UL 676

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Underwater Luminaires and Submersible Junction Boxes

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Underwriters Laboratories Inc. (UL)
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Northbrook, IL 60062-2096

UL Standard for Safety for Underwater Luminaires and Submersible Junction Boxes, UL 676

Eighth Edition, Dated June 9, 2003

Revisions: This Standard contains revisions through and including April 25, 2006.

Summary of Topics

These editorial revisions to UL 676 replace all references to UL 1020, the Standard for Thermal Cutoffs for Use in Electrical Appliances and Components, with reference to UL 60691, the Standard for Thermal-Links – Requirements and Application Guide. UL 1020 was withdrawn and superseded by UL 60691.

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

Announcement Bulletin(s): This Standard contains the announcement bulletin(s) dated May 16, 1990, and December 29, 1993. The announcement bulletins are located at the end of the Standard.

The revisions dated April 25, 2006 include a reprinted title page (page1) for this Standard.

The revisions dated April 25, 2006 editorially replace all references to UL 1020 with the reference to UL 60691.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: http://ulstandardsinfonet.ul.com/ulforeword.html

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the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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This Standard consists of pages dated as shown in the following checklist:

Page	Date
1	April 25, 2006
2-3	November 24, 2004
4-5	June 9, 2003
6	November 24, 2004
7-9	June 9, 2003
10-11	November 24, 2004
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UL 676

Standard for Underwater Luminaires and Submersible Junction Boxes

The first edition was titled Standard for Underwater Lighting Fixtures and Junction Boxes for Swimming Pools.

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June 9, 2003

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

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INTRODUCTION

1 Scope

1.1 These requirements cover electric luminaires for installation below the surface of the water in swimming pools, permanently installed spas, hot tubs, and similar water-containing vessels intended to accommodate the complete or partial immersion of persons, and for operation on supply circuits rated 150 volts or less, in accordance with the National Electrical Code, NFPA 70.

1.2 These requirements also cover:

a) Metal luminaire housings (forming shells) for use with wet-niche luminaires intended for installation as described in 1.1;

b) Mounting brackets for use with no-niche luminaires intended for installation as described in 1.1; and

c) Electric luminaires and junction boxes for installation in fountains and similar water-containing vessels not intended to accommodate the complete or partial immersion of persons.

1.3 These requirements do not cover junction boxes for use in swimming pools and spas, ground-fault circuit-interrupters, transformer enclosures, or transformers used for the supply of underwater luminaires.

1.4 A wet-niche luminaire as covered by these requirements is one intended for installation in a metal luminaire housing (forming shell) mounted in or on the wall of a swimming pool or fountain where the luminaire will be surrounded by water. The luminaire is supplied by a flexible cord of sufficient length to permit the luminaire to be removed from the niche and lifted to the deck for servicing.

1.5 A dry-niche luminaire as covered by these requirements is one intended to be permanently mounted and sealed in the wall of a swimming pool or fountain. It is equipped with provisions for conduit connection, and is designed to be serviced from the rear in a passageway or tunnel behind the wall or from the deck.

1.6 A no-niche luminaire as covered by these requirements is one intended for installation on a mounting bracket that is, in turn, mounted in or on the wall of a swimming pool or fountain where the luminaire will not extend behind the plane of the wall and will be surrounded by water. The luminaire is supplied by a flexible cord of a length that permits the luminaire to be removed from the mounting bracket and lifted to the deck for servicing.

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2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components used in the products covered by this standard.

2.1.2 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.

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

2.1.4 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.

2.2 Units of measurement

2.2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.2.2 Unless indicated otherwise, all voltage and current values specified in this standard are root-mean-square (rms).

2.3 Undated references

2.3.1 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.

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PART I – SWIMMING POOL LUMINAIRES

CONSTRUCTION – LUMINAIRES

3 General

3.1 A luminaire shall be constructed to provide mechanical strength appropriate for the stress it is likely to encounter during installation and use.

3.2 A luminaire shall be constructed to provide an enclosure for all electrical parts, including the lamp bulb.

Exception No. 1: The lens face of a PAR lamp is not required to be enclosed.

Exception No. 2: Flexible cord, attachment plugs, receptacles, and cord connectors are not required to be enclosed in an electrical enclosure when the luminaire and its installation complies with requirements for Flexible Cord and Connectors, Section 7.

3.3 A luminaire rated more than 15 volts and provided with a PAR lamp shall be provided with a guard, grid, or an outer lens.

3.4 A luminaire intended to be mounted facing upward shall have the lens guarded to prevent contact by any person.

3.5 All metal parts of a luminaire, including assembly rivets, screws, and the like, shall be of copper, a copper alloy, or other corrosion resistant metal. Copper alloy parts forming the luminaire enclosure and all other copper alloy parts in contact with the water in the pool, fountain, or the like shall have a zinc content not in excess of 15 percent.

3.6 Aluminum and aluminum alloys shall not be used for any part of a luminaire.

3.7 The requirements in 3.5 and 3.6 apply to metal parts of components, such as lampholders, as well as to metal parts of the luminaire itself. Plated ferrous materials may be used for lampholder contact reinforcing springs and lampholder assembly rivets.

3.8 Paint, enamel, or other coatings that inhibit bonding of parts or reduce the electric-field shielding effect (where required) shall not be used on either the inside or the outside of a luminaire.

3.9 Tin-lead solder shall not be used for the fastening of seams or the assembly of parts of a luminaire.

3.10 Self-threading or sheet-metal screws shall not be used.

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4 Sheet Metal

4.1 The thickness of sheet metal in a luminaire enclosure shall be not less than 1 mm (0.040 inch) at any point where a conduit hub is secured, and not less than 0.5 mm (0.020 inch) at any other point on a drawn or spun luminaire. The thickness of sheet metal in a drawn or spun luminaire shall be such as to provide strength and rigidity at sealing points, or shall be reinforced to provide strength equivalent to that of sheet metal not thinner than 1 mm.

5 Cast Metal

5.1 Cast metal in a luminaire enclosure shall have a minimum thickness in accordance with Table 5.1.

Table 5.1
Minimum thickness of cast metal

Surface involved	Cast metal other than die-cast,		Die-cast metal,	
	mm	(inch)	mm	(inch)
Unreinforced flat surface	3.2	0.125	1.2	0.047
At base of threads, surface that is curved, ribbed, or otherwise reinforced, or surface of such size or shape that equivalent physical strength is provided	2.3	0.090	1.1	0.045

6 Mounting Means

6.1 A luminaire shall be provided with means for mounting as intended.

6.2 The means for mounting a wet-niche luminaire in its forming shell, and a no-niche luminaire to its mounting bracket, shall automatically bond the luminaire to the luminaire housing or mounting bracket as described in 22.1.1 and 22.2.1, and shall require the use of a tool for the removal of the luminaire. The bond shall comply with the bonding requirements in Bonding, Section 22.

7 Flexible Cord and Connectors

7.1 Flexible cord not enclosed within an enclosure shall be used only to facilitate the installation, maintenance, or servicing of the luminaire.

7.2 Flexible cord not enclosed within an enclosure shall be of the type suitable for hard usage (such as Type SJ, SJT, or SJTO) or the equivalent.

7.3 Flexible cord that is immersed in water shall be suitable for:

a) Hard usage (such as Type SJW, SJTW, or STOW) and not smaller than 3.3 mm^2(12 AWG);

b) Extra-hard usage (such as Type SOW, STW, or STOW); or

c) Equivalent to the type specified in (a) or (b).

A grounding conductor shall not be smaller than the circuit conductors and, for flexible cords suitable for extra-hard usage, shall not be smaller than 1.3 mm^2(16 AWG).

7.3 revised November 24, 2004

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7.4 Flexible cord that is immersed in pool water, might rest in collected water outside a pool, or that is exposed to water such as rain, sprinkler, or water splashed from the pool, but that does not rest or become immersed in collected water shall be of the type suitable for immersion in water as indicated with the flexible cord type designation suffix “W”.

7.4 revised November 24, 2004

7.5 When the point where the flexible cord enters an enclosure is immersed, a watertight fitting or an equivalent method for reducing the risk of water entering the enclosure shall be used.

7.6 Flexible cord that is exposed to sunlight or another source of UV light shall be suitable for outdoor use as indicated by the presence of the flexible cord type designation suffix ″W.″

7.7 A luminaire shall be provided with an attachment plug or receptacle or cord connector only when:

a) The luminaire includes both the attachment plug and the mating receptacle or cord connector;

b) A tool is required to access or disconnect the attachment plug and mating receptacle or cord connector;

c) The attachment plug and mating receptacle or cord connector are not exposed to sunlight, water, impact, strain, and other adverse conditions unless they have been found suitable for the conditions anticipated; and

d) To facilitate the installation, maintenance, or servicing of the luminaire.

Exception: The attachment plug that is part of the power supply cord of a cord- and plug-connected luminaire need not comply with items (a) and (c) of this requirement.

7.8 An attachment plug shall not have the blade or pin configuration of a 125-volt, 15-ampere, parallel-blade, grounding-type attachment plug (ANSI 5-15); a 125-volt, 15-ampere, parallel-blade, nongrounding-type attachment plug (ANSI 1-15); or a 125-volt, 20-ampere, perpendicular-blade, grounding-type attachment plug (ANSI 5-20).

Exception No. 1: The attachment plug that is part of a cord- and plug-connected luminaire’s power supply cord is not prohibited from having a blade-and-pin configuration matching the configurations specified in 7.8.

Exception No. 2: An attachment plug is not prohibited from having a blade-and-pin configuration matching the configurations specified above when the attachment plug and the receptacle or cord connector to which it connects are only accessible during installation, maintenance, or servicing of the luminaire.

7.9 An attachment plug and the mating receptacle or cord connector shall be polarized when polarization is required to comply with the requirements in Polarization and Identification, Section 16, or the Electric Shock Test, Section 37. When polarization is required and conductors are connected to the device during installation, the device shall have terminals marked to identify the intended connection of wiring.

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7.10 A cord- and plug-connected luminaire shall be provided with a length of flexible cord that extends from the pool wall to the location remote from the pool wall. The flexible cord shall have a length of not less than 7.6 m (25 feet).

7.11 Flexible cord shall not be accessible to contact unless the luminaire and its installation comply with item (a), (b), (c), or (d), and strain relief is provided to reduce the risk of stress being transmitted to electrical splices. The flexible cord is accessible to contact only:

a) During luminaire relamping or servicing;

b) When it is part of the power supply cord of a cord- and plug-connected luminaire;

c) When it is the flexible cord of the cord- and plug-connected luminaire that extends from the pool wall to the location remote from the pool wall as specified in 7.10; or

d) When it is reliably routed and secured to suitably rigid structural members of the pool, the luminaire, or other objects installed for the purpose in accordance with subitem (1) or (2).

1) The flexible cord is positioned and secured so that it is not likely to be stepped on, pulled, or subjected to a force that increases its tensile stress. The flexible cord is considered to comply with this requirement if it is secured against a vertical surface (for example, a pool wall) or if the flexible cord is guarded so that it is not likely to be subjected to such force. A guard and supporting structural members used to comply with this requirement shall comply with the Flexible Cord Guard and Support Test, Section 39.

2) The flexible cord is secured in a location other than as described in subitem (1) and in a location such that the flexible cord is pressed against and supported by a suitable rigid surface directly under the force application point if the flexible cord is stepped on or subjected to another downward or horizontal force. Structural members used to comply with this requirement shall comply with the Flexible Cord Guard and Support Test, Section 39.

The total length of flexible cord that is accessible to contact and that is connected to the same circuit shall not exceed 1.52 m (5 feet). The flexible cord identified in (a) – (c) is not to be considered when determining compliance with this 1.52-m requirement. The installation instructions shall include the instructions described in 40.11.

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8 Power Supply Connections

8.1 General

8.1.1 A dry-niche luminaire and the luminaire housing for a wet-niche luminaire, and the mounting bracket for a no-niche luminaire, shall have provision for the connection of rigid metal or nonmetallic conduit.

8.1.2 Holes for the connection of conduit shall be threaded. When the threads are tapped all the way through a hole in an enclosure wall, or when an equivalent construction is used, there shall not be fewer than 3-1/2 nor more than five threads in the metal and the construction shall be such that a conduit bushing can be attached as intended. When the threads are not tapped all the way through a hole in an enclosure wall, conduit hub, or the like, there shall not be fewer than five threads in the metal and there shall be a smooth, rounded inlet hole for the conductors equivalent to that provided by a standard conduit bushing. The internal diameter of the inlet hole shall be the same as that of the corresponding trade size of rigid conduit.

8.1.3 A conduit hub shall be threaded and shall have a wall thickness before threading not less than that of the corresponding trade size of conduit. A conduit hub that is not cast integrally with an enclosure shall not depend upon friction alone to prevent its turning. The hub shall additionally be capable of withstanding the specified torque applied to a short length of rigid metal conduit threaded into the hub in the intended manner, without turning in the enclosure and without stripping any threads. The enclosure shall be rigidly mounted or supported. For the 3/4-inch and smaller trade sizes, the applied torque shall be 90.4 N·m (800 pound-inches); for the 1, 1-1/4, and 1-1/2 inch trade sizes, 113.0 N·m (1000 pound-inches); and for the 2-inch and larger sizes, 180.8 N·m (1600 pound-inches).

8.1.4 The termination means for a field-connected conductor shall consist of a pigtail lead, a pressure terminal connector, a wire-binding screw, or a stud with nut. A pressure terminal connector shall be of a type that can be applied by means of an ordinary tool (such as a screwdriver, nut driver, or pliers).

8.1.5 A pigtail lead for connection of field wiring shall not be more than two standard (AWG) sizes smaller than the field-connected conductor to which it will be connected, and shall not be smaller than a 0.82 mm^2 (18 AWG) copper conductor in any case.

8.1.6 A pigtail lead shall have a free length in a splice compartment of at least 15.2 cm (6 inches).

8.1.7 A field-wiring terminal shall be provided with a pressure terminal connector securely fastened in place by being brazed, bolted, held by a screw, or the equivalent. A single rivet shall not be used.

Exception: A wire-binding screw is not prohibited from being used at a field-wiring terminal intended to accommodate a 5.3 mm^2 (10 AWG) or smaller conductor.

8.1.8 A field-wiring terminal shall be prevented from turning or shifting in position by means other than friction alone. Acceptable means of complying with this requirement include use of two screws or rivets, square shoulders or mortises, dowel pins, lugs, offsets, or connecting straps or clips fitted into an adjacent part, or by an equivalent method.

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8.1.9 A wire-binding screw at a field-wiring terminal shall not be smaller than 4.8 mm (No. 10 major diameter).

Exception: A 4.2 mm (No. 8) screw is not prohibited from being used for the connection of a 2.1 mm^2 (14 AWG) conductor. A 3.5 mm (No. 6) screw is not prohibited from being used for the connection of 1.3 mm^2 (16 AWG) and smaller conductors.

8.1.10 A wire-binding screw shall thread into metal at least 1.3 mm (0.050 inch) thick.

Exception: Metal not less than 0.8 mm (0.030 inch) thick is not prohibited from being used when the threaded joint withstands a tightening torque applied to the wire-binding screw without stripping the screw threads or the terminal plate threads when tested with a solid copper conductor of the size intended and placed under the screw head and wrapped 2/3 – 3/4 turn around the screw. The tightening torque shall be 1.4 N·m (12 pound-inches), 1.8 N·m (16 pound-inches), and 2.3 N·m (20 pound-inches) for screw sizes No. 6, No. 8, and No. 10 or larger, respectively.

8.1.11 Upturned lugs or a cupped washer or the equivalent shall be provided with a wire-binding screw and shall be capable of retaining a conductor of the size intended under the head of the screw or washer.

8.1.12 Where continuity or secureness of an electrical connection involves a threaded joint, at least two full threads shall be engaged in the threaded joint and, for a screw with a tapered end, any threads on the tapered end shall be disregarded.

Exception: The threaded joint of a component complying with applicable component requirements for threaded joint design, continuity, and secureness is not required to comply with this requirement.

8.1.13 Where pigtail leads are provided for field wiring connections, a threaded joint at the product end of the lead shall comply with 8.1.12.

8.1.14 A field-wiring terminal intended for the connection of a grounded conductor shall be of (or plated with) a metal substantially white in color and shall be readily distinguishable from the other terminals, or identification of the terminal shall be clearly shown in some other manner.

8.1.15 A lead intended for connection of a grounded conductor shall be finished to show a white or gray color and shall be distinguishable from any other leads.

8.1.15 revised June 9, 2003

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8.2 Wet-niche and no-niche luminaires

8.2.1 Wet-niche and no-niche luminaires shall be provided with a permanently attached length of flexible cord for routing through the conduit connected to the luminaire housing or mounting bracket and for connecting to the power source. The flexible cord shall extend a minimum of 3.7 m (12 feet) from the point at which the cord emerges from the luminaire.

8.2.2 A grounding conductor in the flexible cord shall be green with or without one or more yellow stripes.

8.2.3 The end of the flexible cord jacket and the flexible cord conductor terminations shall be covered with or encapsulated in a potting compound to prevent the entry of water into the luminaire through the cord or its conductors. In addition, a ground connection within the luminaire shall be similarly treated to protect such connection from the deteriorating effect of chemicals in the water in the event of water entry into the luminaire.

8.2.4 Strain relief shall be provided to prevent a mechanical stress on the flexible cord from being transmitted directly to terminals, splices, or interior wiring of the luminaire. The strain-relief means shall comply with the Strain-Relief Test, Section 33.

8.2.5 The flexible cord specified in 8.2.1 shall be considered a pigtail lead with regard to the requirements in 8.1.1 – 8.1.15.

8.3 Dry-niche luminaires

8.3.1 Connections between the luminaire conductors and the conductors of the power supply circuit shall be accessible for inspection without requiring the disconnection of any portion of the wiring.

8.3.2 The luminaire shall provide:

a) Ample space for any required splices to the supply conductors and

b) Means for independent termination of at least two equipment grounding conductors.

8.3.3 When flexible cord is used to supply the lamp assembly of a dry-niche luminaire, the end of the flexible cord jacket and the flexible cord conductor terminations shall be covered with or encapsulated in a potting compound to protect such connections from the deteriorating effect of chemicals in the water in the event of water entry into the lamp assembly.

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9 Diffusers

9.1 A panel or lens shall be investigated with regard to mechanical strength. The investigation will include consideration of the ability of the panel or lens to withstand the forces, including impact, to which it may be subjected after installation. A luminaire shall be tested as described in the Impact Test, Section 36. For a polymeric material, consideration will be given to thermal conditioning.

10 Guards

10.1 A metal guard, when provided, shall be conductively connected to the point of attachment of the equipment grounding conductor to the luminaire.

10.2 If a luminaire must be provided with a guard in order to comply with the requirements concerning the risk of electric shock, the construction shall be such that the luminaire cannot be installed without the guard.

10.3 There shall be no sharp or protruding edges of a guard or other parts of the luminaire that may be contacted by persons in a pool.

11 Gaskets

11.1 A gasket shall be of a material able to withstand the temperature and use to which it will be subjected. The gasket material shall be resistant to aging. A gasket that will be disturbed during routine servicing, such as during lamp replacement, shall be formed of resilient material such as neoprene or silicone rubber.

11.2 A gasket of neoprene, rubber, neoprene composition, or rubber composition used to prevent the entry of water into a luminaire shall be subjected to the Gasket Accelerated Aging Test, Section 38.

11.3 A gasket material other than those specified in 11.2 is not prohibited from being used when determined to have equivalent characteristics, including resistance to aging. Such material is considered resistant to aging when there is no visible evidence of deterioration (such as cracking after flexing, softening, or hardening) after these characteristics are investigated.

12 Wiring Devices

12.1 A porcelain lampholder mounted by means of a screw ring shall not be used without the gasket usually supplied with this type of lampholder.

12.2 A lampholder, receptacle, or other device supporting current-carrying parts shall be of porcelain or of cold-molded, phenolic, or urea composition.

12.3 Fiber or other absorptive material shall not be used as electrical insulation.

12.4 A wiring device (lampholder, receptacle, or the like) shall be prevented, by means other than friction, from any turning that applies tension to splices or other wiring connections, causes damage to the wiring, or otherwise adversely affects the assembly.

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13 Wireways

13.1 A luminaire shall be constructed so wires can be pulled through, or the luminaire otherwise wired, without resulting in damage to the coverings or insulation on the conductors. A wireway shall be smooth and free from burrs and fins.

13.2 Screw threads are not prohibited from being exposed in a wiring compartment when the wires are held or positioned away from such screws.

13.3 When conductors pass through an opening in sheet metal, they shall be held away from the edges of the opening or shall be protected by a bushing, a grommet, or by rolling the edge of the metal at the opening not less than 120 degrees. A bushing, when used, shall be held in place. An insulating bushing shall have a minimum thickness of 1.2 mm (3/64 inch) and shall be capable of withstanding the temperatures involved. Any burr, fin, or sharp edge shall be removed from the edges of an opening in cast metal to reduce the risk of abrasion of the conductor insulation.

13.4 A fiber bushing shall not be used.

14 Wiring

14.1 Wires and splices within the luminaire shall be located so that they are not disturbed when lamps are being replaced.

14.2 The requirement in 14.1 does not apply to leads attached to a lampholder that is supported by a lamp that is in turn supported by the luminaire.

14.3 A conductor shall have insulation rated for a potential of 300 volts or more and for the temperature to which it will be subjected under conditions of intended use as determined in the Temperature Test, Section 29.

14.4 A conductor shall have:

a) Rubber or neoprene insulation and a saturated braid or

b) Thermoplastic insulation.

The thickness of the insulation shall be at least 0.8 mm (1/32 inch).

14.5 A conductor shall be of copper and of such size that its ampacity is not less than that required for the load supplied, but not smaller than 0.82 mm^2 (18 AWG) in any case. The wire gage requirement for the equipment grounding conductor is specified in 7.3.

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15 Splices

15.1 A splice shall be made mechanically and electrically secure with solder or a wire connector. A soldered joint or a joint made with an uninsulated pressure wire connector shall be covered with insulation equivalent to that on the conductors.

16 Polarization and Identification

16.1 Each lampholder screwshell shall be connected to a grounded conductor or terminal.

17 Exposure of Live Parts

17.1 A luminaire shall have no uninsulated live part exposed to contact by persons during intended use. A luminaire rated more than 15 volts shall have no uninsulated live part (other than the lamp contacts of a screw shell lampholder) accessible during relamping.

18 Position of Live Parts

18.1 With the luminaire lens removed (to simulate a broken lens) but with any luminaire guard, grid, or barrier in place, the resulting lens opening or openings in the guard, grid, or barrier shall be such that:

a) A 203-mm (8-inch) diameter disc held parallel to the pool wall will not enter the opening and

b) All uninsulated live parts (including the live parts within the lamp) are recessed at least one-seventh of the major dimension of any front opening or 25.4 mm (1 inch), whichever is greater, from the plane of that opening.

19 Spacings

19.1 There shall be a spacing of at least 6.4 mm (1/4 inch) through air, or at least 9.5 mm (3/8 inch) over surface of insulating material, between uninsulated live parts of opposite polarity and between an uninsulated live part and metal that may be grounded when a luminaire is installed.

Exception: The spacings required do not apply between an uninsulated live part of a wiring device, such as a lampholder, and dead metal that is part of the wiring device (including mounting screws, rivets, yoke, clamp, and the like), or between such live part and that part of the dead metal surface of the luminaire on which the device is mounted in its intended manner. Some examples of these spacings are illustrated in Figure 19.1.

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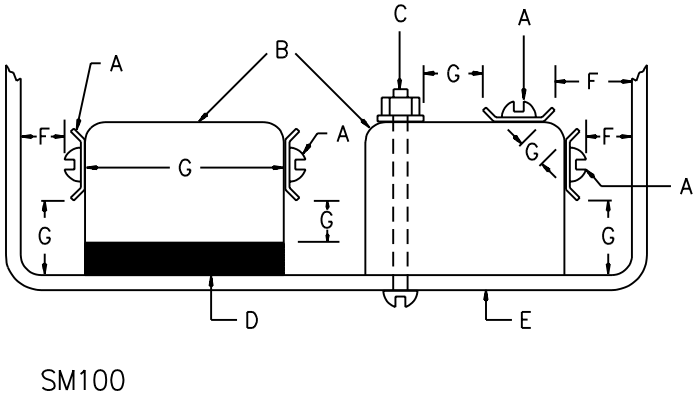
Figure 19.1
Spacings at wiring devices



A – Uninsulated live parts of wiring device.
B – Insulating material of wiring device.
C – Mounting screw of wiring device.
D – Dead-metal parts of wiring device.
E – Dead-metal parts of luminaire.
F – Spacings to which 19.1 applies.
G – Spacings to which 19.1 does not apply.

20 Barriers

20.1 A barrier or liner of insulating material shall be of nonabsorptive material at least 0.8 mm (1/32 inch) thick. Treated fiber or similar material shall not be used.

Exception: A barrier that is held in place and not exposed or otherwise likely to be damaged mechanically after installation is not prohibited from being less than 0.8 mm but shall not be less than 0.4 mm (1/64-inch) thick.

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