.

4.5.2 Fluorescent lampholders

4.5.2.1 An uninsulated live part shall not be contacted by the appropriate rod probe illustrated in Figure 2 and Figure 3.

4.5.2.2 With regard to Clause 4.5.2.1, a fluorescent lampholder that is intended for use in dwellings shall comply with item (a) or (b), as applicable, when a probe is applied externally to the lamp contact opening of the lampholder:

a) for a lampholder rated at 600 V or less, there shall not be contact between the probe illustrated in Figure 2 and live parts.

b) for a lampholder rated at more than 600 V but not more than 1000 V, the spacing between the probe illustrated in Figure 3 and live parts shall not be less than 3.2 mm (1/8 in).

4.5.2.3 With regard to Clause 4.5.2.1, a lampholder that is intended for use in locations other than dwellings and which is marked in accordance with Clause 7.4.9 shall comply with item (a) or (b) if rated 1000 V or less, and with item (a) if rated 2500 V:

a) the diameter of the opening for insertion of the lamp shall not be more than 28.6 mm (1-1/8 in); the spacing between the plane of the opening and any uninsulated live parts behind the opening within the lampholder shall not be less than 9.5 mm (3/8 in).

b) if applied externally to the opening intended to accommodate the lamp, the probe illustrated in Figure 2 shall not make contact with uninsulated live parts; the spacing between such live parts and the plane of the opening shall not be less than 1.6 mm (1/16 in).

4.5.3 All other lampholders

4.5.3.1 To reduce the likelihood of unintentional contact that may involve a risk of electric shock from an uninsulated live part, an opening in the enclosure of a lampholder shall not be contacted by the articulate probe illustrated in Figure 1. Accessibility shall be determined only with the lamp fully installed.

Note: Wiring terminals and cleat-type lampholders need not comply with this requirement.

4.6 Corrosion Protection

4.6.1 Iron and steel parts and other parts not inherently corrosion-resistant shall be protected against corrosion by painting, enameling, galvanizing, plating, or other equivalent means.

4.7 Current-Carrying Parts

4.7.1 Current-carrying parts shall be made of:

a) copper, copper alloy;

b) other corrosion-resistant metal having equivalent conductivity and mechanical strength;

c) corrosion-resistant (stainless steel) alloy for current-carrying parts that are not subjected to arcing. The center contact shall not be considered to be an arcing part;

d) plated steel when used for wire-binding nuts and screws; or

e) plated or unplated steel for current-carrying parts exposed to temperatures exceeding 218 °C (424 °F).

4.7.2 Softer metals that are prone to deformation when subjected to mechanical stress, such as aluminum, shall not be used for the terminal plates of lampholders designed for mounting in or on a ceiling outlet box and intended for field wiring.

4.7.3 Zinc or cadmium plating shall not be used on terminal parts of a lampholder where the parts will come in contact with branch circuit conductors other than the grounding conductors.

4.7.4 A current-carrying part shall be secured such that it cannot be turned relative to the surface on which it is mounted.

4.7.5 Positive electrical contact shall be maintained at any point at which a connection is made between current-carrying parts.

4.7.6 The wiring terminals of a lampholder constructed for installation in an outlet-box shall be located or protected such that they will not be forced against the wires in the box.

4.8 Supply Connections

4.8.1 General

4.8.1.1 A lampholder shall be capable of being readily wired as intended. If a lampholder is intended for the connection of conductors, wiring terminals or leads shall be provided.

4.8.1.2 A lampholder intended for factory assembly into portable luminaires or appliances may employ solder terminals provided that such lampholders are for factory assembly only and are marked in accordance with Clause 7.3.1. The solder terminals may be in the form of a terminal plate with a hole, an eyelet connected to the screwshell and/or center contact, or other such termination.

4.8.2 Screw terminals

4.8.2.1 A screw for securing lead wires shall be of the wire-binding type.

4.8.2.2 A terminal plate having a tapped hole for a wire-binding screw shall be of metal not less than 0.76 mm (0.030 in) thick and shall not have fewer than two full threads in the metal.

4.8.2.3 For a binding screw having 32 or more threads per inch (25.4 mm), a terminal plate formed from stock not less than 0.76 mm (0.030 in) thick may have the metal extruded at the screw hole to provide two full threads for the binding screw.

4.8.2.4 With reference to the requirement in Clause 4.8.2.2, metal having a thickness of not less than 1.52 mm (0.060 in) shall be considered acceptable for a tapped hole for a screw having 32 threads per inch (25.4 mm).

4.8.2.5 A terminal employing a wire-binding screw shall be provided with upturned lugs or the equivalent to hold a wire under the head of the screw.

4.8.2.6 A wire-binding screw shall thread into metal.

4.8.2.7 Thread-cutting screws shall not be used for field connections.

4.8.2.8 Wire-binding screws of a screw lampholder shall comply with the requirements in Clause 4.8.8.

4.8.2.9 The minimum size and the maximum number of threads per inch (25.4 mm) of wire-binding screws shall be as indicated in Table 3, except that the wire-binding screws of an intermediate-screw lampholder for use in electric signs shall not be smaller than M3.5 (No. 5).

4.8.2.10 The wiring terminals of a lampholder designed for mounting in an outlet-box shall be located or protected such that upon installation they are not forced against the wiring in the box.

4.8.2.11 With reference to the requirement in Clause 4.8.2.10, a lampholder shall not be acceptable if the minimum required clearance is not maintained between each terminal and the metal of a standard box of the type in which it is intended to be installed.

4.8.2.12 The terminals of a lampholder designed for open wiring or for use in electric signs, and the circuit wires connected to such a lampholder, shall not be less than 12.7 mm (1/2 in) from the surface wired over if the device is rated at 250 V or less, and shall not be less than 25.4 mm (1 in) from the surface wired over if the device is rated at more than 250 V.

4.8.2.13 The terminal parts of a cleat-type lampholder shall not overhang the supporting base and shall be spaced at least 6.4 mm (1/4 in) from any mounting screw.

4.8.3 Insulation-piercing terminals

4.8.3.1 Screw lampholders employing insulation-piercing terminals shall be specified for use only with:

a) fixture wire and Type SP, SPE, or SPT flexible cords that comply with UL 62, CSA C22.2 No. 49, and C22.2 No. 127;

b) insulated conductors that comply with UL 44 and CAN/CSA-C22.2 No. 38; or

c) insulated conductors that comply with UL 83 and CSA C22.2 No. 75.

Note: A lampholder intended for temporary use in accordance with the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part I, C22.1, need not comply with the requirements in this clause.

4.8.3.2 Lampholders employing insulation-piercing terminals intended for use with Type SP, SPE, or SPT flexible cord shall be for factory assembly only and shall be marked in accordance with Clause 7.3.2.

4.8.3.3 Lampholders employing insulation-piercing terminals intended for use with Type SP, SPE, or SPT flexible cord shall be specified for use with a minimum 105 °C (221 °F) rated flexible cord.

4.8.3.4 Lampholders intended for use with Type SP, SPE, or SPT flexible cord shall comply with the temperature tests specified in Clause 5.2.15, and shall be evaluated for the intended application, such as the marked wattage rating and the position of the lamp base, and as specified by the manufacturer with regard to the type of flexible cord used.

4.8.4 Push-in terminals

4.8.4.1 Lampholders with push-in terminals shall comply with the security of leads test specified in Clause 5.1.2, and shall be evaluated for the intended wire sizes and types.

4.8.4.2 Lampholders with push-in terminals shall comply with the marking requirements in Clause 7.3.3.

4.8.4.3 An outlet-box lampholder employing push-in terminals intended for use with copper conductors only shall be constructed such that it will permit insertion of a 14 AWG (2.1 mm^2) conductor but will reject a 12 AWG (3.3 mm^2) or larger conductor. Compliance shall be determined by the tests specified in Clause 5.1.3.

4.8.4.4 Openings in an outlet-box lampholder not intended for wire termination shall reject a 14 AWG (2.1 mm^2) or larger solid conductor.

4.8.5 Set screws

4.8.5.1 Lampholders employing set screws for supply connections shall be specified for use only with solid or tinned stranded wire, and shall comply with the performance requirements specified in UL 486E or CSA C22.2 No. 158.

4.8.6 Lead wires

4.8.6.1 Lead wires shall be of appliance wiring material, flexible cord, or fixture wire and shall be suitable for the application.

4.8.6.2 Lead wires for a lampholder shall not be less than 18 AWG (0.82 mm^2).

4.8.6.3 Lead wires smaller than 18 AWG (0.82 mm^2) and not smaller than 24 AWG (0.21 mm^2) may be used for an indicator lamp when:

a) the device is intended for factory installation;

b) the leads are intended to be completely enclosed and not subject to movement in the end-product; and

c) the leads are not more than 152 mm (6 in) long.

4.8.6.4 For a mogul-base lampholder that is intended only for use in a luminaire or portable luminaire, leads having an ampacity of 6 A or more shall be acceptable on a 750 W lampholder, and leads having an ampacity of 12 A or more shall be acceptable on a 1500 W lampholder. Leads having an ampacity of 16 A or more shall be acceptable on a 2000 W lampholder.

Note 1 A mogul-screw lampholder rated 1500 W and marked in accordance with Clause 7.4.7 may employ leads having an ampacity of 8 A or more.

Note 2 A mogul-screw lampholder rated 2000 W and marked in accordance with Clause 7.4.7 may employ leads having an ampacity of 11 A or more.

4.8.6.5 The lead wires of an outlet-box lampholder shall not be smaller than 16 AWG (1.3 mm^2).

4.8.6.6 With reference to Clause 4.8.6.5, the lead wires of an outlet-box lampholder of the GU24 or GU24-1 designation shall not be smaller than 18 AWG (0.82 mm^2).

4.8.6.7 A lead wire for a double-based fluorescent lampholder rated at 2500 V shall not be smaller than 14 AWG (2.1 mm^2).

4.8.6.8 The lead wire insulation shall be acceptable for use at a maximum potential (at least 300 V) and at a temperature required for the application, with minimum of 90 °C (194 °F).

4.8.6.9 Wire leads provided as an integral part of a lampholder for use with pulse-rated lamps shall be rated a minimum 600 V.

4.8.6.10 A screw lampholder with lead wires shall have the lead wires identified such that they comply with the requirements in Clause 4.8.8.

4.8.6.11 A single-conductor lead wire with thermoplastic-insulation shall be:

a) fixture wire;

b) provided with a braid covering; or

c) a type that has a voltage rating of at least 600 V.

4.8.6.12 Rubber insulated lead wires shall be provided with an overall braid.

4.8.6.13 A braided lead wire on a lampholder for damp or wet locations shall be sealed in place with an acceptable sealing compound or by equivalent means.

4.8.6.14 Lead wires intended for connection to branch circuit conductors shall be not less than:

a) 100 mm (4 in) measured from the outside of the lampholder body for outlet-box, canopy, or similar type lampholders; and

b) 152 mm (6 in) for a grounding lead wire, if provided.

For lampholders for the factory assembled type, a lead length is not specified. For weatherproof lampholders, the requirements of Clause 4.11.2.1.2 shall apply.

4.8.6.15 Lamp connectors shall be provided with stranded lead wires only.

4.8.6.16 A soldered connection shall be made mechanically and electrically secure before soldering.

4.8.6.17 Lead wires shall be prevented from contacting edges which contain burrs that could damage the lead insulation.

4.8.6.18 Leads shall be securely terminated to the electrical components of the lampholder. Compliance shall be determined by the security of leads test specified in Clause 5.1.2.

4.8.7 Quick-connect terminals

4.8.7.1 Quick-connect terminals shall comply with the dimension requirements in UL 310 and CSA C22.2 No. 153.

4.8.8 Polarization

4.8.8.1 A conductor terminal intended for connection of the neutral conductor of the branch circuit shall be substantially white in color or shall be marked neutral, W, N, or white adjacent to the terminal. Lampholders intended for factory assembly need not be identified where polarity of the lampholder may be determined by visual examination.

4.8.8.2 With regard to Clause 4.8.8.1, the terminal connected to the screwshell may be identified by the white head of the wire-binding screw provided the screw is not readily removable from its terminal plate and it does not appear to relate to parts other than the screwshell.

4.8.8.3 A white terminal plate of a binding-screw terminal that is plainly visible after wiring and that does not appear to relate to the center contact of the lampholder may serve as the terminal identification specified in Clause 4.8.8.1 if all the line-terminal binding screws are of the same color.

4.8.8.4 If the terminal that would be plated white to comply with the requirement in Clause 4.8.8.1 is not visible, the wire-entrance hole for the connection to that terminal shall be marked with the word “white” or colored white directly adjacent to the lead wire entry hole.

4.8.8.5 A lampholder in which the cap or supporting base is provided with terminals for the connection of circuit conductors shall be constructed such that the device cannot be assembled with the center contact in electrical connection with the identified terminal in the cap or base.

4.8.8.6 If a screw lampholder is provided with lead wires or flexible cord, the identification of the leads shall be in accordance with Table 4 or Table 5.

4.8.9 Grounding

4.8.9.1 A grounding lead, if provided, shall have insulation that is green, with or without one or more yellow stripes.

4.9 Creepage Distances and Clearances

4.9.1 Creepage distances and clearances shall not be less than those specified in Clause 4.9 for other than pulse-rated lampholders, which are required to comply with Clause 5.2.13.

4.9.2 Creepage distances and clearances shall be measured with and without a lamp installed as intended. If the lampholder is a circuit-interrupting type in which all parts are de-energized in the absence of a lamp, the spacing shall be measured only with a lamp installed. For holders for fluorescent lamps that involve a telescoping section that abuts the lamp, this section shall be depressed 1.6 mm (1/16 in) while the measurement is being made.

4.9.3 On a spring contact lampholder, the creepage distances and clearances shall be maintained in any position up to 3.2 mm (1/8 in) from the fully depressed position of the spring.

4.9.4 Uninsulated live parts that are supported by friction alone and movable non-current-carrying metal parts in proximity to uninsulated live parts shall maintain the minimum creepage distances and clearances specified under all conditions.

4.9.5 The minimum acceptable creepage distances and clearances between leads on a neon indicator lamp that is operated in series with a resistor shall be based on the actual voltage between the lamp leads.

4.9.6 For the purpose of these measurements, the lampholder mounting surface shall be considered to be a grounded, non-current-carrying metal part.

4.9.7 A dead metal screw head, rivet, or the like shall not be considered accessible if, after the device is installed in the intended manner, the dead metal part is located in a maximum 7.1 mm (9/32 in) diameter hole and is recessed not less than 4.8 mm (3/16 in).

4.9.8 A non-current-carrying dead metal part interposed between live parts of opposite polarity or between a live part and a grounded or exposed non-current-carrying metal part shall be considered as reducing the spacing by the dimension of the interposed non-current-carrying metal part.

4.9.9 Creepage distances and clearances shall be measured between uninsulated live parts:

a) of opposite polarity;

b) and non-current-carrying metal parts;

c) and the intended mounting surface; and

d) non-current-carrying metal parts likely to be exposed to contact when the device is installed in the intended manner shall comply with Table 6.

4.9.10 In reference to Clause 4.9.9, the creepage distances and clearances from the columns of Table 6 labeled “at wiring terminals” shall apply to points of the holder where the supply connections are made (i.e., points that may come in contact with supply conductors). Creepage distances and clearances from the columns of Table 6 labeled “at points other than wiring terminals” shall apply to distances between points other than wiring terminals, including terminal contacts.

4.9.11 For fluorescent type, ferrule cap, and recessed single-pin lampholders rated at 1000 V, there shall be a spacing through air and over surface between an uninsulated live part and the outer surface of the lampholder. The spacing shall not be less than 4.8 mm (3/16 in) if the body of the holder is of glass, porcelain, or a polymeric material with a minimum comparative tracking index of 175 V, determined in accordance with the methods described in UL 746B and CAN/CSA-C22.2 No. 0.17. For other materials, this spacing shall not be less than 6.4 mm (1/4 in). This requirement does not apply:

a) at an opening for insertion of a lamp terminal or pin; or

b) to an uninsulated live part if the part is enclosed (in a luminaire enclosure, for example) while the lampholder is mounted in the intended manner.

4.9.12 An insulating barrier may be used in lieu of the required spacings provided that it complies with the barrier requirements contained in UL 746C and CAN/CSA-C22.2 No. 0.17.

4.9.13 If the insulating barrier in Clause 4.9.12 has an interface between two surfaces of insulating materials, which could allow a current path through the interface, the surfaces shall be bonded together to form a solid homogeneous cemented joint. Acceptable materials for providing a cemented joint are epoxy, acrylic adhesive, polyurethane adhesive, and solvent cements. Sonic welding may also be used to bond materials together. Friction interface alone shall not be acceptable.

4.10 Screw Devices

4.10.1 Lamp support

4.10.1.1 A screw-type lampholder shall provide threads, or their mechanical equivalent, to engage:

a) at least two threads of a standard lamp base to enable electrical contact to be made when the lamp is fully seated; and

b) one full thread for an intermediate- or candelabra-screw flush-mounted pilot light.

4.10.1.2 Other forms of lamp-base support and other means for making electrical contact are acceptable if they meet the requirements of Clause 5.2.3.

4.10.1.3 A lampholder with a skeleton type of construction shall comply with the requirements of Clause 5.2.3.

4.10.1.4 The lamp support means for a medium-screw lampholder shall demonstrate sufficient mechanical strength for the intended application. Compliance shall be determined in accordance with Clause 5.2.3.

4.10.2 Lamp cavity

4.10.2.1 The dimensions of the lamp cavity shall be in conformity with the specifications of NEMA ANSLG C81.62. Compliance shall be determined by Clause 5.2.4.

4.10.2.2 The depth of the lamp cavity of a lampholder shall be in accordance with Table 7. The maximum-depth requirement in Table 7 shall not apply if the insulating-material outer shell is flared and extends beyond the specified limit to provide further protection against contact with live parts. The outer shell shall prevent contact with the screwshell of an installed lamp, as determined by the application of the articulate probe shown in Figure 1.

4.10.2.3 The depth of the lamp cavity shall be measured from the plane of the fixed or fully depressed center contact to the plane of the rim:

a) of the insulating lining; or

b) of the lampholder body if the body is of insulating material.

4.10.2.4 If a lampholder interior is held in place between sections of a lampholder body or shell in which there can be movement of the interior, the depth of the lamp cavity shall be measured with the interior held as close as possible toward the open end of the lampholder.

4.10.2.5 If the method of mounting a lampholder affects the depth of the lamp cavity, the determination shall be made with the device mounted as intended. For example, a medium-screw lampholder of the screw-ring type intended to be mounted in the sheet-metal face of an electric sign, a metal canopy, or the like shall comply with the requirements of Clause 4.10.2.2 while mounted in a metal sheet 0.8 mm (1/32 in) thick.

4.10.3 Screwshell and device screw base

4.10.3.1 Except as limited by Clause 4.10.3.3 and 4.10.3.4, a metal screwshell or a screw base metal shell shall be made of a material specified in Table 21 or Table 22, respectively, or other metal acceptable for the purpose.

4.10.3.2 The female screwshell of a medium-base or larger lampholder intended for use with an infrared lamp or similar heat intensive equipment shall be of copper, copper alloy, corrosion-resistant (stainless) steel alloy, nickel, or nickel alloy. Copper or copper-alloy screwshells shall be plated with nickel or equivalent oxidation-resistant metals.

4.10.3.3 Where permitted, aluminum alloy for use in a metal screwshell or a screw base metal shell shall be a wrought alloy employing manganese and/or magnesium as the principal alloying material (with the possible addition of chromium), and not containing more than 1.5 percent of iron and silicon combined and not more than 1 percent of all other usual impurities of aluminum (including a maximum of 0.25 percent of copper).

4.10.3.4 A screwshell or the metal shell of a device screw base used in wet or damp location lampholdersthat is made from a copper alloy with less than 80 percent copper shall comply with Clause 5.2.19.

4.10.3.5 The minimum thickness of a metal lampholder screwshell shall be as indicated in Table 8. The minimum thickness of a metal screw base shall be as indicated in Table 9.

4.10.3.6 To determine if a metal screwshell or a screw base metal shell complies with the requirement in Clause 4.10.3.5, measurements of metal thickness shall be made on the flat surface of the bottom of the screwshell or screw base, respectively, by means of pointed- or round-nose micrometer calipers.

4.10.3.7 A screwshell or device screw base shall demonstrate sufficient mechanical strength for the intended application. Compliance shall be determined by Clause 5.2.3.

4.10.3.8 A screwshell or device screw base shall comply with Clause 5.2.4.

4.10.3.9 The metal screwshell of an all-rubber, molded, pendant, weatherproof lampholder shall be tinned or otherwise suitably treated to resist corrosion that might result from contact with the rubber.

4.10.3.10 The skeleton type of construction shall not be used on a device screw base.

4.10.3.11 A device screw base intended to lock in place and be non-removable shall be provided with a ratcheting mechanism, or the equivalent, so that the lampholder it is installed in is not damaged.

4.10.4 Center contact

4.10.4.1 The center contact of a spring type of lampholder intended for use with single-filament lamps shall have a width at the lamp-contact end to provide a circular area, located centrally in the well of the lampholder, when the contact is fully depressed, of at least the diameter shown in Table 10. This circular area may be in the form of an annulus provided that the diameter of the central hole is not greater than 50 percent of the width of the contact at this point. Contacts other than the spring type shall have a circular area of at least the diameter shown in Table 10.

4.10.5 Metal cap and shell (outer shell)

4.10.5.1 General

4.10.5.1.1 Means shall be provided for securely attaching the cap of a lampholder to the body or outer shell. The cap shall be prevented from turning with respect to the body or outer shell after assembly.

4.10.5.1.2 Caps and outer shells of ferrous metal shall be protected against corrosion by enameling, lacquering, galvanizing, plating, or other equivalent means.

4.10.5.1.3 The thickness of metal of the lampholder cap and of the outer shell shall be as indicated in Table 11.

4.10.5.1.4 To determine if an outer shell complies with the requirement in Clause 4.10.5.1.3, measurements shall be made with round-nose micrometer calipers. The average shall be taken of four measurements, 90 degrees apart, around the shell where its diameter is greatest and the surface cylindrical.

4.10.5.1.5 Rubber shall not be employed for the outer shell or body of a lampholder, except for a molded-rubber, pendant, weatherproof lampholder, as indicated in Clause 4.11.2.2.1.

4.10.5.2 Lining

4.10.5.2.1 The inside of a metal shell and cap shall be lined completely with insulating material such that the metal cannot become a part of the circuit, even though the wires inside the lampholder become loosened or detached from their positions under the terminal screws. The lining shall not extend beyond the shell more than 3.2 mm (1/8 in), and shall be located such that any uninsulated live part of a lamp base cannot become exposed while the lamp is in place. The lining of a metal cap shall be secured in place.

4.10.5.2.2 In a lampholder of conventional form, a removable ring of any material inserted between the outer shell and the screwshell for insulating purposes shall not be acceptable. This requirement shall not apply to the use of rings in a lamp cluster or in a device in which the outer shell is of porcelain or acceptable molded composition, if such rings serve to hold the several porcelain or composition parts together and thus are a necessary part of the complete device.

4.10.5.2.3 The lining shall be in one piece and shall not be slit, notched, or cut, except as may be necessary for the operation or assembly of the device.

4.10.5.2.4 The requirement in Clause 4.10.5.2.3 does not require a cap lining to be integral with a lining for an outer shell.

4.10.5.2.5 The thickness of a lampholder lining, as measured by means of round-nose micrometer calipers, shall not be less than 0.8 mm (1/32 in).

4.10.6 Switching or dimming mechanism

4.10.6.1 Base

4.10.6.1.1 A base on which uninsulated live parts are mounted (parts such as a wiring terminal, switching mechanism, center contact, or screwshell) shall be of porcelain, cold-molded or phenolic composition, or other insulating material acceptable for the particular application.

4.10.6.1.2 Vulcanized fiber shall not be used as the sole support for uninsulated live parts. It shall be considered acceptable as insulating washers, separators, or the ratchet wheel of a pull-chain switching mechanism.

4.10.6.1.3 The interior of a lampholder shall be secured such that it cannot be turned relative to the cap or base.

4.10.6.1.4 A single-pole switching mechanism shall interrupt the electrical connection to the center contact of a lampholder.

4.10.6.2 Actuator

4.10.6.2.1 An actuator that is a live part shall not be provided with a live threaded stem. A probe, as illustrated in Figure 1, when applied to a completely assembled lampholder with the actuating member removed, shall not contact the live parts of the actuator.

4.10.6.2.2 An actuating member (that part of the actuating mechanism that extends outside the lampholder body and is exposed to contact by the user), if of metal, shall be insulated from live parts. An actuating member made of insulating material shall comply with Clause 5.2.7.

4.10.6.2.3 The chain of a lampholder having a pull-type mechanism shall not become energized external to the enclosure, the external non-current carrying parts of the lampholder shall not become live, and the chain shall not cause the mechanism to jam when the chain is suddenly and completely released or breaks after having been pulled to the full ON position and the full OFF position.

4.10.6.2.4 Lampholders with outer shells of insulating material and having pull-type switch mechanisms shall have the operating means in the form of:

a) a cord made of suitable insulating material;

b) a cord made of suitable insulating material or a chain with a link of suitable insulating material, connected to the metal chains as close as possible to where the chain emerges from the enclosure; or

c) a metal chain without an insulating link provided that the complete assembly complies with Clause 5.2.9.2.

4.10.6.3 Insulating links

4.10.6.3.1 An insulating link shall be designed for ready attachment to the conventional metal chain employed in pull-type lampholders.

4.10.6.3.2 An insulating link shall be constructed such that there is a distance over the surface of the insulating material of not less than 12.7 mm (1/2 in).

4.10.6.3.3 A link made by the manufacturer of the lampholder and assembled in the pull-chain at the factory need not comply with the requirements in Clauses 4.10.6.3.1, 4.10.6.3.2, and 7.4.10.

4.10.6.3.4 An insulating link shall comply with the performance requirements in Clause 5.2.9.

4.10.7 Double-contact lampholders

4.10.7.1 An E26d double-contact medium-screw or E39d double-contact mogul-screw lampholder for use with double-filament lamps shall have a center contact and an intermediate contact to accommodate the corresponding lamp contacts, as shown in Figure 4.

4.10.7.2 In a mogul-screw lampholder, the distance (A) from the plane of the rim of the insulating body or lining to the intermediate contact (stationary, or while fully depressed if of the spring type) shall be 38.9 mm (1-17/32 in), with a plus tolerance of 1.6 mm (1/16 in), or the distance (B) from the plane of the rim of the body or lining to the center contact (stationary, or while fully depressed if of the spring type) shall be 41.3 mm (1-5/8 in), with a plus tolerance of 1.6 mm (1/16 in). In addition, when the position of either the center or intermediate contact has been determined in this manner, the other contact shall be capable of assuming positions 1.6 – 4.8 mm (1/16 – 3/16 in) (C) from the plane of the located contact in its stationary or fully depressed position.

4.10.7.3 In a medium-screw lampholder, the distance (A) from the plane of the rim of the insulating body or lining to the intermediate contact (stationary, or while fully depressed if of the spring type) shall be 21.4 mm (27/32 in), with a plus tolerance of 1.6 mm (1/16 in), or the distance (B) from the plane of the rim of the body or lining to the center contact (stationary, or while fully depressed if of the spring type) shall be 23.8 mm (15/16 in), with a plus tolerance of 1.6 mm (1/16 in). In addition, when the position of either the center or intermediate contact has been determined in this manner, the other contact shall be capable of assuming positions 0.8 – 3.2 mm (1/32 – 1/8 in) (C) from the plane of the located contact in its stationary or fully depressed position.

4.10.7.4 The requirements in Clauses 4.10.7.1 – 4.10.7.3 provide for the proper location of a double-filament lamp in the lampholder, with no metal of the lamp screw extending beyond the rim of the body or lining while the lamp is fully screwed in place. These requirements also indicate that either the center or the intermediate contacts, or both, may be of the spring type, but only one contact may be solid.

4.10.7.5 There shall be a spacing of not less than 1.2 mm (3/64 in) between the center contact and the intermediate contact with no lamp in the lampholder or with a double-filament lamp partly or fully screwed in place.

4.10.7.6 There shall be a distance of not less than 7.9 mm (5/16 in) between the intermediate contact and the axis of a mogul-screw lampholder, and not less than 4.8 mm (3/16 in) between the intermediate contact and the axis of a medium-screw lampholder.

4.11 Screw Lampholders for Use in Wet or Damp Locations

4.11.1 General

4.11.1.1 A screwshell shall be as described in Clause 4.10.3.4.

4.11.2 Weatherproof lampholders

4.11.2.1 General

4.11.2.1.1 The enclosure of a weatherproof lampholder shall be of porcelain, cold-molded or phenolic composition, or other material acceptable for the purpose. See Clause 5.2.14.1.

4.11.2.1.2 If lead wires are provided as a part of a weatherproof lampholder and are intended to be exposed after installation, they shall, except as provided in Clause 4.11.2.1.3, be stranded Type TW wire or the equivalent, not smaller than 14 AWG (2.1 mm^2) for the mogul- and medium-screw sizes, and not smaller than 18 AWG (0.82 mm^2) for the intermediate-, candelabra-, and miniature-screw sizes, and shall be sealed in place or comply with Clause 5.2.14.5. The lead wires shall not be less than 152 mm (6 in) in length, except that the attached lead wires of a pendant-type lampholder shall not be less than 100 mm (4 in) in length (measured outside of the body), and shall emerge from the lampholder not less than 6.4 mm (1/4 in) apart.

4.11.2.1.3 A weatherproof lampholder of the medium-screw size provided with a threaded nipple smaller than the 1/2-in trade size may be supplied with lead wires of 16 AWG (1.3 mm^2) or 18 AWG (0.82 mm^2) conductors having rubber or thermoplastic insulation not less than 0.8 mm (1/32 in) in thickness, provided the lead wires enter the lampholder through the nipple. Such lead wires need not be sealed in place.

4.11.2.1.4 A weatherproof lampholder provided with insulation-piercing terminals shall comply with Clause 5.2.14.5.

4.11.2.1.5 Fiber and similar absorptive materials shall not be used in a weatherproof lampholder.

4.11.2.2 Molded-rubber, pendant-type

4.11.2.2.1 A molded-rubber, pendant, weatherproof lampholder shall be made in the keyless, medium-screw size only and shall employ a rubber compound intended for continuous use at a temperature of 60 °C (140 °F) and shall comply with Clause 5.2.14.

4.11.2.2.2 The wall thickness of a rubber compound lampholder body shall be:

a) not less than 4.9 mm (3/16 in);

b) not less than 3.2 mm (1/8 in) at points on the lampholder such as shade-holder grooves; or

c) less than in (a) and (b) above when the material complies with Clause 5.2.12.

4.11.2.2.3 The depth of the lamp cavity as measured vertically from the plane of the depressed center contact to the plane of the rim of the molded-rubber body shall not be less than 23.8 mm (15/16 in) or more than 25.4 mm (1 in), except that a lamp cavity having a depth greater than 25.4 mm (1 in) may be acceptable if the lampholder properly accommodates a medium-screw lamp.

4.11.2.2.4 A molded-rubber, weatherproof lampholder shall be provided with individual lead wires not less than 100 mm (4 in) in length (measured outside of the body) that consist of stranded Type TW wire or the equivalent, not smaller than 14 AWG (2.1 mm^2), except that stranded lead wires without braids and employing not less than 1.6 mm (1/16 in) of 40-percent-rubber, sunlight-resistant insulation may be used if the compound is acceptable for the purpose.

4.11.2.2.5 The female screwshell shall be tinned or otherwise acceptably coated to resist corrosion. See Clause 4.10.3.3.

4.11.3 All other lampholders for use in wet locations

4.11.3.1 All other lampholders for use in wet locations shall comply with Clause 5.2.14.5.

4.12 Pulse-Rated Lampholders

4.12.1 A lampholder with a pulse rating shall not employ a switching mechanism.

4.12.2 A lampholder with a pulse rating shall employ an enclosure of porcelain, phenolic, cold-molded composition, or other material found acceptable for the purpose.

4.12.3 A pulse-rated lampholder shall have a peak starting pulse rating of:

a) 4 or 5 kV for mogul-screw-type rated 1500 W or 2000 W, 600 V;

b) 4 kV for medium-screw-type rated 660 W, 600 V; or

c) 4 or 5 kV for other type lampholders.

The lampholder shall comply with Clause 5.2.13.

4.12.4 A pulse rating greater than specified in Clause 4.12.3 shall be permitted when:

a) the enclosure is made of an inorganic material, such as porcelain;

b) the pulse rating is in increments of 1 kV; and

c) the lampholder complies with Clause 5.2.13.

4.12.5 Fiber and similar absorptive insulating materials shall not be used in a lampholder with a pulse rating.

4.12.6 A lampholder with a pulse rating shall comply with Clause 5.2.13.

4.13 Lamplocks

4.13.1 A lampholder provided with a special feature, such as a lamplock, shall be so constructed that operation of the feature as in actual service does not damage the enclosure, lining, or interior; does not result in the loosening of any of the parts of the complete assembly; and does not expose live parts for persons to contact unintentionally.

4.14 Ceiling outlet-box lampholders

4.14.1 A ceiling outlet-box lampholder provided with a shade or guard with less than 20% open surface area around the lamp shall be subjected to the normal temperature test of UL 1598 and CSA C22.2 No. 250.0.

5 Tests

5.1 All Lampholders

5.1.1 General

5.1.1.1 The performance of a lampholder shall be investigated by means of tests on each of six representative lampholders in commercial form. Unless otherwise specified, six lampholders shall be used for each test. The sequence of tests is not specified, except that tests that are made on the same set of lampholders shall be conducted in the order indicated.

5.1.2 Security of Leads Test

5.1.2.1 When tested as described in Clause 5.1.2.2, the strain relief means provided on the lampholder leads shall withstand for 1 minute, without disconnection, damage, or permanent deformation, a force of 89 N (20 lbf) applied to each lead.

5.1.2.2 An 89 N (20 lbf) weight shall be suspended from each lead, one at a time, and supported by the lampholder so that the strain relief means will be stressed from any angle that the construction of the lampholder permits. The strain relief shall be acceptable if there is no damage to the lead connection and no permanent deformation to any part of the lampholder.

5.1.3 Tests for Push-In Terminals

5.1.3.1 The opening provided for the conductor shall reject a hardened steel pin 1.98 ±0.005 mm (0.078 ±0.0002 in) in diameter with a 0.070 mm (0.0027 in) by 45 degree chamfer at the end. The pin shall be applied with a force of 22.2 N (5 lbf).

5.1.4 Dielectric Voltage-Withstand Test

5.1.4.1 When tested as described in Clause 5.1.4.2, a lampholder rated at more than 1000 V that contains a reduction in spacings as indicated in Note 2 of Table 6 shall withstand without breakdown the application of a 60 Hz essentially sinusoidal potential of 2-1/4 times the rated voltage of the lampholder

plus 2000 V applied for 1 minute between live parts of opposite polarity and live parts and accessible dead metal parts that are likely to become energized.

5.1.4.2 The lampholder shall be tested by means of a 500 VA or larger capacity transformer whose output voltage is essentially sinusoidal and can be varied. The applied potential shall be increased from zero until the required test level is reached and shall be held at that level for 1 minute. The increase in the applied potential shall be at a uniform rate that is as rapid as is consistent with its value being correctly indicated by a voltmeter.

5.2 Screw Lampholders

5.2.1 Effect of Heat on Gaskets Test

5.2.1.1 A gasket shall not crack, distort, or flake after being subjected to the test described in Clause 5.2.1.2.

5.2.1.2 A gasket shall be placed in an air-circulating oven at a temperature of 90 °C (194 °F) for a period of 72 hours.

5.2.2 Sealing Compound Softening Test

5.2.2.1 A determination of the softening point of a sealing compound shall be made in accordance with ASTM E28 and CSA C22.2 No. 0.

5.2.3 Mechanical Strength of Screwshell and Screw Base

5.2.3.1 The screwshell of a screw lampholder or the screw base of a screwshell device shall not turn, pull out, or become loose or distorted enough to adversely affect the assembly when the lampholder or device, respectively, is subjected for one minute to a straight pull as described in Clause 5.2.3.2 and a torque as described in Clause 5.2.3.3.

5.2.3.2 A straight pull of 89 N (20 lbf) shall be applied for one minute to the medium-screwshell of the lampholder or the screw base of the screwshell device by means of a weight attached to a threaded plug that can be screwed into a female shell, or a threaded receptacle that can be screwed onto a male shell.

5.2.3.3 A torque shall be applied in accordance with Table 12 for one minute.

5.2.3.4 In conducting the torsion test, the torque shall be applied by means of a threaded plug or receptacle to which a torque can be imparted while the plug or receptacle engages the screwshell and thrusts against the center contact of the lampholder. Figure 5 shows a device for making the torsion test.

5.2.3.5 In conducting the torsion test specified in Clause 5.2.3.3, the threaded plug or threaded receptacle is to be made to engage fully with the lampholder or device being tested and then, with the lampholder or device firmly held, the torque shall be applied very gradually so that there is no sudden jerk on the assembly.

5.2.4 Screwshell and Screw Base Conformity Tests

5.2.4.1 General

5.2.4.1.1 A screwshell or screw base shall satisfy the gauges shown in Table 13 or Table 14, respectively. Gauges shall be made in conformity with the specifications of NEMA ANSLG C81.63.

5.2.4.1.2 A skeleton-type lampholder required per Table 13 to comply with a threaded “Go” gauge or a “Not Go” plug gauge shall be tested as described in Clause 5.2.4.2.

5.2.4.2 Screwshell Go/Not Go Test

5.2.4.2.1 When tested as described in Clause 5.2.4.2.2, a lampholder shall comply with the following:

a) there shall not be any deformation of the screwthreads of the lampholder; and

b) the “Go” gauge shall screw into the lampholder and shall turn smoothly. When the gauge is fully inserted, the screwshell and screw threads of a metal screwshell-type lampholder, or the side contact and screw threads of a skeleton-type lampholder, shall be located at or above the horizontal surface y_1 of the gauge (see Figure 13), but shall not be above surface y_2. To verify the inside dimension of the screw threads, surface “t” of the “Not Go” gauge (see Figure 14) shall not be below the lampholder screw threads when inserted.

5.2.4.2.2 Each of six previously untested lampholders shall be tested with the “Go” gauge. The threaded “Go” gauge shall be installed into each lampholder until contact is made with the center contact (if it is a rigid type), or until a flexible center contact is fully depressed. The threaded “Go” gauge shall be capable of being inserted smoothly into the lampholder. If smooth insertion of the gauge is not possible, the test shall be repeated, and the torque required to install the gauge shall be recorded. The torque needed to install the gauge shall not exceed 0.34 N·m (3 lb-in) for candelabra, 0.45 N·m (4 lb-in) for intermediate, or 0.56 N·m (5 lb-in) for medium or mogul screw-type lampholders. The same lampholders shall then be tested with the “Not Go” gauge. The “Not Go” gauge shall be installed into each lampholder with an insertion force equal to the weight of the gauge.

5.2.5 Screw Base Switched AC/DC Lampholders

5.2.5.1 General

5.2.5.1.1 A lampholder provided with a switching mechanism shall be capable of performing acceptably when subjected to the overload test and the endurance test in accordance with the requirements in Clauses 5.2.5.1.2 – 5.2.5.3.3. As a result of the tests, there shall not be electrical or mechanical failure of the mechanism, nor shall there be undue pitting or burning of the contacts. The fuse described in Clause 5.2.5.1.2 shall not open at the conclusion of these tests.

5.2.5.1.2 During the overload and endurance tests, all dead metal parts of the switch that are exposed to user contact, including the intended mounting surface, shall be connected through a 15 A fuse to earth ground or to the neutral (grounded) conductor of the test circuit. This shall be accomplished in accordance with Clause 5.2.5.1.3.

5.2.5.1.3 The fuse shall be of a type and voltage rating intended for branch circuit protection. The potential rating of the fuse shall be equal to or greater than the maximum potential from the switch to the point at which the dead metal parts and intended mounting surface are connected. The connection shall be such that:

a) on a direct current circuit, dead metal parts are positive with respect to the nearer arcing point in the switch; and

b) the potential between live parts and conductive dead metal parts is the full test potential.

5.2.5.1.4 For the overload and endurance tests, line connections shall be made to the wiring terminals or leads as in actual service, and the load shall be connected by means of a plug or the equivalent to the screwshell and center contact of the lampholder. Proper connections are shown in Figure 6.

5.2.5.1.5 The load connected to each lampholder shall consist of a non-inductive load. For endurance testing the switching mechanism of a medium-screw lampholder for double-filament lamps and the switching mechanism of any mogul-screw lampholder shall be tested with a tungsten-filament-lamp load as described in Clause 5.2.5.3.2.

5.2.5.1.6 The overload test and the endurance test shall be conducted with the lampholders connected to a three-wire, direct-current circuit with grounded neutral. Exposed dead metal parts, such as the cap, shell, metal pull-chain, and the like, shall be grounded. A single-pole mechanism shall be connected in the ungrounded conductor that is negative with respect to the neutral or grounded conductor of the circuit.

5.2.5.1.7 A switching mechanism shall not be adjusted, lubricated, or otherwise conditioned either before or during the overload or endurance test. This requirement does not apply to a manufacturer's regular practice of lubricating lampholders after they are completely assembled.

5.2.5.2 Overload test

5.2.5.2.1 A lampholder provided with a switching mechanism shall be capable of performing acceptably when operated under the following conditions. The lampholder shall be mounted and wired such that actual service conditions are represented. It shall be operated manually by means of its actuating member and subjected to 50 cycles of operation making and breaking a circuit of current and voltage according to its wattage rating, as indicated in Table 15, at 6 – 10 cycles per minute. The voltage of the test circuit shall not be less than 95 percent or more than 105 percent of the voltage value indicated in Table 15.

5.2.5.3 Endurance test

5.2.5.3.1 A lampholder provided with a switching mechanism shall be capable of performing acceptably when operated under the following conditions. The lampholder shall be mounted and wired such that actual service conditions are represented. It shall be operated by means of its actuating member either manually or by means of a machine and subjected to 6000 cycles of operation making and breaking a circuit of current and voltage according to its wattage rating, as indicated in Table 16, at 6 – 10 cycles per minute. The voltage of the test circuit shall not be less than 95 percent or more than 105 percent of the voltage value indicated in Table 16.

5.2.5.3.2 The switching mechanism of a medium-screw lampholder for double-filament lamps and the switching mechanism of any mogul-screw lampholder shall be tested with a tungsten-filament lamp load or the equivalent, according to the methods previously described, except that, in the case of a lampholder for double-filament lamps, the load shall necessarily be divided into two sections, one representing each filament of the lamp. Following the usual cycle of high-medium-low-off, this means that the “low” load actually shall be turned on and off twice during each complete cycle.

5.2.5.3.3 The endurance test with tungsten-filament lamps indicated in Clause 5.2.5.3.2 is the only endurance test; that is, it is not in addition to the regular endurance test conducted with non-inductive loads.

5.2.6 Medium-Screw Switched AC Lampholders

5.2.6.1 General

5.2.6.1.1 The switches of a medium-screw switched ac lampholder shall be capable of withstanding the tests described in Clauses 5.2.6.1.2 – 5.2.6.5.1, without electrical or mechanical failure of any switch or undue burning or pitting of the contacts, and the switch mechanisms shall be capable of performing their normal function and shall not show wear, loosening of parts, or defects of any other description that would appreciably diminish the usefulness and reliability of the devices.

5.2.6.1.2 Compliance with the requirements for overload, endurance (noninductive load), endurance (tungsten filament lamp load), temperature, and dielectric strength test shall be determined by subjecting representative specimens of the lampholders to the tests specified in the order named.

5.2.6.1.3 Switching mechanisms shall not be adjusted, additionally lubricated, or otherwise conditioned before or during any of the tests.

5.2.6.1.4 In the performance of these tests, the lampholders shall be mounted and wired to approximate actual service conditions.

5.2.6.1.5 Exposed non-current-carrying metal parts such as caps, outer shells, or the like, shall be grounded.

5.2.6.1.6 A single-pole switch mechanism shall be connected in the ungrounded conductor.

5.2.6.1.7 The switches of a medium-screw switched ac lampholder shall be operated by means of the actuating member either manually or by means of a suitable machine.

5.2.6.2 Temperature

5.2.6.2.1 The current-carrying parts of a lampholder shall be capable of carrying continuously a current of 6 A without exceeding a temperature rise of 30 °C (54 °F). This test may be conducted at any convenient voltage and 60 Hz, and the readings shall be obtained using thermocouples.

5.2.6.3 Overload

5.2.6.3.1 The specimens of lampholders shall be capable of withstanding an overload test of 100 cycles of operation making and breaking a current of 6 A at 250 V, 60 Hz, and unity power factor.

5.2.6.3.2 The rate of speed shall be 6 – 10 cycles per minute, and the duration of the ON period for each cycle shall not be more than 1 second.

5.2.6.4 Endurance

5.2.6.4.1 Specimens of lampholders that have been previously subjected to the temperature and overload tests shall be capable of withstanding an endurance test of two parts as follows:

a) 20,000 cycles of operation making and breaking a current of 3 A at 250 V and 60 Hz, using a noninductive load. The speed of operation shall be 18 – 22 cycles per minute; and

b) 10,000 cycles of operation making and breaking the current of a 300 W tungsten filament lamp load at 120 V and 60 Hz. The speed of operation shall be 6 – 10 cycles per minute. The operating cycle shall be such that the lamp will be OFF for not less than 55 seconds of each cycle. (If the speed of operation is 10 cycles per minute, not less than 10 separate lamp banks controlled by a commutator or selector will be necessary for each lampholder under test.)

5.2.6.4.2 For the testing of a lampholder with tungsten filament lamps, the test circuits, including the generator or other source of supply, shall have sufficient ampere capacity to permit a current in-rush through the load of not less than 8 times the rms current, when the circuit is closed on a 20 A load, and the circuit shall be such that the peak value of the in-rush current will be reached within 1/240 of a second after the circuit is closed.

5.2.6.4.3 The suitability of a test circuit, including the generator or other source of supply, for testing with tungsten filament lamps, shall be determined by means of oscillograph studies. The current in-rush factor

of 8 shall be based on a normal current flow of 20 A. The characteristics of the test circuit shall be judged from a number of oscillograms (12 or more), and testing equipment shall be acceptable if not less than six of the oscillograms show a current in-rush factor of 8 or more. With reference to a 60-cycle timing wave, the peak values of the in-rush currents as shown by the oscillograms shall be attained within 1/4 cycle.

5.2.6.5 Dielectric strength

5.2.6.5.1 Immediately at the conclusion of the tests described in Clauses 5.2.6.4.1 – 5.2.6.4.3, the lampholder shall withstand without breakdown the application of an ac voltage of 1500 V and suitable frequency, for 1 minute, between live parts of opposite polarity and between live parts and exposed non-current-carrying metal parts, when tested as described in Clause 5.1.4.2.

5.2.7 Effect of Heat Test on Actuating Members

5.2.7.1 An actuating member of thermoplastic insulating material shall not soften or become damaged when it is caused to operate the mechanism after having been exposed to a temperature of 90 °C (194 °F).

5.2.7.2 To determine if an actuating member complies with the requirement in Clause 5.2.7.1, the lampholder assembly shall be subjected to a temperature of 90 °C (194 °F) until the insulating material under consideration is thoroughly heated (1 hour in a constant temperature oven usually is sufficient). The actuating member shall then be operated manually as in actual service at no load (as by turning the key or by pressing the buttons of a push-type mechanism) and shall not be affected adversely to the extent that it is deformed so as to reduce the electrical spacings below those required by Clause 4.9, or fails to operate the mechanism for 25 cycles of make and break at the rate of 6 – 10 cycles per minute. At the conclusion of this test, the operating mechanism shall be capable of performing its intended function. In conducting this test, the actuating member should not be operated more violently than would be the case in the intended service, and care shall be taken to conduct the test immediately after each individual lampholder is removed from the oven.

5.2.8 Lampholders With Pull Switch

5.2.8.1 General

5.2.8.1.1 The chain of 3 lampholders is to be pulled to the OFF position and then released. This test is to be repeated a total of 5 times for each lampholder. The chain shall not become energized, and the mechanism shall not jam as a result of this test.

5.2.8.2 Dielectric strength

5.2.8.2.1 A lampholder with an outer shell of insulating material and having a switch mechanism of the pull-type, which is operated by a metal chain without an insulating link or cord, shall withstand without breakdown the test outlined in Clause 5.2.8.2.2.

5.2.8.2.2 Specimens of the lampholder shall be subjected to a saturated moist atmosphere for a period of 48 hours at a temperature of 32.0 ±2 °C (89.6 ±3.6 °F). Immediately after removal from the humidity cabinet, an ac voltage of 2500 V shall be applied for a period of 1 minute between the pull chain and live parts. The switch is to be in the ON position for this test.

5.2.9 Insulating Links Tests

5.2.9.1 Mechanical strength test

5.2.9.1.1 An insulating link shall withstand for a period of 1 minute a direct pull of 178 N (40 lbf) applied between the chain attachments at either end, except that in the case of a factory-assembled link that is not detachable from the chain, the link shall not break before the chain breaks when the complete assembly is subjected to a direct pull of not more than 178 N (40 lbf) between the chains at either end. The load shall then be held constant for 1 minute or until failure occurs.

5.2.9.2 Dielectric voltage-withstand test

5.2.9.2.1 When tested as described in Clause 5.1.4.2, an insulating link shall withstand without breakdown the application of a 60 Hz essentially sinusoidal potential of 1500 V applied for a period of 1 minute between metal chains attached to both ends, after the link has been exposed to a saturated moist atmosphere for a period of 48 hours as described in Clause 5.2.9.2.2.

5.2.9.2.2 Prior to testing, the insulating links shall be conditioned by exposure for 48 hours in a saturated moist atmosphere at a temperature of 32.0 ±2.0 °C (89.6 ±3.6 °F). The links shall be suspended over water in a small, flat-bottomed vessel with a tight-fitting cover. The water shall be about 12.7 mm (1/2 in) deep, and the samples shall clear the water by 25.4 mm (1 in) or more. The closed vessel containing the water and the suspended links shall be placed in a controlled-temperature cabinet, with a free circulation of air around the vessel, and the temperature of the air within the cabinet shall be maintained at the value specified.

5.2.10 Lampholder Lining Tests

5.2.10.1 Mechanical strength

5.2.10.1.1 A lampholder lining shall withstand for 1 minute, without tearing or breaking, a steady pull of 80 N (18 lbf) applied to rods passing through 6.4-mm (1/4-in) diameter holes punched at diametrically opposite points on the lining and located as shown in Figure 7.

5.2.10.1.2 Each lining shall be prepared by punching four 6.4-mm (1/4-in) holes as follows. Two holes shall be punched at diametrically opposite points so that there is 6.4 mm (1/4 in) of lining between each hole and the upper edge. Similarly, two holes shall be punched 6.4 mm (1/4 in) from the lower edge so that a line through their centers is at right angles to a line through the centers of the upper holes.

5.2.10.1.3 Metal plugs with supporting rings shall be provided, the plugs having different diameters, 31.8 and 27.0 mm (1-1/4 and 1-1/16 in), to accommodate the large and small ends of a lining. A plug shall be placed in each end of each lining to be tested and a metal rod or mandrel approximately 5.8 mm (0.23 in) in diameter and 76 mm (3 in) in length shall be inserted in the holes in the lining and the hole in the plug. The lining is then ready to support a weight that supplies an 80 N (18 lbf). A lining with holes punched, plugs in place, mandrels inserted, and ready to support a weight is shown in Figure 7.

5.2.10.2 Dielectric voltage-withstand test

5.2.10.2.1 When tested as described in Clause 5.1.4.2, a lampholder lining shall withstand without breakdown the application of a 60 Hz essentially sinusoidal potential of 4000 V applied for 1 minute.

5.2.10.2.2 Specimens of linings of medium-screw lampholders that have been neither cut nor slotted shall be placed in a desiccator with dry calcium chloride for 24 hours. They shall then be removed from the desiccator and immediately subjected to an ac voltage of 4000 V for 1 minute (applied gradually, starting from zero). The 4000 V shall be impressed between an inner and an outer metal electrode (see Figure 8)

with the lining of the lampholder between electrodes and extending approximately 6 mm (0.23 in) beyond the electrodes at each end of the lining.

5.2.10.3 Effect of heat

5.2.10.3.1 A lampholder lining shall not char, crack, crumble, or become brittle as the result of the conditioning outlined in Clause 5.2.10.3.3.

5.2.10.3.2 Each lining to be tested shall be placed on a dummy interior made of porcelain, metal, or other material that is not affected by the oven temperature during the test. The dummy shall be formed to represent the size and shape of the interior of a lampholder, as shown in Figure 9. It shall be made somewhat longer than the lining so that it supports the lining completely during the test.

5.2.10.3.3 The lining shall be placed in an oven and maintained at a temperature of 150 ±5 °C (302 ±9 °F) for 72 hours.

5.2.10.3.4 After removal from the oven, the lining shall be tested for mechanical strength in accordance with Clauses 5.2.10.1.1 – 5.2.10.1.3, except that the force applied shall be 62 N (14 lbf) instead of 80 N (18 lbf).

5.2.11 Security of Cap of Metal-Shell Lampholders Test

5.2.11.1 Cantilever test

5.2.11.1.1 The cap of a metal-shell medium-screw lampholder shall be secured to the outer shell such that the cap does not separate from the shell when subjected to a cantilever load for a period of 1 minute as described in Clause 5.2.11.1.2. For lampholders with threading on the outside of the shell near the open end of the shell (UNO thread), the load shall be 3.39 N·m (30 lbf-in), and for lampholders without an external thread, the load shall be 1.69 N·m (15 lbf-in).

5.2.11.1.2 The lampholders to be tested, complete with interior mechanism, shall be mounted on an appropriate nipple. A threaded plug with attached shaft shall be inserted into the lamp opening. A weight shall be suspended from the shaft so as to subject the lampholder to the appropriate cantilever load. The value of the cantilever load shall be such that the appropriate bending moment is applied at the point of attachment of the cap to the outer shell. During this test, the lampholder shall be rotated at an even rate through 360 degrees.

5.2.11.2 Torque test

5.2.11.2.1 The assembly of a cap to the body or outer shell of a lampholder, complete with the interior mechanism, shall withstand for one minute a torque as described in Clause 5.2.11.2.2 without separation or turning of the body or outer shell of the lampholder relative to the cap.

5.2.11.2.2 A torque of 2.25 N·m (20 lb-in) for a medium-screw lampholder and 1.69 N·m (15 lb-in) for an intermediate-screw lampholder shall be applied for one minute to the cap and lampholder assembly. The torque shall be applied as described in Clauses 5.2.3.3 and 5.2.3.4.

5.2.12 Insulation Resistance Test

5.2.12.1 When tested as described in Clauses 5.2.12.2 – 5.2.12.5, the insulation resistance shall not be less than 100 MΩ:

a) between a molded-in live part and any dead metal part or surface of insulating material that is exposed for persons to contact or that may be in contact with ground in service; and

b) between any internal surface that is contacted by a molded-in or other live part and any surface of insulating material that is exposed for persons to contact or that could be in contact with ground in service.

5.2.12.2 In determining compliance with the requirement in Clause 5.2.12.1, the insulation resistance shall be measured by a magneto megohmmeter that has an open-circuit output of 500 V or by equivalent equipment.

5.2.12.3 The megohmmeter test between molded-in live parts and exposed metal parts that may be grounded requires no additional instruction. However, in measuring insulation resistance from or to an insulating-material surface, electrodes shall be applied to the insulating material as described in Clause 5.2.12.4.

5.2.12.4 To provide the electrode to contact an exterior surface, a quantity of No. 7 lead drop shot [approximate diameter 2.5 mm (0.10 in)] shall be placed in a container that is open at the top and, after cord holes and other openings through which the shot could enter are carefully plugged with a high-resistance insulating material, the device shall be immersed in the shot so that the shot serves as an electrode in contact with the exterior surface to which the test shall be applied. A cavity that is a molded-in live part, or a cavity from which assembled-in live parts have been removed, shall similarly be filled with No. 7 drop shot to provide the other electrode.

5.2.12.5 All rubber parts shall be conditioned at least 48 hours at room temperature before being subjected to the above tests.

5.2.13 Dielectric Voltage-Withstand Test for Pulse-Rated Lampholders

5.2.13.1 When tested as described in Clauses 5.2.13.2 and 5.2.13.4, a lampholder shall withstand without breakdown the application of a 60 Hz essentially sinusoidal potential applied for 1 minute following exposure to moist air for 48 hours. The moist air shall have a relative humidity of 88 ±2 percent at a temperature of 32.0 ±2 °C (89.6 ±3.6 °F). The test potential shall be applied between parts of opposite polarity and between live parts and dead metal parts with an applicable dummy lamp base. Where specified in NEMA ANSLG C81.61, the dummy lamp base shall be ceramic and dimensioned in accordance with the specifications of NEMA ANSLG C81.61. For bases not specified in NEMA ANSLG C81.61, a dummy lamp base shall be fabricated by appropriately modifying a sample of the intended lamp, including the potting or encapsulating of remaining interior parts of the lamp with a suitable dielectric material.

5.2.13.2 The test potential shall be 4000 V rms for lampholders with a starting pulse rating of 4 kV, and 7070 V rms for lampholders with a starting pulse rating of 5 kV. The test potential shall be an rms voltage that is the same numeric value as the pulse rating in volts peak for a lampholder having a pulse rating of more than 5 kV.

5.2.13.3 A lampholder that employs an enclosure of inorganic material (e.g., porcelain) shall be tested at an rms voltage that is the same numeric value as the pulse rating in volts peak.

5.2.13.4 A lampholder employing integral leads shall have separate leads subjected to a dielectric voltage-withstand test. Six leads, each approximately 305 mm (12 in) long, shall be wound four times around a 19.0 mm (3/4 in) diameter steel mandrel. The leads shall then be exposed to moist air for 48 hours at a relative humidity of 88 ±2 percent at a temperature of 32.0 ±2 °C (89.6 ±3.6 °F). Following the exposure, the leads shall be capable of withstanding without breakdown a 60 Hz essentially sinusoidal potential for 1 minute between the conductor and the mandrel. The test potential shall be equal to the test potential to which the lampholder is subject in Clause 5.2.13.2.

5.2.13.5 To determine whether or not the leads comply with the requirements in Clauses 5.2.13.1 and 5.2.13.2, each lead shall be tested as described in Clause 5.1.4.2. The dielectric voltage-withstand shall be conducted in the humidity chamber or immediately upon removal from the test chamber.

5.2.14 Weatherproof Lampholder Tests

5.2.14.1 Softening of molded composition test

5.2.14.1.1 The enclosure of a weatherproof lampholder employing material that softens with the application of heat shall withstand a temperature of 60 °C (140 °F) under the conditions described in Clauses 5.2.14.1.2 – 5.2.14.1.5.

5.2.14.1.2 A specimen shall be obtained by cutting through the lampholder body in a plane parallel to and approximately 19.0 mm (3/4 in) from the outer rim. After this cut surface has been smoothed with fine sandpaper, the specimen shall be placed in an oven that previously has been heated thoroughly to a temperature of 60 °C (140 °F). The specimen shall remain in the oven at that temperature for 3 hours.

5.2.14.1.3 The specimen shall be placed on a horizontal surface in the oven, with its cut surface up, and shall support the 1.4 kg (3-lb) weight described in Clause 5.2.14.1.4 for the full 3 hours.

5.2.14.1.4 The weight shall consist of a lead-filled section of cylindrical copper tubing having a wall thickness of approximately 1.6 mm (1/16 in). The cylinder shall be approximately 56.6 mm (2-3/16 in) in diameter and 50.8 mm (2 in) long. In the surface of the lead at one end of the cylinder, three 6.4-mm (1/4-in) steel balls [protruding approximately 2.4 mm (3/32 in)] shall be set equally spaced around a circle 31.8 mm (1-1/4 in) in diameter and concentric with the axis of the cylinder.

5.2.14.1.5 During the 3-hour heating period, the weight shall rest on the specimen with the three steel balls pressing against the cut surface of the composition. Upon removal of the weight and specimen from the oven, there shall not be depressions in the composition that are caused by the steel balls and are visible to the naked eye.

5.2.14.2 Accelerated aging of molded rubber

5.2.14.2.1 Molded rubber employed in a pendant-type, weatherproof lampholder shall comply with the requirements in Clauses 5.2.14.3.1 – 5.2.14.4.3.

5.2.14.3 Oven aging test

5.2.14.3.1 The physical properties of a molded-rubber compound, unaged and after air oven aging, shall be as indicated in Clause 5.2.14.3.2 and Table 17.

5.2.14.3.2 Test specimens shall be taken from lampholders and shall be prepared and handled precisely in accordance with the methods described in UL 1581 and CSA C22.2 No. 0.3.

5.2.14.4 Air-oven test

5.2.14.4.1 A molded-rubber compound shall be acceptable for continuous use at a temperature of 60 °C (140 °F).

5.2.14.4.2 To determine if a compound is for continuous use at 60 °C (140 °F), an investigation shall be made of the physical properties of specimens taken from lampholders, two sets of which have been maintained at temperatures of 60 °C (140 °F) and 66.0 °C (150.8 °F) respectively, in ovens. Individual

specimens are to be investigated after periods of 10 days, 1 month, and 2 months in the oven continuously at the temperature specified.

5.2.14.4.3 With respect to tensile strength and elongation, after the 2-month period, a deterioration of more than 16 percent for specimens aged at 60 °C (140 °F) and of more than 37 percent for specimens aged at 66.0 °C (150.8 °F) shall not be acceptable. Consideration shall also be given to the rate of deterioration as indicated by deterioration curves: a rapid rate of deterioration during the last test period is undesirable.

5.2.14.5 Rain test

5.2.14.5.1 When tested as described in Clauses 5.2.14.5.2 – 5.2.14.5.4, the construction of a lampholder intended for use in wet locations shall not permit the entrance of water into the lampholder body, including the lamp cavity.

5.2.14.5.2 The intended lamp shall be inserted in the unenergized lampholder. The lampholder and lamp assembly shall be subjected for one hour to a downward spray of water applied at an angle of 45 degrees to the vertical, in the direction or directions most likely to cause water to enter the lampholder.

5.2.14.5.3 The water spray test apparatus shall consist of three spray heads mounted as shown in Figure 10. The spray heads shall be constructed in accordance with Figure 11. The water pressure at each spray head shall be maintained at approximately 34.5 kN/m^2 (5 lbf/in^2). The lampholder assembly shall be positioned in the focal area of the three spray heads such that the greatest quantity of water is likely to enter the lampholder.

5.2.14.5.4 After exposure to the water spray, each lampholder shall be individually subjected to the dielectric voltage-withstand test, Clause 5.2.14.6.

5.2.14.6 Dielectric voltage-withstand test

5.2.14.6.1 When tested as described in Clause 5.2.14.6.2, a lampholder shall withstand without breakdown the application of a 60 Hz essentially sinusoidal potential of:

a) 500 V for a lampholder rated 250 V or less; or

b) 1500 V for a lampholder rated greater than 250 V.

applied for 1 minute between the screwshell contact and the center contact of the lampholder and between live parts and the lampholder and lamp assembly covered in foil.

5.2.14.6.2 The test shall be conducted without lamps installed in the lampholders. Each lampholder that has been subjected to the rain test of Clause 5.2.14.5 shall be tested as described in Clause 5.1.4.2.

5.2.15 Insulation-Piercing Terminal Lampholder Temperature Tests

5.2.15.1 General

5.2.15.1.1 A screw lampholder employing insulation-piercing terminals specified for use with Type SP, SPE, or SPT flexible cord, as indicated in Clause 4.8.3.4, shall be tested in accordance with Clauses 5.2.15.1.2 to 5.2.15.5.4.

5.2.15.1.2 All values for temperature are based on an ambient of 25 °C (77 °F). The temperature test may be conducted at any ambient temperature within the range of 10 – 40 °C (50 – 140 °F).

5.2.15.1.3 Temperatures shall be measured by thermocouples consisting of wire not larger than 24 AWG (0.21 mm^2) and not smaller than 30 AWG (0.05 mm^2). The thermocouples and the related instrument shall be accurate and calibrated in accordance with standard laboratory practice. The thermocouple wires shall conform with the requirements specified in the Tolerance of Initial Values of EMF versus Temperature tables in ANSI/ASTM E230/E230M. Thermocouples using iron and constantan 30 AWG (0.05 mm^2) wire shall be used with a potentiometer-type instrument whenever a referee temperature measurement by thermocouple is necessary.

5.2.15.1.4 Thermocouples shall be placed on the wire insulation as close to the terminal connections as possible. They shall be placed in the same location on each lampholder tested.

5.2.15.1.5 Unless otherwise specified, each test shall be continued until constant temperatures are obtained. A temperature shall be considered constant if:

a) the test has been running for at least three hours; and

b) three successive readings, taken at 15-minute intervals, are within 1 °C (1.8 °F) of each other and are still not rising.

5.2.15.2 Temperature test – thermal cycling

5.2.15.2.1 Six previously untested lampholders shall be assembled to conductors of the size and type for which they are intended. The lampholders shall be connected to the rated load and the temperature of the insulation-piercing terminal connections shall be monitored continuously with thermocouples. The devices shall be operated for a period of seven hours and the temperature of the insulation-piercing terminal connections recorded.

5.2.15.2.2 The same six lampholders shall be cycled for a total of 180 cycles at a rate of 3-1/2 hours on and 1/2 hour off. The temperatures of the insulation-piercing terminal connections shall be monitored continuously throughout the 180 cycle period. After the last cycle, the lampholders shall be energized for a period of seven hours, after which temperatures shall again be measured. The off cycle time may be extended for the convenience of measurement.

5.2.15.2.3 Throughout the test described in Clause 5.2.15.2.2, the maximum temperature of the insulation-piercing terminal connections on each lampholder shall not be more than 30 °C (54° F) higher than the temperatures measured on the same lampholder in Clause 5.2.15.2.1. The temperature of the insulation-piercing terminal connections shall not exceed 90 °C (194 °F).

5.2.15.3 Strain relief/terminal temperature

5.2.15.3.1 Six previously untested lampholders shall be assembled to conductors of the size and type for which they are intended. The lampholders shall be connected to the rated load and the temperature of the insulation-piercing terminal connections monitored continuously with thermocouples. The lampholders shall be operated for a period of seven hours and the temperature of the insulation-piercing terminal connections recorded.

5.2.15.3.2 The same lampholders shall be placed in an air-circulating oven for 15 days. The oven shall be at a temperature of 90 °C (194 °F).

5.2.15.3.3 The same six lampholders shall be allowed to cool to room temperature and each lampholder shall be mounted as intended. A pull on the supply cord shall be gradually applied in any direction consistent with normal use and maintained for a period of one minute with the following load:

a) 156 N (35 lbf); or

b) 89 N (20 lbf), if marked for factory assembly in accordance with Clause 7.3.2.

5.2.15.3.4 The same lampholders shall then be connected to the rated load and the temperature of the insulation-piercing terminal connections monitored continuously with thermocouples. The lampholders shall be energized for a period of 30 days.

5.2.15.3.5 Throughout the testing in Clause 5.2.15.3.4, the temperature of the insulation-piercing terminal connections on each lampholder shall not be more than 30 °C (54 °F) higher than the temperature measured in Clause 5.2.15.3.1. In no case shall the temperature of the insulation-piercing terminal connections exceed 90 °C (194 °F).

5.2.15.4 Switching mechanism/insulation-piercing terminal temperature test

5.2.15.4.1 Lampholders employing insulation-piercing terminals that also employ a switching mechanism shall be subjected to the conditioning and test described in Clause 5.2.15.4.2.

5.2.15.4.2 Six previously untested lampholders shall be assembled to conductors of the size and type for which they are intended and sequentially subjected to the following:

a) overload conditioning, in accordance with the requirements for Screw Base Switched AC/DC Lampholders, Clause 5.2.5;

b) stress relief oven conditioning: the devices shall be aged in an air-circulating oven for 15 days at a temperature of 90 °C (194 °F);

c) endurance conditioning, in accordance with the requirements for Screw Base Switched AC/DC Lampholders, Clause 5.2.5; and

d) temperature test: the temperatures of the insulation-piercing terminal connections shall be monitored continuously by means of thermocouples. The lampholders shall be connected to the rated load and energized for a period of seven hours. During this test, the temperature of the insulation-piercing terminal connections shall not exceed 90 °C (194 °F).

5.2.15.5 Rewiring/terminal temperature test

5.2.15.5.1 Six previously untested lampholders shall be assembled to conductors of the size and type for which they are intended. The lampholders shall be connected to the rated load and the temperature of the terminal connections shall be monitored continuously. The lampholders shall be operated for a period of seven hours and the temperature of the terminal connections recorded.

5.2.15.5.2 When disassembly of the lampholder would cause damage such that rewiring is not possible, then the tests in Clause 5.2.15.5 need not be performed.

5.2.15.5.3 The conductors shall then be removed from the lampholders and the same lampholders shall be assembled to new conductors. After waiting a minimum of five minutes, the conductors shall be replaced with new conductors and the process repeated until a total of ten conductors have been installed on each lampholder. The tenth set of conductors shall remain installed on the lampholders.

5.2.15.5.4 The lampholders shall then be connected to the rated load and the temperature of the insulation-piercing terminal connections shall be monitored continuously with thermocouples. The lampholders shall be energized for a period of 30 days.

5.2.15.5.5 The maximum temperature of the insulation-piercing terminal connections on each lampholder as measured in Clause 5.2.15.5.4 shall not be more than 30 °C (54 °F) higher than the

temperatures measured in Clause 5.2.15.5.1. The temperature of the insulation-piercing terminal connections shall not exceed 90 °C (194 °F).

5.2.16 Temperature Test of Dimmer-Type Lampholders

5.2.16.1 The dimmer circuit components of a lampholder of the dimmer or regulating type shall not exceed the rated temperature limit or show a temperature rise of more than 75 °C (135 °F). The test shall be performed in accordance with Clauses SA5.2 – SA5.7, except that the unit shall be operated continuously with a lamp having the same rating as the lampholder with the dimming mechanism in any position between off and full on that will result in maximum temperatures.

5.2.16.2 The temperature rise of 75 °C (135 °F) shall be based on an assumed ambient temperature of 25 °C (77 °F).

5.2.17 Mold Stress-Relief Distortion Test

5.2.17.1 Six samples of lampholders with thermoplastic enclosures shall be conditioned in a full draft circulating air oven in accordance with item (a) or (b) as follows:

a) screwshell lampholders – the oven temperature shall be maintained at a uniform minimum temperature of 160 °C (320 °F).

b) fluorescent lampholders with no marked temperature rating – the oven temperature shall be maintained at a uniform minimum temperature of 100 °C (212 °F). For fluorescent lampholders with a marked temperature rating, the oven temperature shall be 100 °C (212 °F) or 10 °C (18 °F) higher than the material's marked temperature rating in accordance with Clause 7.5, whichever is higher.

5.2.17.2 The samples shall remain in the oven for 7 hours. After their careful removal from the oven and return to room temperature, the samples shall be investigated for compliance with Clause 5.2.17.3.

5.2.17.3 There shall not be any shrinkage, warpage, or other distortion of the lampholders as judged after cooling to room temperature that results in any of the following:

a) reduction of creepage distances and clearances in accordance with Clause 4.9;

b) making uninsulated live parts accessible to contact in accordance with Clause 4.5;

c) causing a condition that affects the strain-relief means in accordance with Clause 5.1.2, if applicable; and

d) causing any condition that interferes with the normal operation of insertion or removal of a lamp into the lampholder.

5.2.18 Switched GU24 Lampholder Test

5.2.18.1 The switching mechanism of a GU24 lampholder shall comply with the Screw Base Switched Lampholder test of Clause 5.2.5 or 5.2.6 with the following modifications for the switched AC/DC test of 5.2.5:

a) the load connection described in Clause 5.2.5.1.4 shall be made to the contacts of the GU24 holder. Figure 6 is not applicable.

b) referring to Clause 5.2.5.1.5, the switching mechanism shall be tested using a tungsten-filament lamp load or the equivalent. Clause 5.2.5.3.2 is not applicable.

c) the overload test shall be conducted as described in Clause 5.2.5.2.1 except that the switching mechanism shall make and break a circuit that results in 150 percent of the lampholder's rated wattage at rated voltage. Table 15 is not applicable.

d) the endurance test shall be conducted as described in Clause 5.2.5.3.1 except that the switching mechanism shall make and break a circuit that results in the lampholder's rated wattage at rated voltage. Table 16 is not applicable.

5.2.19 Moist Ammonia Air Stress Cracking Test

5.2.19.1 After being subjected to the conditions described in 5.2.19.2 – 5.2.19.4, copper-alloy screwshells or device screw bases shall show no evidence of cracking, delamination or degradation.

5.2.19.2 Each test sample shall be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Such stresses shall be applied to the sample prior to and maintained during the test. Therefore, the screwshells or device screw bases under test shall be mated with corresponding nickel-plated or nickel alloy screw base plugs or screwshells of the same fit designation and tightened to the applicable torque specified in 5.2.4.2.2. All parts shall be clean and free from any oil or lubricant prior to insertion.

5.2.19.3 Three samples, prepared per 5.2.19.2, shall be tested in accordance with Apparatus (Section 6), Reagents and Materials (Section 7), Test Media (Section 8), Test Sample Preparation (9.3 – 9.4), and Test Procedure (10.1 – 10.4) of the Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys, ASTM B858, with the test solution pH level High 10.5 ±0.1; exposure temperature of 25 ±1 °C; and with the examination in accordance with 5.2.19.4.

5.2.19.4 After the exposure period, the samples shall be examined for cracks or other signs of stress corrosion using a microscope having a magnification of 25X.

6 Ratings

6.1 Screw Lampholders

6.1.1 A screw lampholder shall be rated in accordance with Table 18.

6.1.2 A combination device employing a medium-screwshell (male or female) and parallel or tandem blades or slots shall be rated in accordance with Table 19.

6.1.3 A lampholder of the dimmer or regulating type shall be rated in watts and volts in accordance with test performance. See Clause 6.1.5.

6.1.4 A lampholder adapter consisting of parallel attachment plug blades assembled to a candelabra-screw lampholder may be marked with a wattage rating less than 75 W in conjunction with the 125 V rating. If the adapter employs a switching mechanism, the test circuit values for the overload and endurance tests shall be as indicated for candelabra-screw lampholders in Table 15 and Table 16, respectively.

6.1.5 A medium-screw lampholder of the dimmer or regulating type shall be rated at not less than 150 W and not less than 120 V ac or 125 V dc.

6.2 Lampholders Other Than Screw-Type

6.2.1 The ratings of lampholders other than screw-type shall be in accordance with Table 20.

6.2.2 Single-based fluorescent lampholders not covered by Table 20 shall be rated 250 V or 600 V. The lampholder marked wattage rating shall not be less than the lamp it is intended to accommodate.

Note: For applicable lamp-base wattage rating see NEMA C78.901.

7 Markings

7.1 General

7.1.1 A lampholder shall be plainly and permanently marked with:

a) the manufacturer's name, trade name, trademark, or other distinctive marking by which the organization responsible for the product may be identified;

b) a distinctive catalog number or the equivalent; and

c) the electrical rating.

Note: When the catalog number is not marked on the lampholder, it should appear on the carton or other container in which the device is packaged.

7.1.2 For a screw lampholder, the electrical rating and other marking of the lampholder shall not appear on the extension plaster ears, whether separate pieces or integral with the mounting means, unless the marking and rating also appear elsewhere on the device.

7.1.3 The manufacturer's name, trade name, trademark, or other distinctive marking and, if practicable, the rating of a lampholder shall be visible after installation.

7.1.4 A lampholder that has an integral flush plate or outlet-box cover of insulating material may be marked on the inside of the plate or cover.

7.1.5 An open-rated EX26 or EX39 screw lampholder shall be marked “Type O”, “Open Rated”, or shall have another distinctive marking, shape, or color to differentiate it from a non-open-rated lampholder.

7.1.6 A surface-type lampholder may be marked on the inside of the insulating cover or on the side of the base that is exposed when the cover is removed.

7.1.7 The rating on a glazed porcelain lampholder may be located such that it can be made visible after installation by removing the body or shell without disconnecting any wires; if practicable, the marking shall be visible after installation without disassembling any parts of the device.

7.1.8 A lampholder for use in a luminaire canopy may be marked such that the marking will be readily visible upon removing the canopy.

7.1.9 A lampholder provided with push-in terminals shall be plainly and permanently marked with the proper strip length of conductors.

7.2 Permanence

7.2.1 Markings required by this standard shall be permanent and shall be molded, die-stamped, paint-stenciled, stamped, or etched metal that is permanently secured or indelibly stamped lettering on a pressure-sensitive label secured by an adhesive that, upon investigation, is found to be acceptable for the application. Ordinary usage, handling, storage, operating temperatures, and the like shall be considered in the determination of the permanence of a marking.

7.2.2 Unless it has been investigated and found to be acceptable for the application, a pressure-sensitive label or a label that is secured by an adhesive and that is required to be permanent shall comply with UL 969 and CSA C22.2 No. 0.15.

7.3 Lampholders for Factory Assembly

7.3.1 A lampholder provided with solder terminals that are intended for factory assembly into overall equipment shall contain the following information on each carton:

a) “For factory assembly into portable luminaires or appliances only”;

b) the appropriate conductor sizes; and

c) the proper strip length of conductors.

7.3.2 A screw lampholder employing insulation-piercing terminals intended for use with Type SP, SPE, or SPT flexible cord (see Clause 4.8.3) shall have the smallest unit shipping container or a stuffer sheet provided with the container marked with the following information:

a) “For factory assembly into portable luminaires”;

b) the appropriate conductor size and flexible cord-type, and that a minimum 105 °C (221 °F) flexible cord is required;

c) whether supplemental strain relief is required, in accordance with Clause 5.2.15.3.3; and

d) all necessary instructions for assembly, including polarization.

7.3.3 A lampholder provided with push-in terminals shall contain the following information on each carton:

a) “For factory assembly into portable luminaires”;

b) the appropriate conductor sizes and types;

c) the proper strip length of conductors; and

d) “Use copper conductors only”.

7.4 Details

7.4.1 A lampholder that complies with the requirements of Clause 4.11 shall be marked with either of the following, as applicable:

a) “FOR USE IN DRY OR DAMP LOCATIONS” for a lampholder that complies with the requirements for lampholders intended for use in damp locations; or

b) “FOR USE IN DRY, DAMP OR WET LOCATIONS” for a lampholder that complies with the requirements for lampholders intended for use in damp or wet locations.

7.4.2 A medium-screw lampholder rated 660 W or less that is not marked “CO/ALR” and that has provisions for mounting to a standard outlet-box shall be marked as indicated in Clause 7.4.3. This requirement applies only to devices intended for installation in a branch circuit that employ one or more of the following means for wire securement:

a) wire-binding screws;

b) back-wired pressure plates; or

c) push-in terminals.

7.4.3 The devices mentioned in Clause 7.4.2 shall be marked with one of the following, or its equivalent:

a) “Notice – Use only copper or copper-clad wire with this device”;

b) “Notice – Use only devices marked CO/ALR with aluminum wire”; or

c) the symbols illustrated in Figure 12.

7.4.4 The marking in Clause 7.4.3 shall be located as follows:

a) For individually packaged devices, the marking shall appear on one of the following:

1) the device;

2) a stuffer sheet; or

3) the device carton.

b) For devices intended for factory assembly, the marking shall be on the device.

7.4.5 If the marking required in Clause 7.4.2 appears on the device, one of the abbreviated markings shown below may be used to indicate that the lampholder is for use with either copper or copper-clad wire. The marking shall be legible, with letters at least 1.6 mm (1/16 in) high:

a) “Use copper wire only”;

b) “Cu wire only”;

c) “Use copper or copper-clad wire only”; or

d) “Cu and Cu-clad wire only”.

7.4.6 A metal-shell lampholder not intended for factory assembly and employing an insulating liner shall be provided with wiring and assembly instructions. These instructions shall include the appropriate conductor sizes, proper preparation of leads (including strip gauge), method of securing conductors to terminals, assembly of outer shell to cap, and other information necessary to make a proper assembly. The instructions shall be provided in one of the following locations:

a) on an individual package or blister-package device; or

b) on a sheet, the number which is equal to the number of devices in the carton, for over-the-counter sales.

7.4.7 A mogul-screw lampholder rated 1500 W or 2000 W and employing leads having an ampacity of 8 A or 11 A, respectively, in accordance with Notes 1 and 2 of Clause 4.8.6.4 shall be marked “Not For Use With Incandescent Lamps” or an equivalent wording.

7.4.8 A pulse-rated lampholder that meets the construction requirements in Clause 4.12, and complies with Clause 5.2.13, shall be marked with the statement “Pulse Rating ___ kV” or equivalent, where the numeric pulse rating of the device, in kilovolts, is filled in.

7.4.9 A lampholder of the type described in Clause 4.5.2.3 shall be marked “Not for residential use” or with an equivalent statement. The marking shall be in letters at least 3.2 mm (1/8 in) high.

7.4.10 An insulating link shall be marked with the manufacturer's name or trademark and, if practicable, with the catalog number or the equivalent.

7.4.11 Ceiling outlet-box lampholders shall be marked “Min 90 °C supply conductors” on the device or the smallest unit package.

7.5 Temperature Rating

7.5.1 A lampholder that has thermoplastic materials rated greater than the relative thermal index (RTI) as specified in Clause 4.2.2.4.1 may be plainly and permanently marked with a rated operating temperature in the form “HT#”, where # equals the temperature rating in increments of 10 °C (18 °F).

7.5.2 If a lampholder is constructed of more than one thermoplastic material, the marking in Clause 7.5.1 shall not exceed the lowest RTI value of any material used.

Table 1
Pitch of threads

(Clause 4.4.8.1)

Nominal pipe size in inches	Threads per inch (25.4 mm)
1/8	27
1/4	18
3/8	18
1/2	14
3/4	14

Table 2
Probes

(Clause 4.5.1.2 and Figure 1 – Figure 3)

Lampholder types	Probe type	Probe figure no.
Fluorescent lampholders	Rod probe	Figure 2 and Figure 3
All other lampholders	Articulate probe	Figure 1

Table 3
Minimum screw size and maximum pitch

(Clause 4.8.2.9)

Size of lampholder	Minimum acceptable size of screw	Maximum acceptable number of threads 25.4 mm (1 in)
E39 (mogul)	M4 (8)	32
E29 (Admedium)	M3.5 (6)	36
E26 (Medium)	M3.5 (6)	36
E17 (Intermediate)	M3 (4)	40
E12 (Candelabra)	M2.5 (3)	48
E11 (Mini-can)	M2.5 (3)	48
E10 (Miniature)	M2.5 (3)	48

Table 4
Polarity identification of single-conductor lampholder leads

(Clause 4.8.8.6)

Acceptable combinations		
Identification obtained by	**Wire connected to the screwshells of lampholders (identified wire)**	**All other wires**
Color of braid	A. Solid white or grey (without tracer)	White or grey with tracer in braid or Solid color other than white, grey, or green (without tracer)
	B. Color other than white, grey, or green (with tracer in braid)	Solid color other than white, grey or green (without tracer)
Color of insulation[a]	C. White or grey stripe on contrasting color other than green or solid white or grey (with no stripe)	Solid color other than white, grey or green
Color of separation[a]	D. Solid white or grey	Solid color other than white, grey or green
Metal coating on conductor[b]	E. Tin or other acceptable metal on all strands of the conductor	No tin or other metal on the strands of the conductor

[a] If color of braid, insulation, or separator is used for identification, all conductors shall be either acceptably metal-coated or not metal-coated.

[b] If an acceptable metal coating is used for identification, all braids and/or insulation shall have the same color and shape.

Table 5
Polarity identification of flexible-cord lampholder leads

(Clause 4.8.8.6)

Acceptable combinations		
Identification obtained by	**Wire connected to the screwshells of lampholders (identified wire)**	**All other wires**
Color of braids on individual conductors	A. Solid white or grey (without tracer) or green (without tracer)	Solid color other than white, grey
	B. Solid white or grey (without tracer)[a]	White or grey with tracer in braid[a]
	C. Color other than white, grey, or green (with tracer in braid)	Solid color other than white, grey, or green (without tracer)
Color of insulation on individual conductors	D. Solid white or grey[b]	Solid color other than white, grey, or green[b]
Color of separators on individual conductors	E. White or grey[c]	Color other than white, grey, green[c]
	F. Tin or other acceptable metal on all strands of the conductor[d]	No tin or other white metal on the strands of the conductor[d]
Other means	G. A stripe, ridge, or groove on the exterior surface of the cord[c]	

[a] Only for Types C and PD cords.

[b] Only for cords (other than Types SP-1, SP-2, and SPT-1, and SPT-2) having no braid on any individual conductor.

[c] Only for Types SP-1, SP-2, and SPT-1, and SPT-2 cords.

[d] Only for Types SPT-1 and SPT-2 cords.

Table 6
Minimum creepage distances and clearances in mm (in)

(Clauses 4.9.9, 4.9.10, and 5.1.4.1 and Table 20)

Rating of holder in volts	Holder for wet location use				Holder for dry and damp location use			
	At wiring terminals		At points other than wiring terminals		At wiring terminals		At points other than wiring terminals	
	Clearance through air	Creepage over surface	Clearance through air	Creepage over surface	Clearance through air	Creepage over surface	Clearance through air	Creepage over surface
250	9.5 (3/8)	12.7 (1/2)	9.5 (3/8)	12.7 (1/2)	6.4 (1/4)	6.4 (1/4)	1.2 (3/64)	1.2 (3/64)
300	9.5 (3/8)	12.7 (1/2)	9.5 (3/8)	12.7 (1/2)	6.4 (1/4)	6.4 (1/4)	1.6 (1/16)	1.6 (1/16)
600	9.5 (3/8)	12.7 (1/2)	9.5 (3/8[b])	12.7 (1/2[b])	6.4 (1/4)	6.4 (1/4)	3.2 (1/8)	3.2 (1/8)
1000	9.5 (3/8)	12.7 (1/2)	9.5 (3/8[b])	12.7 (1/2[b])	9.5 (3/8)	12.7 (1/2[a])	9.5 (3/8)	12.7 (1/2)
5000	19.0 (3/4)	19.0 (3/4)	19.0 (3/4)	19.0 (3/4)	19.0 (3/4)	19.0 (3/4)	19.0 (3/4)	19.0 (3/4)
10,000	28 (1-1/32)	28 (1-1/32)	28 (1-1/32)	28 (1-1/32)	28 (1-1/32)	28 (1-1/32)	28 (1-1/32)	28 (1-1/32)
15,000	38 (1-1/2)	38 (1-1/2)	38 (1-1/2)	38 (1-1/2)	38 (1-1/2)	38 (1-1/2)	38 (1-1/2)	38 (1-1/2)

[a] This spacing shall not be less than 9.5 mm (3/8 in) if the insulating material involved is porcelain, glass, urea formaldehyde, or other material that is not readily carbonized.

[b] This spacing shall not be less than 4.8 mm (3/16 in) for lampholders for use with pulse-rated lamps.

NOTES:

1. In the case of spacings between live parts and non-current-carrying metal parts that are exposed to contact, but that are not liable to be grounded in service, except at wiring terminals, if the spacing shown in the table is 6.4 mm (1/4 in) or more, it may be reduced to one-half of the value shown or 4.8 mm (3/16 in), whichever is larger, for voltage ratings of 1000 V or less.

2. This reduction in spacings mentioned in Note 1 may also apply to a lampholder rated at more than 1000 V, provided that the lampholder complies with Clause 5.1.4.

3. A lampholder rated 2500 V that complies with the requirements in Clause 4.9.3.

4. For a miniature bipin lampholder rated 75 W, 600 V, the spacing through air and over surface between an uninsulated live part and a dead-metal part shall be measured while a lamp is in place in the holder. The spacing shall also be measured without a lamp in place, unless the lampholder is of a type for which all parts are de-energized in absence of the lamp.

5. A screw lampholder for wet location use need only comply with the creepages and clearances shown for dry and damp locations use, which complies with Clause 5.2.14.5.

6. For a fluorescent lampholder, the spacing between an uninsulated live part, other than a wiring terminal, and a non-current-carrying metal part that is exposed to contact but is not likely to be grounded when the lampholder is installed may be half the value, but not less than 2.4 mm (3/32 in).

7. The 300 V rating applies to GU24 holders (see Table 20).

Table 7
Depth of lamp cavity

(Clause 4.10.2.2 and SA3.5)

Trade size of lampholder	Minimum	Maximum
	mm (in)	mm (in)
E39 (mogul)	41.3 (1-5/8)	42.9 (1-11/16)
E29 (Admedium)	28.6 (1-1/8)	30.2 (1-3/16)
E26 (Medium)	23.8 (15/16)	25.4 (1)
E17 (Intermediate)	19.8 (25/32)	21.4 (27/32)
E12 (Candelabra)	15.9 (5/8)	17.5 (11/16)
E11 (Mini-can)	13.9 (35/64)	15.9 (5/8)
E10 (Miniature)	11.9 (15/32)	13.5 (17/32)

Table 8
Minimum metal thickness of lampholder screwshell

(Clause 4.10.3.5)

Trade size of lampholder and nominal diameter	Copper or copper-alloy		Aluminum or aluminum-alloy		Corrosion-resistant steel, nickel or nickel alloy
	mm	(in)	mm	(in)	
E39 (mogul) 38.1 mm (1-1/2 in)	0.51	(0.020)	0.51	(0.020)	a
E29 (Admedium) 28.6 mm (1-1/8 in)	0.30	(0.012)	0.30	(0.012)	a
E26 (Medium) 25.4 mm (1 in)	0.30	(0.012)	0.38	(0.015)	a
E17 (Intermediate) 16.7 mm (21/32 in)	0.25	(0.010)	0.33	(0.013)	a
E12 (Candelabra) 12.7 mm (1/2 in)	0.25	(0.010)	0.33	(0.013)	a
E11 (Mini-can) 11.1 mm (7/16 in)	0.20	(0.008)	0.28	(0.011)	a
E10 (Miniature) 9.5 mm (3/8 in)	0.20	(0.008)	0.28	(0.011)	a

[a] The minimum thickness of corrosion-resistant steel (stainless), nickel or nickel alloys shall be such that the screwshell complies with the remainder of the requirements in this standard.

Table 9
Minimum metal thickness of screw base

(Clause 4.10.3.5)

Base size	Copper-alloy		Aluminum or aluminum-alloy		Corrosion-resistant steel, nickel or nickel alloy
	mm	(in)	mm	(in)	
E39 (mogul)	0.51	(0.020)	0.51	(0.020)	a
E26 (Medium)	0.20	(0.008)	0.28	(0.011)	a
E17 (Intermediate)	0.20	(0.008)	0.28	(0.011)	a
E12 (Candelabra)	0.20	(0.008)	0.28	(0.011)	a
E11 (Mini-can)	0.20	(0.008)	0.28	(0.011)	a
E10 (Miniature)	0.20	(0.008)	0.28	(0.011)	a

[a] The minimum thickness of corrosion-resistant steel (stainless), nickel or nickel alloys shall be such that the screwshell complies with the remainder of the requirements in this standard.

Table 10
Dimensions of center contacts of lampholders

(Clause 4.10.4.1)

Size of lampholder	Minimum diameter of area at tip of center contact, mm (in)
E39 (mogul)	12.7 (1/2)[a]
E26 (Medium)	5.4 (7/32)
E17 (Intermediate)	4.0 (5/32)
E12 (Candelabra)	3.2 (1/8)
E11 (Mini-can)	3.2 (1/8)
E10 (Miniature)	3.2 (1/8)

[a] Does not apply to EP39 (position-oriented) and EX39 (exclusionary) mogul screw lampholders.

Table 11
Minimum thickness of cap metal or shell metal in mm (in)

(Clause 4.10.5.1.3)

Size of lampholder	Sheet brass	Sheet aluminum	Other metal
E39 (mogul)	0.64 (0.025)	0.81 (0.032)	Mechanical strength and rigidity not less than brass
Smaller than mogul	0.33 (0.013)	0.46 (0.018)	

Table 12
Torque test

(Clause 5.2.3.3)

Mogul	Medium	Adapter	
		Male medium	Female candelabra
3.39 N·m (30 lb-in)	2.25 N·m (20 lb-in)	2.25 N·m (20 lb-in)	1.13 N·m (10 lb-in)

Table 13
Screwshell conformity gauges

(Clause 5.2.4.1)

Screw-type	Gauge name	Standard sheet number
E39 (mogul)	Go	7006-24E-1
	Not go	7006-26-4
EX39 (mogul)	Threaded “Go” gauge	3-210-1
	“Not go” plug gauge	3-191-3
	Threaded gauge for testing contact making	3-211-1
	Protection against bulb-neck damage and testing contact making	7006-24D-1
	Maximum insertion torque gauge	3-213-1
	Minimum torsion gauge	3-212-1
E26d (Medium)	Go	7006-29K-1
	Relative position of the contacts	7006-29E-1
	Unacceptable contact making	3-179-1
E26 (Medium)	Go	3-169-1
	Not go	7006-26A-2
EX26 (Medium)	Go	3-169-1
	“Not-go” plug gauge for EX26 medium-screw lampholders	7006-26A-2
	Threaded gauge for testing contact making	3-911-1
E17 (Intermediate)	Go	7006-25H-1
	Not go	7006-26C-1
E12 (Candelabra)	Go	7006-25C-1
	Not go	7006-26B-1
E11 (Mini-can)	Gauge “A” contact making	7006-6A-1
	Gauge “G” contact making	7006-6B-1
E10 (Miniature)	Go	7006-25-7
	Not go	7006-26-4

Table 14
Screw base conformity gauges

(Clause 5.2.4.1.1)

Screw-type	Gauge name	Standard sheet number
E39 (mogul)	“Go” gauge for caps on finished lamps	7006-24B-1
	“Not go” gauge for caps on finished lamps	7006-24C-1
E26 (Medium)	“Go” gauge for caps	7006-27D-3
	“Not go” gauge for caps	7006-29L-4
E17 (Intermediate)	“Go” gauge for caps on finished lamps	7006-27K-1
	“Not go” gauge caps on finished lamps	7006-28F-1
E12 (Candelabra)	“Go” gauge for caps on finished lamps	7006-27H-1
	“Not go” gauge for caps on finished lamps	7006-28C-1

Table 14 Continued on Next Page

Table 14 Continued

Screw-type	Gauge name	Standard sheet number
E11 (Mini-can)	"Go" gauge for caps on finished lamps	7006-6-1
E10 (Miniature)	"Go" gauge for caps	7006-27A-2
	"Not go" gauge for caps	7006-28E-1

Table 15
Overload test current and voltage

(Clauses 5.2.5.2.1, 5.2.18.1, and 6.1.4)

Trade size of lampholder	Rating in watts	Current and voltage of test circuit	
		Amperes	Volts
E39 (mogul)	1500	9.0	250
	750[a]	4.5	250
E26[b] (Medium)	660	4.5	250
	250[a]	1.5	250
E17(Intermediate)	75	0.9	125
E12 (Candelabra)	75	0.9	125
E11 (Mini-can)	75	0.9	125
E10 (Miniature)	75	0.9	125

[a] In testing lampholders for double-filament lamps, the division of the current (at 250 V) shall be as follows: for a 750 W mogul-screw lampholder, 3 A to the center contact and 1-1/2 A to the intermediate contact; and for a 250 W medium-screw lampholder, 1 A to the center contact and 1/2 A to the intermediate contact.

[b] A lampholder of the dimmer or regulating type of any rating shall be tested at 150 percent of its rated wattage at rated voltage.

Table 16
Endurance test current and voltage

(Clauses 5.2.5.3.1, 5.2.18.1, and 6.1.4)

Trade size of lampholder	Rating in watts	Current and voltage of test circuit	
		Amperes	Volts
E39 (mogul)	1500	12.0	125
	750[a]	6.0	125
E26[b] (Medium)	660	3.0	250
	250[a]	1.0	250
E17(Intermediate)	75	0.6	125
E12 (Candelabra)	75	0.6	125
E11 (Mini-can)	75	0.6	125
E10 (Miniature)	75	0.6	125

[a] In testing lampholders for double-filament lamps, the division of the current (at 125 V) shall be as follows: for a 750 W mogul-screw lampholder, 4 A to the center contact and 2 A to the intermediate contact; and for a 250 W medium-screw lampholder, 1 A to the center contact and 1 A to the intermediate contact.

[b] A lampholder of the dimmer or regulating type of any rating shall be tested at its rated wattage at rated voltage.

Table 17
Physical properties of natural or synthetic rubber compounds used in pendant-type weatherproof lampholders

(Clause 5.2.14.3.1)

Conditions of specimens at time of measurement	Maximum acceptable set in recovery test (25-mm or 1-in bench marks stretched to 62.5 mm or 2-1/2 in)	Maximum acceptable ultimate elongation (25-mm or 1-in bench marks)	Minimum acceptable tensile strength
Unaged	6.2 mm (1/4 in) (25 percent)	62.5 mm (2-1/2 in) (250 percent)	5.9 MN/m^2 (850 lbf/in^2)
Aged in an air oven for 70 hours at 100.0 ±2.0 °C (212.0 ±3.6 °F)	Not measured	65 percent of the result with unaged specimens	75 percent of the result with unaged specimens

Table 18
Ratings for screw lampholders

(Clause 6.1.1)

Trade size of lampholders and nominal diameter in mm (in)	Rating of lampholder with a switching mechanism		Ratings of switchless lampholders	
	watts	volts	watts	volts
E39 (mogul) – 38.1 (1-1/2)	1500	250	1500 or 2000	600[a]
	750	250	1500 or 2000	250
E29 (Admedium) – 28.6 (1-1/8)	–	–	660	250
	–	–	660	600
E26 (Medium) – 25.4 (1)	660	250	660	600[b]
	250	250	660	250
E17 (Intermediate) – 16.7 (21/32)	75	125	75	250
E12 (Candelabra) – 12.7 (1/2)	75	125	75	125
E11 (Mini-can) – 11.1 (7/16)	75	125	75	125
E10 (Miniature) – 9.5 (3/8)	75	125	75	125

[a] Lampholders intended for use with pulse-rated lamps also have a 4 or 5 kV starting pulse-rating.

[b] Lampholders intended for use with pulse-rated lamps also have a 4 kV starting pulse-rating.

Table 19
Ratings of adapters

(Clause 6.1.2)

Ratings of device in which the line connections consist of:				
Means of connection to load	**Wiring terminals or leads**	**A male screwshell**	**Parallel blades**	**Tandem blades**
Parallel slots	–	660 W 125 V	–	–
Tandem slots	–	660 W 250V	–	–
Female screwshell [a]	–	–	660 W 125 V	660 W 250 V
Parallel slots and female screwshell[a]	Slots[b]: 15 A 125 V Shell[c]: 660 W 125 V	660 W 125 V	Slots: 15 A 125 V Shell: 660 W 125 V	
Tandem slots and female screwshell[a]	Slots[b]: 15A 250 V Shell[c]: 660 W 250 V	660 W 250 V	–	Slots: 15 A 250 V Shell: 660 W 250 V

[a] If the lampholder portion of a device involves a switching mechanism, its rating may be 660 or 250 W, depending upon the mechanism. In either case, the overload and endurance tests on the mechanism shall be conducted at 250 V.

[b] If common wiring terminals or leads are provided, the rating of the receptacle outlet portion may be 660 W.

[c] If separate wiring terminals or leads are provided, the lampholder portion of the device may be rated at 250 V.

Table 20
Ratings for lampholders other than screw-type

(Clause 6.2 and Table 6)

Type of lampholder	Watts (maximum)	Volts
G5 (Miniature bipin)	120	250 or 600
G13 (Medium bipin)	660	250 or 600 or 1000
G20 (mogul bipin)	660	250 or 600 or 1000
GU24 (Bipin twist-lock)	300	250 or 300[a]
R17d (Recessed double-contact)	660	600, 1000
Fa8 (Single-pin)	660	250, 600 or 1000
R7s (Recessed single-pin)	660	600 or 1000
Ferrule-cap	660	250, 600, 1000 or 2500
BY22d (Low-pressure-sodium)	660	600 or 1000
G10q (4-pin circline)	660	250 or 600

[a] See Table 6 for spacing requirements.

Table 21
Acceptable screwshell materials

(Clauses 4.10.3.1 – 4.10.3.4)

Metal group	Metal composition	Dry locations	Damp / Wet locations
Copper alloy	Copper, copper alloy	Yes [b]	a
	Brass	Yes	a, b
	Copper alloys with minimum 80 percent copper	Yes	Yes
Aluminum or aluminum-alloy	Aluminum or aluminum alloy (see 4.10.3.3)	Yes	No
Corrosion-resistant steel or nickel alloy	Stainless steel	Yes	Yes
	Nickel or nickel alloy	Yes	Yes

[a] If compliant with 4.10.3.4.

[b] See plating requirement for copper alloy screwshell intended for use in accordance with 4.10.3.2.

Table 22
Acceptable screw base materials

(Clauses 4.10.3.1 – 4.10.3.4)

Metal group	Metal composition	Dry locations	Damp / Wet locations
Copper alloy	Copper, copper alloy	Yes	a or b
	Brass	Yes	b
	Copper alloys with minimum 80 percent copper	Yes	Yes
Aluminum or aluminum-alloy	Aluminum (see 4.10.3.3)	Yes	b or c
	Aluminum alloy	Yes	
Corrosion-resistant steel or nickel alloy	Stainless steel	Yes	Yes
	Nickel or nickel alloy	Yes	Yes

[a] If compliant with 4.10.3.4.

[b] Aluminum or copper alloy if electroplated with nickel (or equivalent oxidation-resistant metals) covering all surfaces after forming and trimming.

[c] Unplated aluminum or aluminum alloys for damp locations only.

Figure 1

Articulate probe

(Clauses 4.5.3.1, 4.10.2.2, and 4.10.6.2.1, and Table 2)

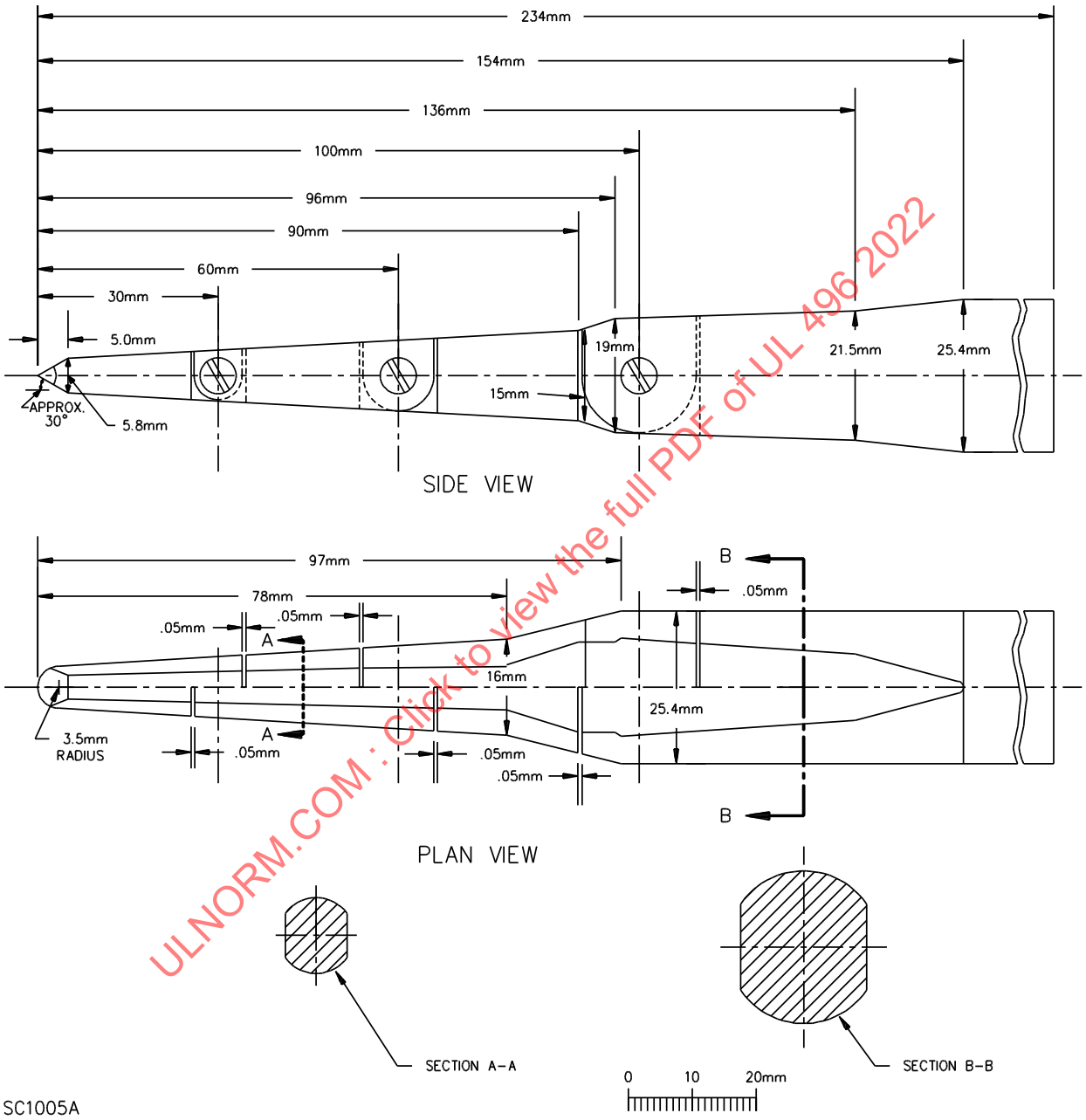
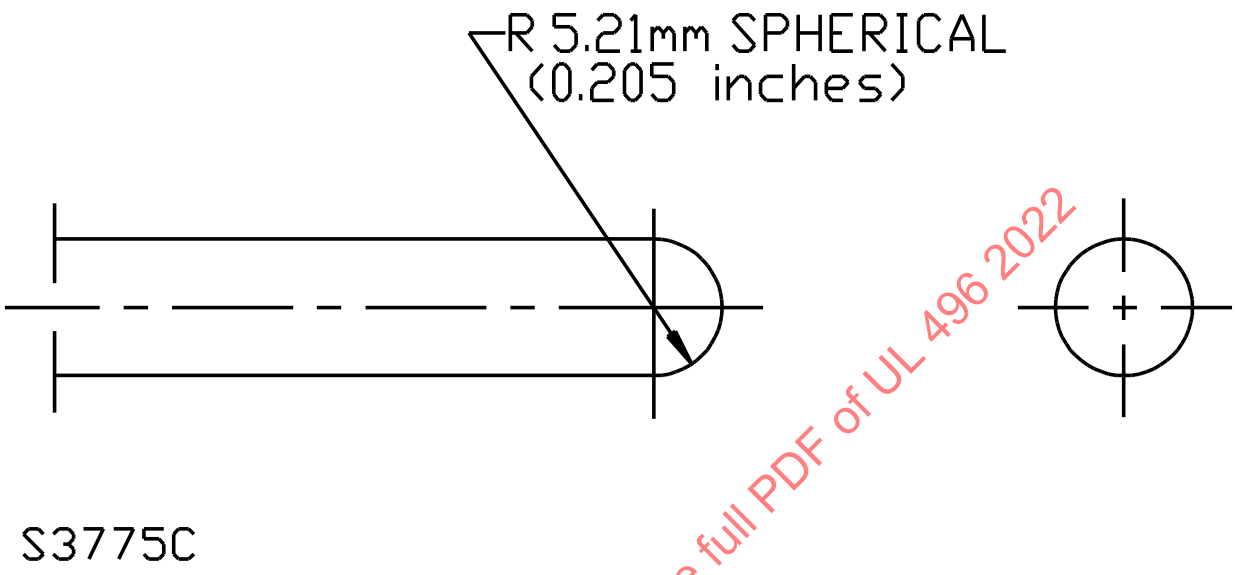


Figure 2

Rod probes

Probe intended for use with a lamp rated 600 V or less

(Clauses 4.5.2.1, 4.5.2.2, and 4.5.2.3 and Table 2)



S3775C

Figure 3

Probe intended for use with a lampholder rated between 600 V and 1000 V

(Clauses 4.5.2.1 and 4.5.2.2 and Table 2)

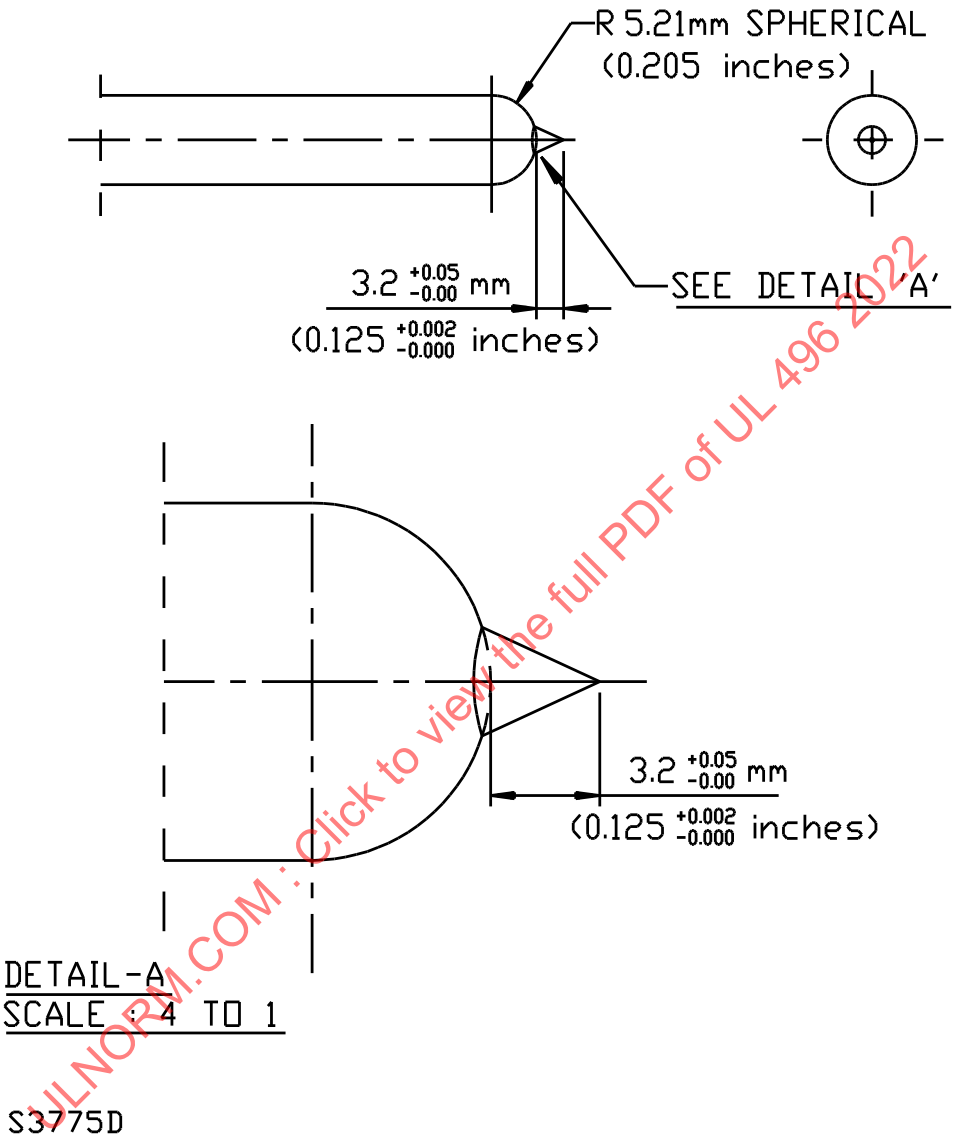


Figure 4

Lampholder with intermediate contact

(Clause 4.10.7.1)

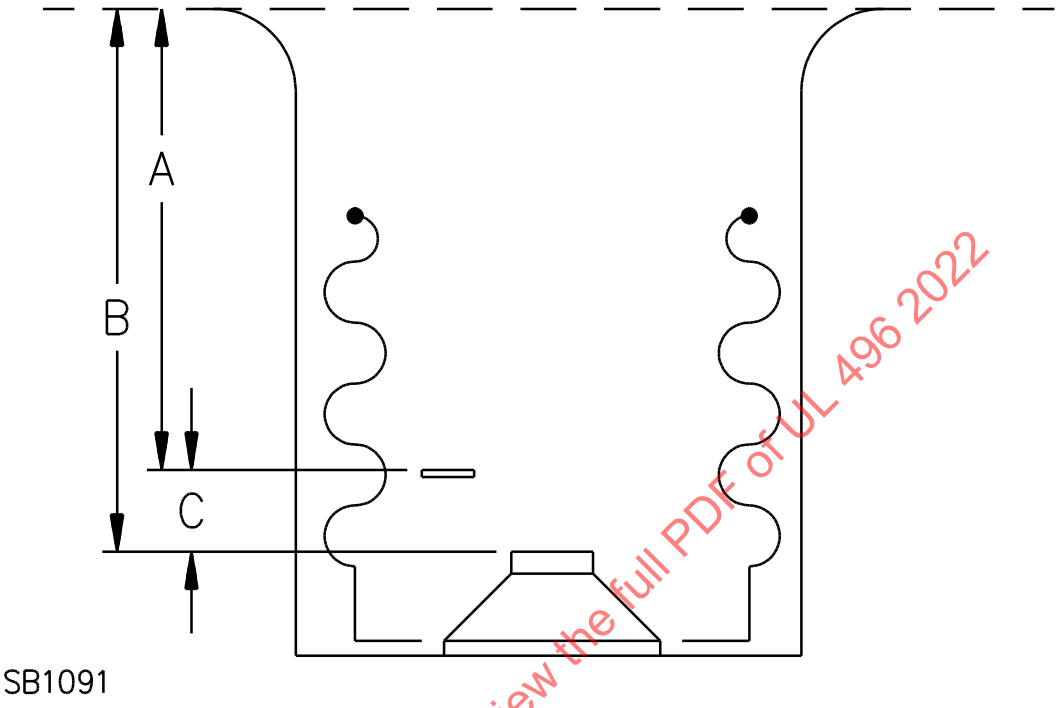


Figure 5

Set-up of torsion test of lampholder

Dimensions in mm (in)

(Clause 5.2.3.4)

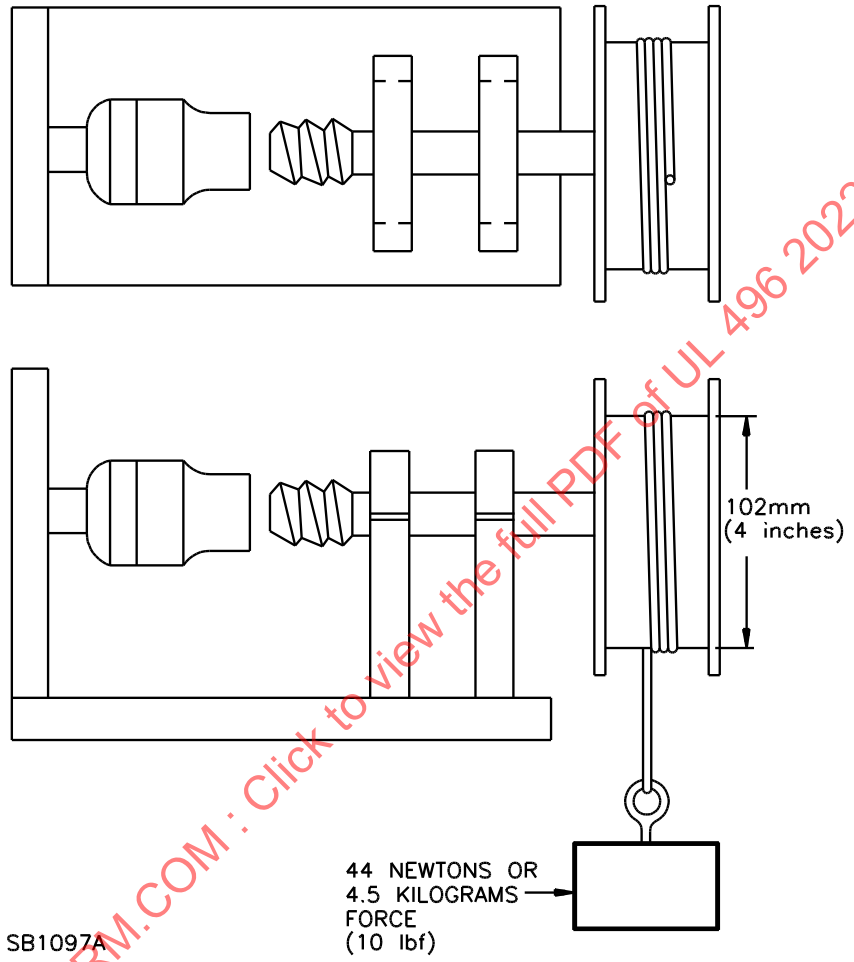


Figure 6

Electrical connections for lampholder testing

(Clauses 5.2.5.1.4 and 5.2.18.1)

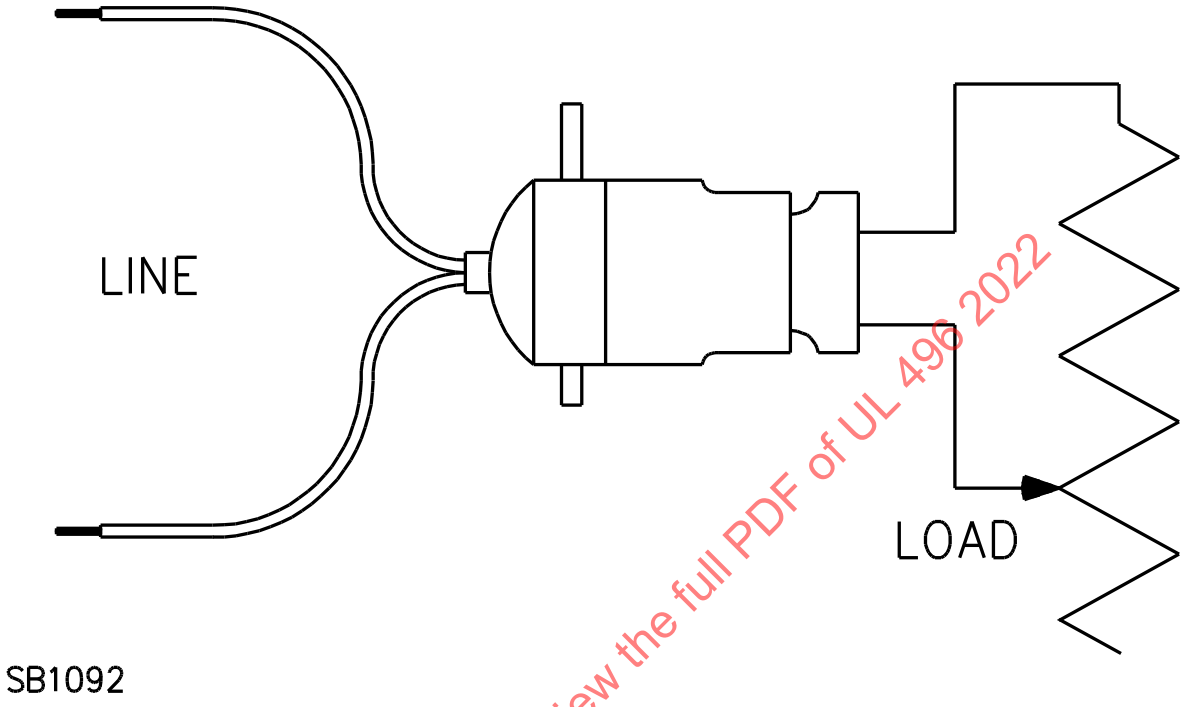
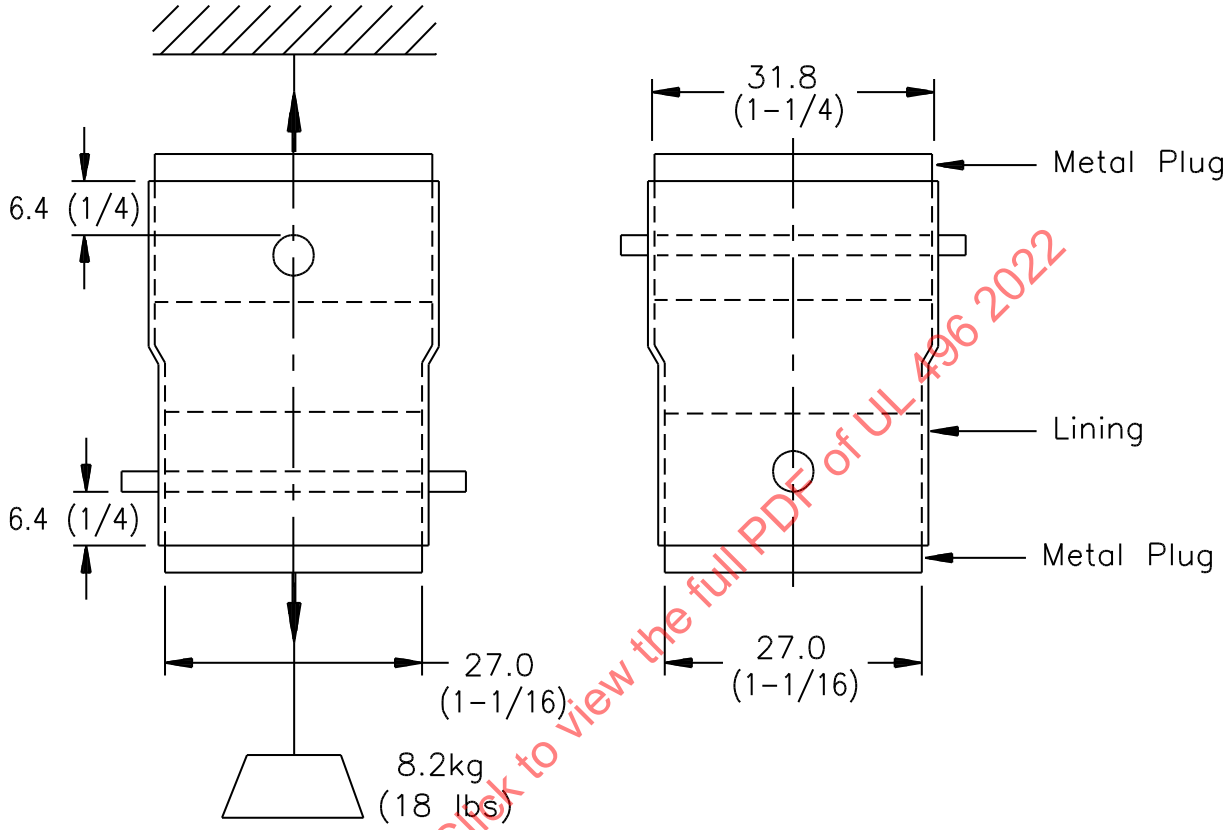


Figure 7

Test set-up for mechanical strength of lampholder lining

(Clauses 5.2.10.1.1 and 5.2.10.1.3)



Dimensions in mm (inches).

S3978

Figure 8

Brass electrodes for liner dielectric test

Dimensions in mm (in)

(Clause 5.2.10.2.2)

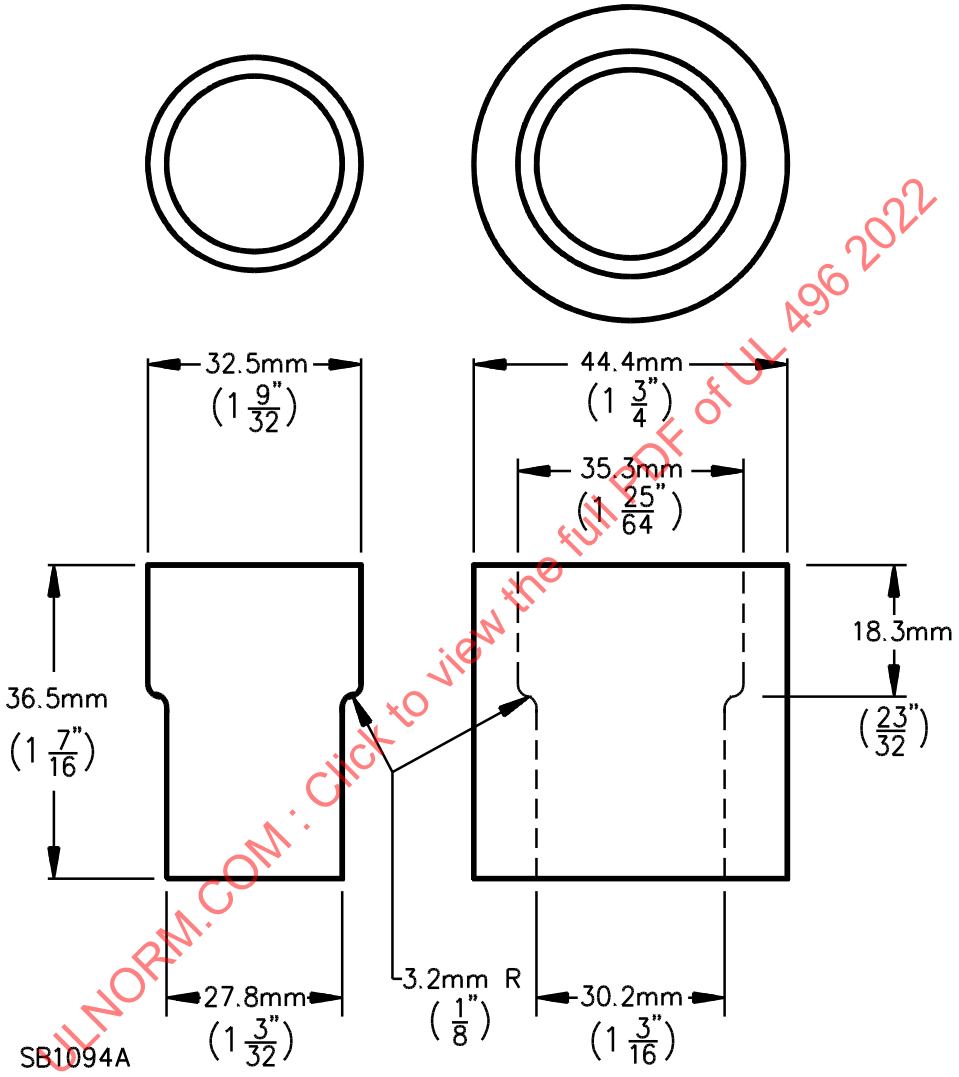


Figure 9

Dummy interior and set-up of heating test of lampholder lining

Dimensions in mm (in)

(Clause 5.2.10.3.2)

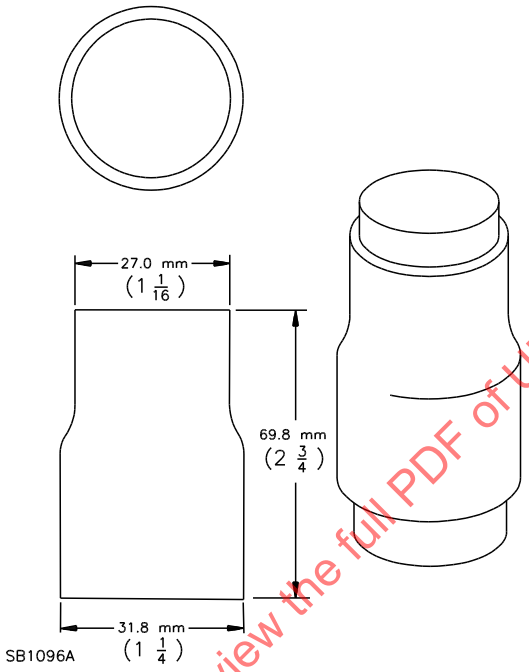
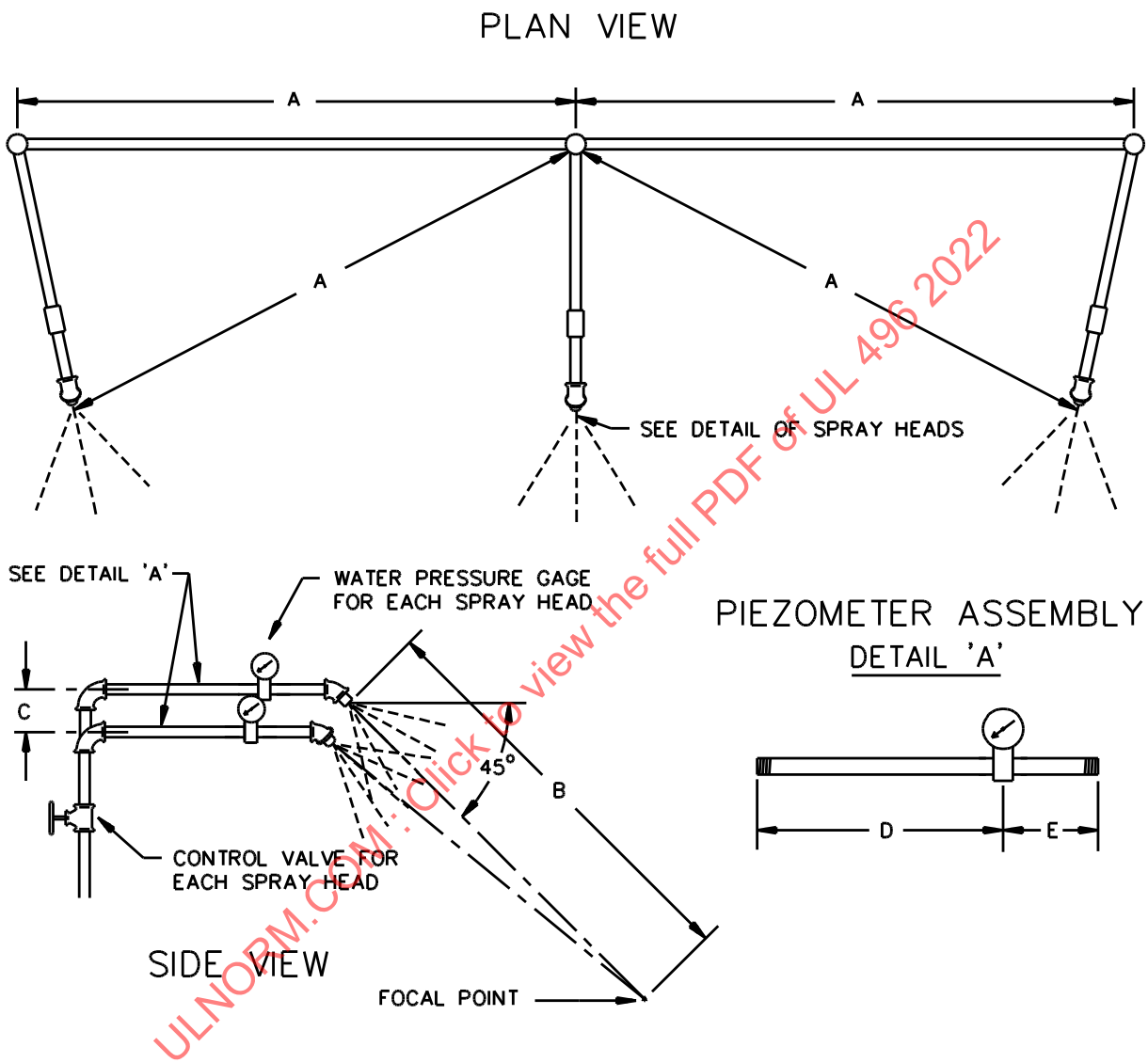


Figure 10

Rain-test spray apparatus spray head

(Clause 5.2.14.5.3)



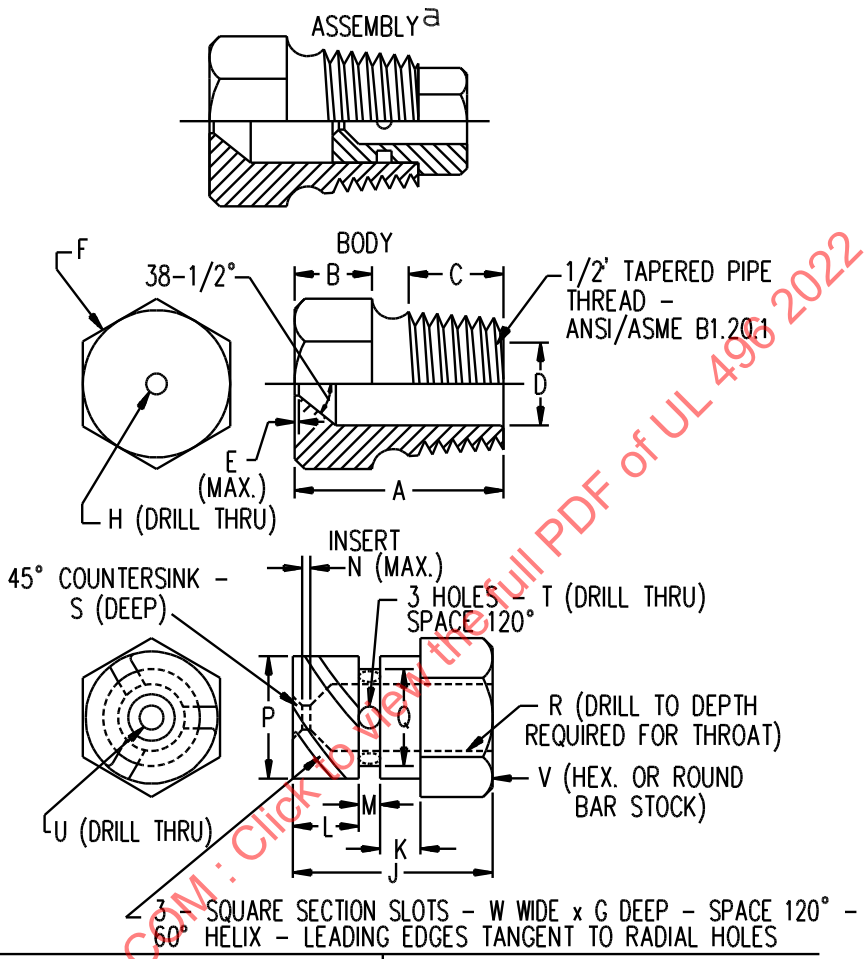
Item	inch	mm
A	28	710
B	55	1400
C	2–1/4	55
D	9	230
E	3	75

RT101E

Figure 11

Spray head

(Clause 5.2.14.5.3)



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	.575
C	14.0	9/16		14.63	.576
D	14.68	.578	Q	11.51	.453
	14.73	.580		11.53	.454
E	0.40	1/64	R	6.35	1/4
F	c	c	S	0.80	1/32
G	1.52	.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] ANSI B94.11M Drill Size

[c] Optional - To serve as a wrench grip.

RT100F

Figure 12

Terminal marking symbols

(Clause 7.4.3)

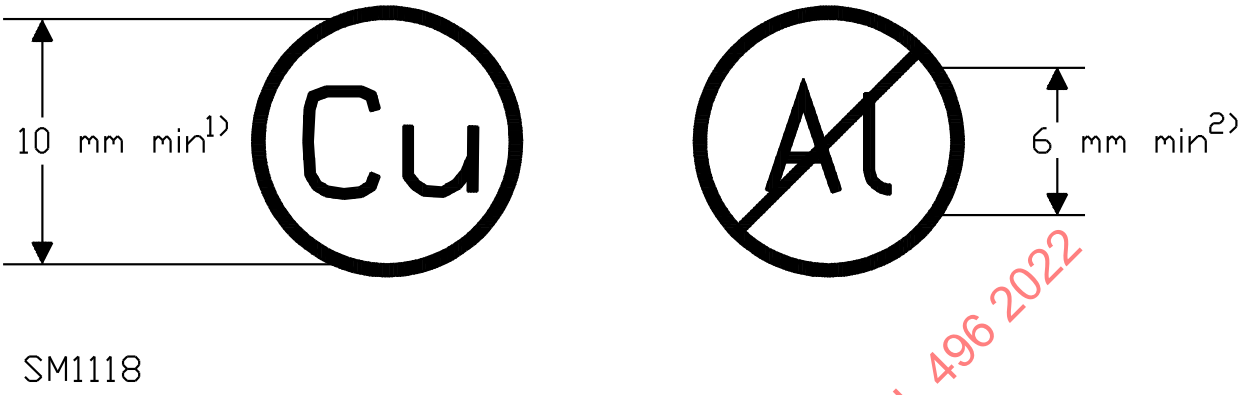


Figure 13

“Go” gauge

(Clause 5.2.4.2.1)

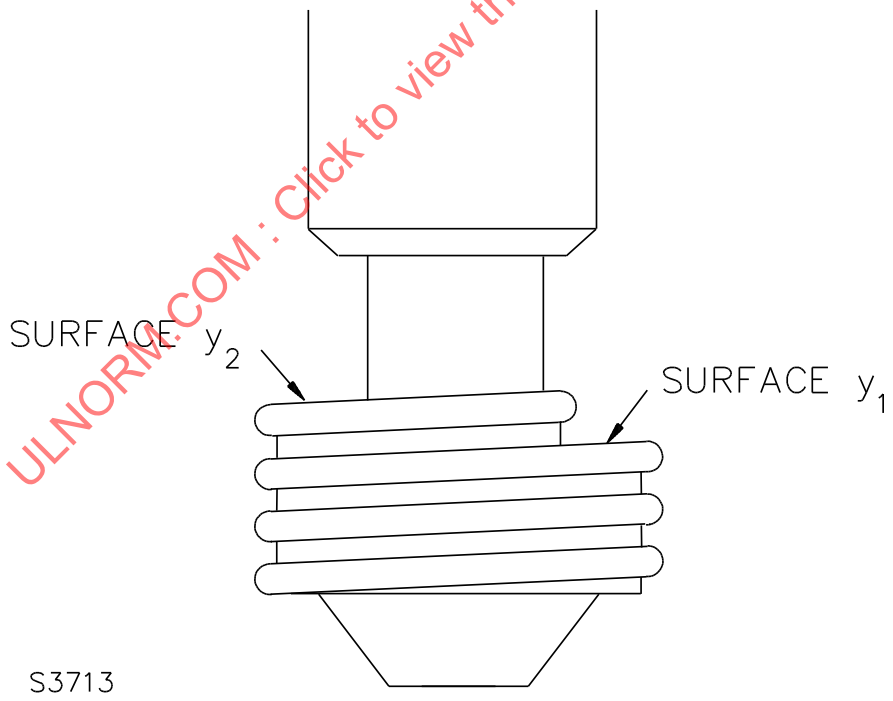
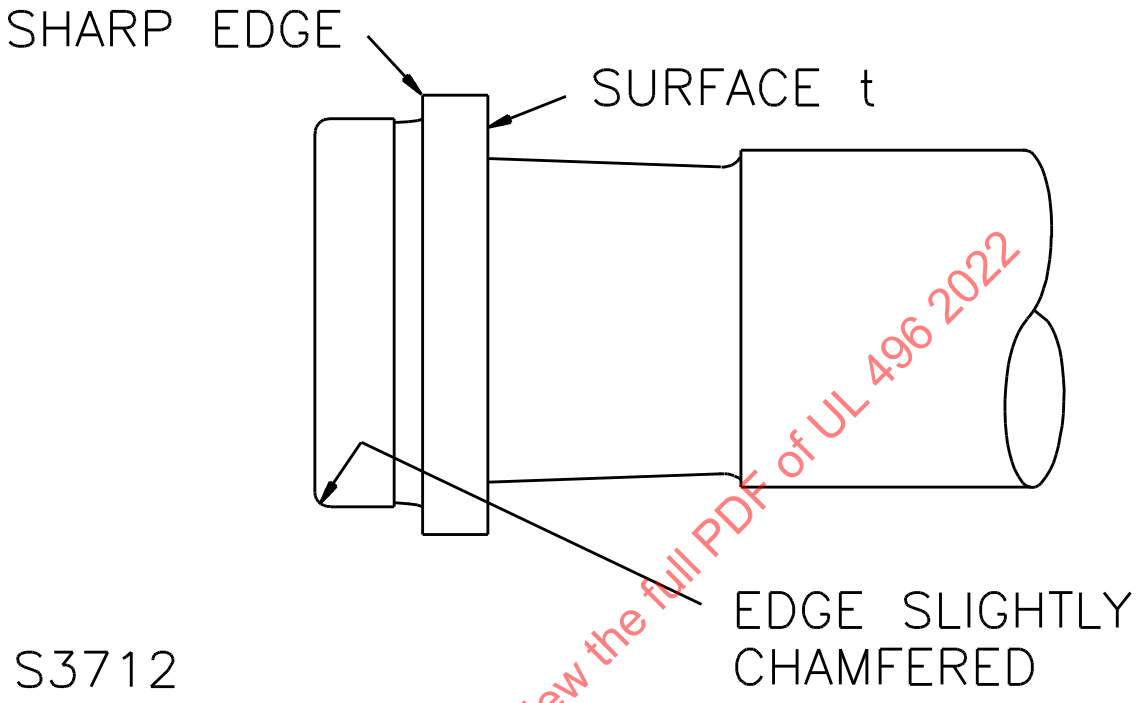


Figure 14

"Not Go" gauge

(Clause 5.2.4.2.1)



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SUPPLEMENT SA – LAMPHOLDER ADAPTERS AND LOAD FITTINGS

SA1 Scope

SA1.1 These requirements cover base-to-base adapters, base reducers, lampholder-to-outlet adapters, switched and unswitched lampholder-mounted current taps, socket extensions, and lampholder "Y" adapters.

SA2 General

SA2.1 A receptacle shall comply with the requirements in UL 498 and CSA C22.2 No. 42.

SA2.2 The lampholder adapters and load fittings mentioned in Clause SA1.1 shall comply with all of the applicable lampholder requirements of this Standard, except as modified by the requirements contained in this supplement.

SA2.3 A base-to-base adapter shall not permit a lamp with a different base to be installed in a GU24 or GU24-1 holder. This requirement does not prohibit the use of an adapter to permit fluorescent and LED self-ballasted lamps and fluorescent lamp adapters provided with GU24 or GU24-1 pin bases to be installed in a luminaire with an E26 lampholder.

SA2.4 An integral Class 2 output power supply provided with one or more USB connectors shall comply with the applicable requirements in UL 498 and CSA C22.2 No. 42.

SA2.5 With reference to Clause SA2.4, requirements that are limited to installation or use in combination with an outlet box may be omitted.

SA3 Screwshell Size Adapters

SA3.1 The male screwshell of an adapter shall be of the same size or larger than that of the female screwshell of the adapter.

SA3.2 An E26 (medium) screw base shall have at least 3.25 mm (0.13 in) of distance between the bottom of the screwshell and the bottom of the eyelet contact. The minimum spacing over the surface of the insulating material or through air shall not be less than 3 mm (0.12 in).

SA3.3 An adapter not intended for use in a portable luminaire and marked in accordance with Clause SA3.4 is not required to comply with Clause SA3.2.

SA3.4 An adapter not intended for use in a portable luminaire that does not comply with the dimensional requirements in Clause SA3.2 shall be marked "CAUTION – Risk of electric shock or fire. Do not install in a three-way lampholder."

SA3.5 The length of the male screw base of an adapter, measured vertically from the plane of the eyelet contact to the plane of the rim of the screw base, shall not be greater than the minimum cavity depth indicated in Table 7.

SA3.6 The cap of a plug-type lampholder shall provide electrical connection through the device from screwshell to screwshell and from center contact to center contact. If wire leads are supplied as a part of the cap for attachment to the wiring terminals of the body, the identification of the leads shall be in accordance with Clause 4.8.8.6.

SA3.7 Lampholder fittings, lampholder adapters, miscellaneous lampholders, and other similar devices, each employing parallel blades for connection to the line, shall be constructed as shown in Figure SA1. A device may employ a smaller face size than shown in Figure SA1 if the probe shown in Figure SA2 does not make contact with the line blades when applied at any point on the circumference of the device face. The surface "Z-W" shall be applied against the outside edge of the device face with the surface "Y-W"

perpendicular to the blades. The blades shall comply with the requirements in UL 498 and CSA C22.2 No. 42.

Figure SA1

Minimum face dimensions

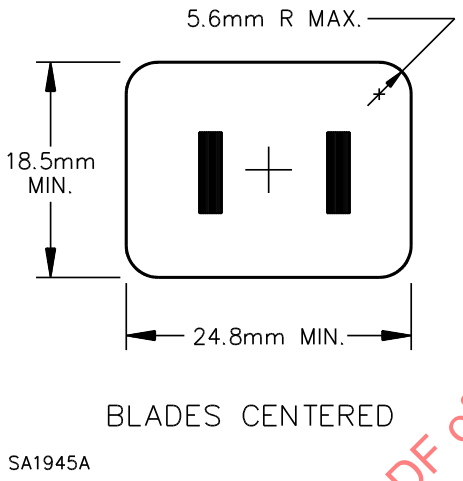
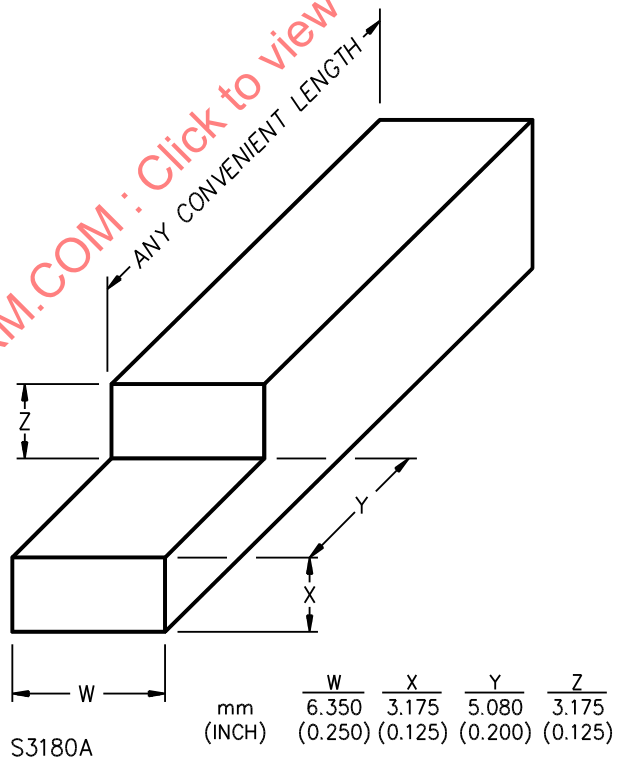


Figure SA2

Minimum face size probe



	W	X	Y	Z
mm	6.350	3.175	5.080	3.175
(INCH)	(0.250)	(0.125)	(0.200)	(0.125)

SA3.8 For a lampholder adapter and fitting, the weight, size, and moment limitations shall be in accordance with Table SA1.

Table SA1
Weight, size, and moment limitations

Intended for use	Maximum weight[a]		Maximum size, any dimension		Maximum moment [a,b]	
	kg	(lb)	mm	(in)	N·m	(lbf-in)
Only with ceiling luminaires	2.27[c]	(5)[c]	406[d]	(16)[d]	2.26[e]	(20)[e]
With portable table luminaires or portable long chain swag luminaires	1.13[f]	(2.5)[f]	216[g,h]	(8-1/2)[g,h]	1.36[f]	(12)[f]

[a] For weight and moment measurements, adapters or fittings shall be provided with lamps.

[b] The product of the weight of an adapter or a fitting times the distance between the center contact and the center of gravity of the fitting.

[c] For units that have provisions for attachment of glassware (where glassware is not provided) the maximum weight shall be 2.27 kg (5 lb); for units provided with glassware or units that do not have provisions for attachment of glassware the maximum weight shall be 2.72 kg (6 lb).

[d] Includes lamp in place.

[e] For units that have provisions for attachment of glassware (where the glassware is not provided), it is to be assumed for calculation purposes that glassware weighing 0.453 kg (1 lb) will be used.

[f] Includes weight of glassware and/or shade if provided with adapter or fitting.

[g] Excludes lamp or lamp supports if instructions indicate that they should not be in place until after the adapter or fitting is installed and the maximum dimension of the completely assembled unit is less than 317 mm (12-1/2 in).

[h] Maximum dimension shall be 317 mm (12-1/2 in) if the adapter or fitting is provided with a slip-ring male screwshell that prevents over-torquing by slipping at less than 1.13 N·m (10 lbf-in).

SA4 Lampholder Fittings

SA4.1 A lampholder fitting with a thermoplastic enclosure material and a female screwshell shall have a relative thermal index of 150 °C (302 °F) in accordance with Clause 4.2.2.4.

SA4.2 A lampholder fitting incorporating electronic circuits or controls, such as a photo-control, may have a relative thermal index less than that indicated in Clause SA4.1, provided that the fitting is subjected to a temperature test in accordance with Clause SA5.

SA5 Temperature Test of Lampholder Fitting

SA5.1 A lampholder fitting incorporating electronic circuits or controls, such as a photo-control, shall be tested in accordance with Clauses SA5.1 – SA5.7. The maximum temperatures shall not exceed the rated temperature of the material or component used when corrected to a room ambient temperature of 25 °C (77 °F).

SA5.2 The lampholder fitting shall be installed in a representative lampholder and tested in both the base up and base down orientations, unless it is obvious that one orientation would result in less severe heating.

SA5.3 The lampholder fitting shall be operated with the maximum wattage and the type of lamp for which it is rated.

SA5.4 During the test, the lampholder fitting shall be energized at rated input voltage and frequency.

SA5.5 Temperatures shall be measured by thermocouples consisting of wire not larger than 24 AWG (0.21 mm^2) and not smaller than 30 AWG (0.05 mm^2). The thermocouples and the related instrument shall be accurate and calibrated in accordance with standard laboratory practice. The thermocouple wires shall conform to the requirements specified in the Tolerance of Initial Values of EMF versus Temperature tables in ANSI/ASTM E230/E230M. Thermocouples using iron and constantan 30 AWG (0.05 mm^2) wire shall be

used with a potentiometer-type instrument whenever a referee temperature measurement by thermocouple is necessary.

SA5.6 A thermocouple junction and the adjacent thermocouple lead wire shall be securely held in thermal contact with the surface of the material, whose temperature is being measured. In most cases, adequate thermal contact will result from securely cementing the thermocouple in place. If a metal surface is involved, brazing or soldering the thermocouple to the metal may be necessary.

SA5.7 The test shall be continued until constant temperatures are obtained. A temperature shall be considered to be constant if:

a) the test has been running for at least 3 hours; and

b) three successive readings, taken at 15-minute intervals, are within 1 °C (34 °F) of one another and the temperatures are still not rising.

SUPPLEMENT SB – NAVAL-USE LAMPHOLDERS

SB1 Scope

SB1.1 These requirements cover screw and double-screw contact bayonet lampholders for use with lamps of various types on military naval ships.

SB1.2 The requirements in this supplement do not cover lampholders with switches or lampholders for use with high-pressure sodium lamps.

SB1.3 These requirements cover lampholders and starter holders for fluorescent lamps for use on military naval ships.

SB1.4 The requirements in this supplement do not cover starters for fluorescent lamps or low-pressure sodium lamps for use on naval ships.

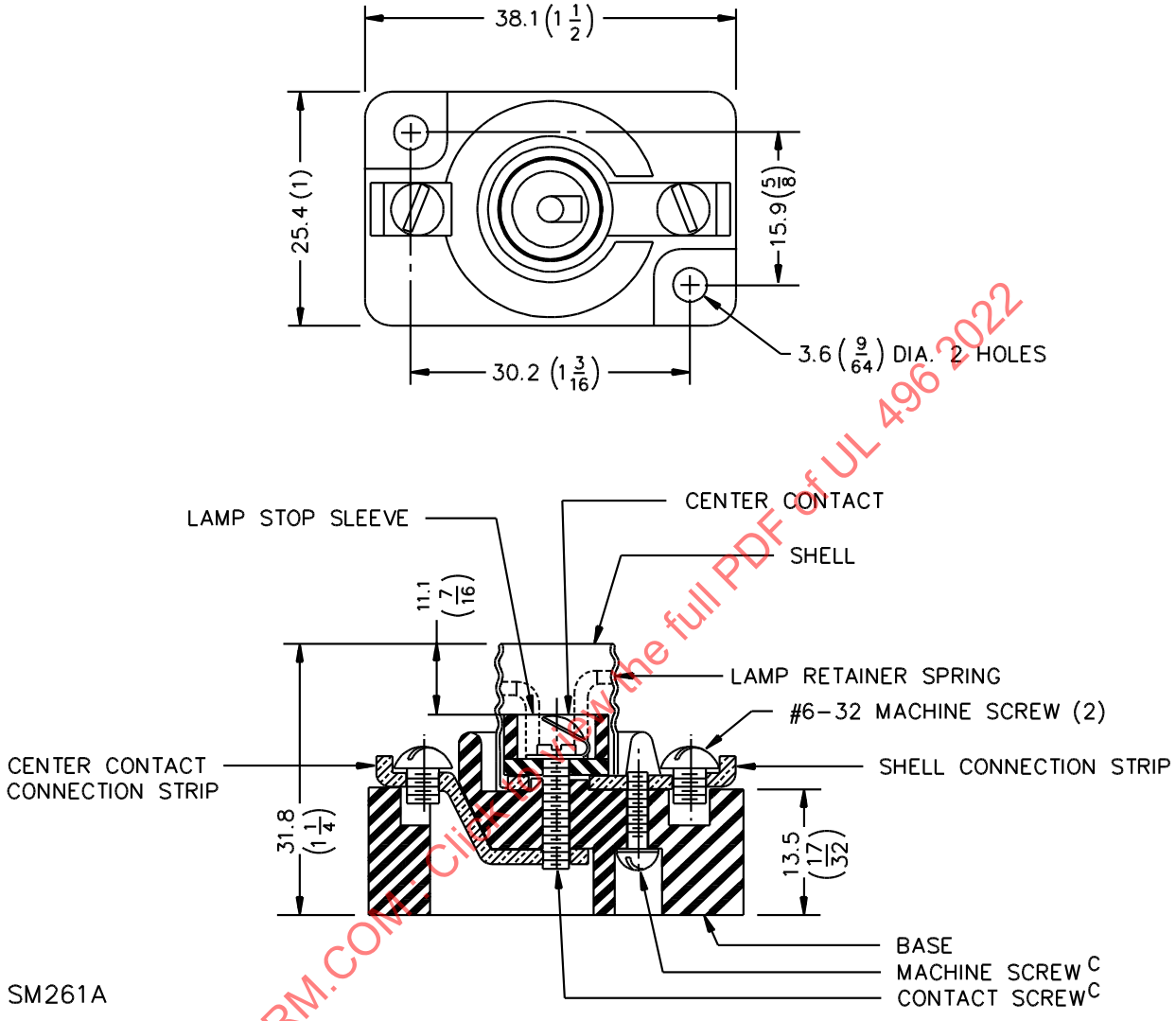
SB2 Naval-Use Screw Lampholders – General

SB2.1 A lampholder for use on naval ships shall be constructed in accordance with Figure SB1 – Figure SB10 as applicable, or the equivalent.

SB2.2 A lampholder shall comply with all the applicable requirements of the preceding clauses of this Standard, except as modified or added to the requirements specified in this supplement.

Figure SB1

Candelabra screw[a,b,d,e,f]



NOTES:

[a] All dimensions are in mm (in). Unless otherwise specified, tolerances for fractions are ±0.4 mm (±1/64 in).

[b] Alternative constructions may be investigated.

[c] Upset after assembly.

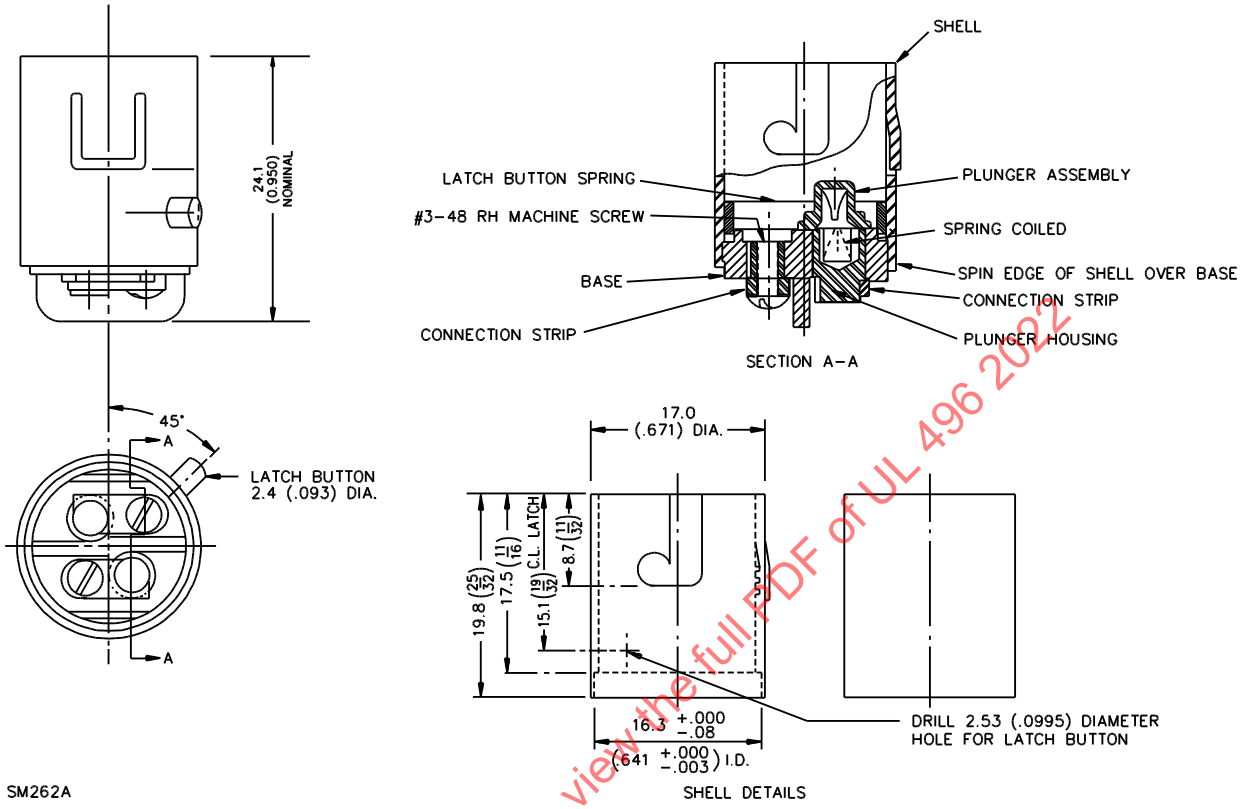
[d] 25.4 mm = 1 in.

[e] Requirements formerly covered under Military Standard MS16748, Drawing 9-S-2036-L, and MIL-L-970/1.

[f] Screwshells shall be constructed in accordance with NEMA ANSLG C81.62.

Figure SB2

Candelabra and double-contact bayonet [a,b,c,d,e]



[a] All dimensions are in mm (in). Unless otherwise specified, tolerances for fractions are ±0.4 mm (±1/64 in), tolerances for decimals are ±0.127 mm (±0.005 in), and tolerances for angles is ±1/2 degrees.

[b] Alternative constructions may be investigated.

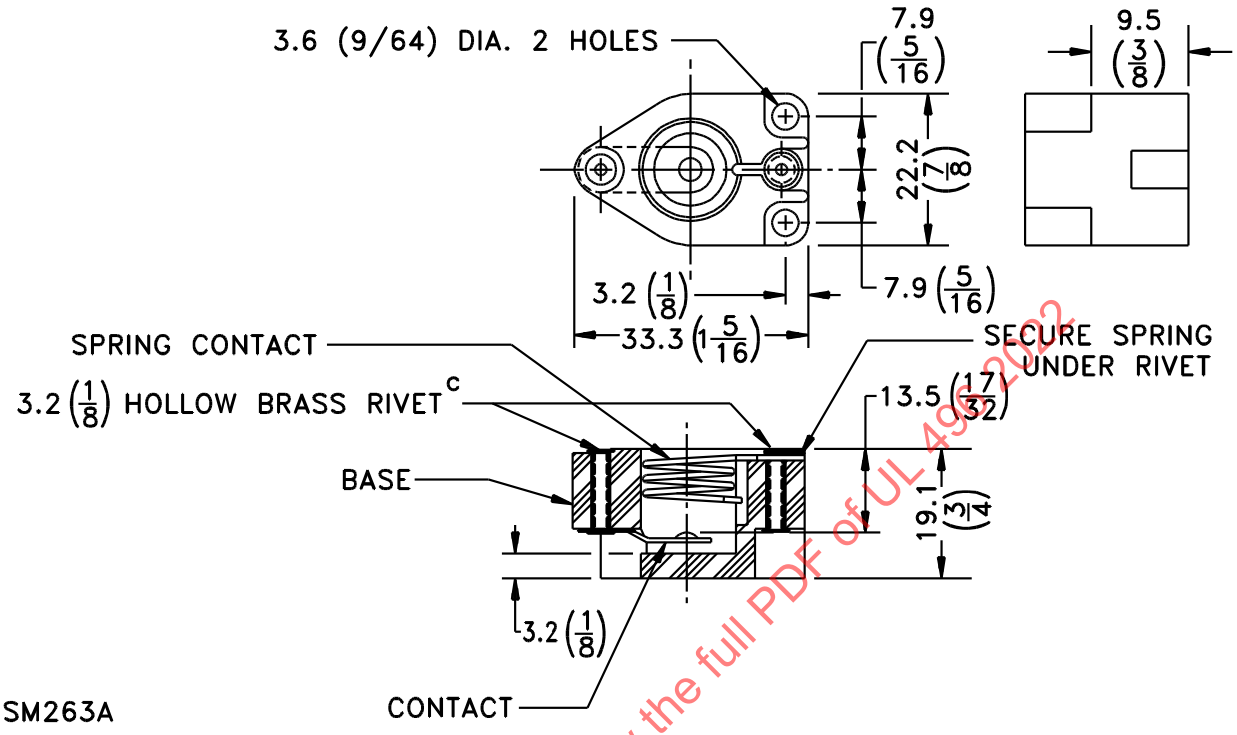
[c] 25.4 mm = 1 in.

[d] Requirements formerly covered under Military Standard MS17077, Drawing 9000-S6401-74333, and MIL-L-970/2.

[e] Lampholder dimensions shall be in accordance with NEMA ANSLG C81.62.

Figure SB3

Candelabra screw (tapered)[a,b,d,e,f]



[a] All dimensions are in mm (in). Unless otherwise specified, tolerances for fractions are ±0.4 mm (±1/64 in).

[b] Alternative constructions will be investigated.

[c] Upset after assembly.

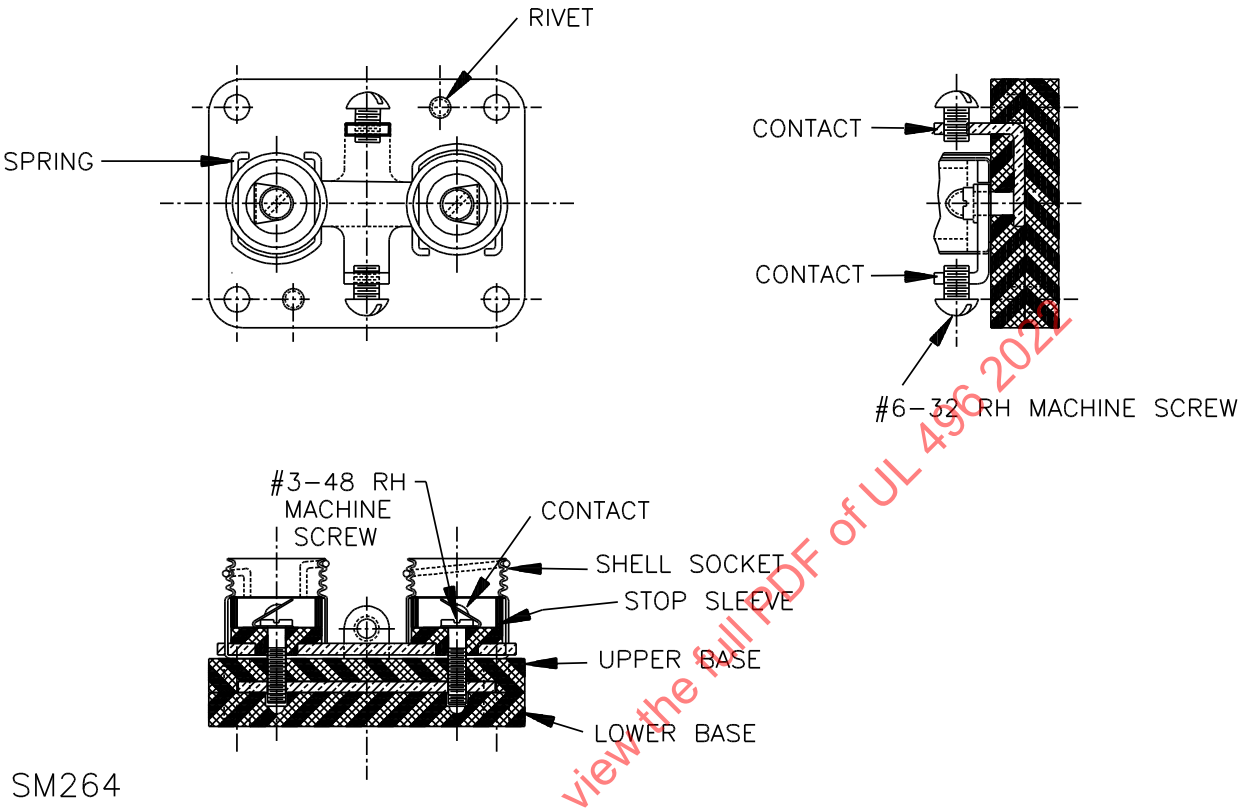
[d] 25.4 mm = 1 in.

[e] Requirements formerly covered under Military Standard MS16754, Drawing 9-S-5038-L, and MIL-L-970/3.

[f] Lampholders shall be constructed in accordance with NEMA ANSLG C81.62.

Figure SB4

Candelabra screw (two lamp) single circuit[a,b,c,d,e]



[a] All dimensions are in mm (in). Unless otherwise specified, tolerances for fractions are ±0.4 mm (±1/64 in).

[b] Alternative constructions will be investigated.

[c] 25.4 mm = 1 in.

[d] Requirements formerly covered under Military Standard MS16750-1, Drawing 9000-S6405-73455, and MIL-L-970/4-1.

[e] Screwshells shall be constructed in accordance with NEMA ANSLG C81.62.