



UL 20

STANDARD FOR SAFETY

General-Use Snap Switches

UL Standard for Safety for General-Use Snap Switches, UL 20

Fifteenth Edition, Dated January 31, 2025

Summary of Topics

This new Fifteenth Edition of ANSI/UL 20 dated January 31, 2025 includes the following changes in requirements:

- AC Only Flush Switch employing magnetic assisted actuation.***
- Flush Switch Grounding Terminal.***
- Conductor Type Markings.***
- New Annex B – Modular AC Only Flush Switch With Separable Device***

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated September 6, 2024.

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NMX-J-005-ANCE-2025
Second Edition



CSA Group
CSA C22.2 No. 111:25
Sixth Edition



ULSE Inc.
UL 20
Fifteenth Edition

General-Use Snap Switches

January 31, 2025



ANSI/UL 20-2025



Documents

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The Department of Defense (DoD) has adopted UL 20 on December 4, 1981. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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Preface

This is the harmonized ANCE, CSA Group, and ULSE standard for General-Use Snap Switches. It is the second edition of NMX-J-005-ANCE, sixth edition of CSA C22.2 No. 111, and the fifteenth edition of UL 20. This edition of NMX-J-005-ANCE supersedes the previous edition published on July 20, 2018. This edition of CSA C22.2 No. 111 supersedes the previous edition(s) published on July 20, 2018. This edition of UL 20 supersedes the previous edition(s) published on July 20, 2018.

This harmonized standard was prepared by the Association of Standardization and Certification, (ANCE), CSA Group and ULSE Inc. (ULSE). The efforts and support of the NEMA (National Electrical Manufacturers Association), EFC (Electro-Federation of Canada), and the CANENA Technical Harmonization Committee for Snap Switches, THSC 23-B, are gratefully acknowledged.

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

The present Mexican standard was developed by the CT 23 Electrical Accessories (Wiring Devices) from the Comité de Normalización de la Asociación de Normalización y Certificación, A.C., CONANCE, with the collaboration of the Wiring Devices manufacturers and users.

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

Application of Standard

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

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

Level of Harmonization

This Standard is published as an equivalent standard for ANCE, CSA Group and ULSE.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

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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INTRODUCTION

1 Scope

1.1 The requirements of this Standard apply to manually operated, general-use snap switches and modular switch assembly for connection to copper (Cu) or copper-clad conductors used in accordance with the National Electrical Code (NEC), NFPA 70, the Canadian Electrical Code (CE Code), Part I, or NOM-001-SEDE and intended to be permanently connected in accordance with the NOM-001-SEDE, NEC and the CE Code, Part I. In Canada, requirements for switches for connection to aluminum (Al) conductors used in accordance with the CE Code, Part I, and intended for connection to wiring systems recognized by the CE Code, Part I, are covered in Annex [D](#).

1.2 This Standard applies to ac/dc rated switches for which the load ratings do not exceed 60 A at 250 V or less, 30 A at 251 V – 600 V, and 2 hp at 125 V – 600 V or less. This Standard also covers ac-only rated switches for which the load ratings do not exceed 30 A at 347 VAC or less.

1.3 This Standard applies to switches constructed to be installed readily in a flush device box or on an outlet-box cover and intended for connection to branch-circuit wiring.

1.4 This Standard applies to pendant and through-cord switches intended for field installation on flexible cord and provided with one "on" and one "off" position.

1.5 This Standard applies to switches intended for surface mounting and provided with a separable base and cover for connection to exposed wiring consisting of nonmetallic sheathed cable or open wiring on insulators (knob and tube).

1.6 This Standard applies to self-contained switches intended for flush mounting without a separate outlet box and for connection to branch-circuit wiring consisting of one or more non-metallic sheathed cables containing copper conductors.

1.7 This Standard applies to ac/dc fixture switches intended to be installed in fixtures to control incandescent lighting or fans for connection to branch-circuit wiring.

1.8 This Standard also applies to single-pole, momentary-contact door switches constructed to be installed readily in a special-purpose device box or on an outlet-box cover for connection to branch-circuit wiring.

1.9 A modular switch assembly is considered to be a general-use AC only flush switch.

1.10 This Standard does not apply to:

- a) Clock operated switches specified in the Standard for Clock-Operated Switches, UL 917, and CSA C22.2 No. 177;
- b) Dimmer switches specified in the Standard for Solid-State Dimming Controls, UL 1472, and CSA C22.2 No. 184.1;
- c) Industrial control equipment specified in the Standard for Industrial Control Equipment, UL 508, and CSA C22.2 No. 14;
- d) Solid-state, single-phase motor speed controls specified in the Standard for Solid-State Fan Speed Controls, UL 1917, and CSA C22.2 No. 156;
- e) Special-use and ac-only fixture switches specified in the Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1, and CSA C22.2 No. 55; and

f) Switches for use in hazardous locations specified in the Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations, UL 1203, and CSA C22.2 No. 159.

1.11 For switches intended for connection to branch-circuit wiring containing aluminum conductors, refer to the Standard for Receptacles and Switches Intended for Use with Aluminum Wire, UL 1567, or to Annex [D](#).

In Mexico, this clause is not applicable. The use of aluminum conductors from 0.824 mm² (18 AWG) to 8.37 mm² (8 AWG) is prohibited.

2 Glossary

2.1 The following definitions apply in this Standard:

2.2 CLEARANCES – Through-air spacing.

2.3 CREEPAGE DISTANCES (CREEPAGE) – Over-surface spacings.

2.4 DOOR SWITCH – A single-pole, momentary contact switch with a push-button actuator, provided with an outlet-box and cover. It is intended for installation in door jambs to control lighting fixtures, typically in a closet.

2.5 FIXTURE SWITCH – A switch installed in the enclosure of a fixture such as a luminaire, a fan, or the like.

2.6 FLUSH SWITCH – A switch provided with a mounting yoke or integral flush device cover plate and intended for installation in or on an outlet box intended to control a branch circuit.

2.7 MODULAR SWITCH ASSEMBLY – A device consisting of a separable terminal assembly and switch.

2.8 MAGNETIC ASSISTED SWITCH ACTUATOR – A switch provided with permanent magnets intended to provide physical magnetic attraction and/or repulsion of switch toggle or rocker actuator. Only intended for flush mounting in a single-gang outlet box.

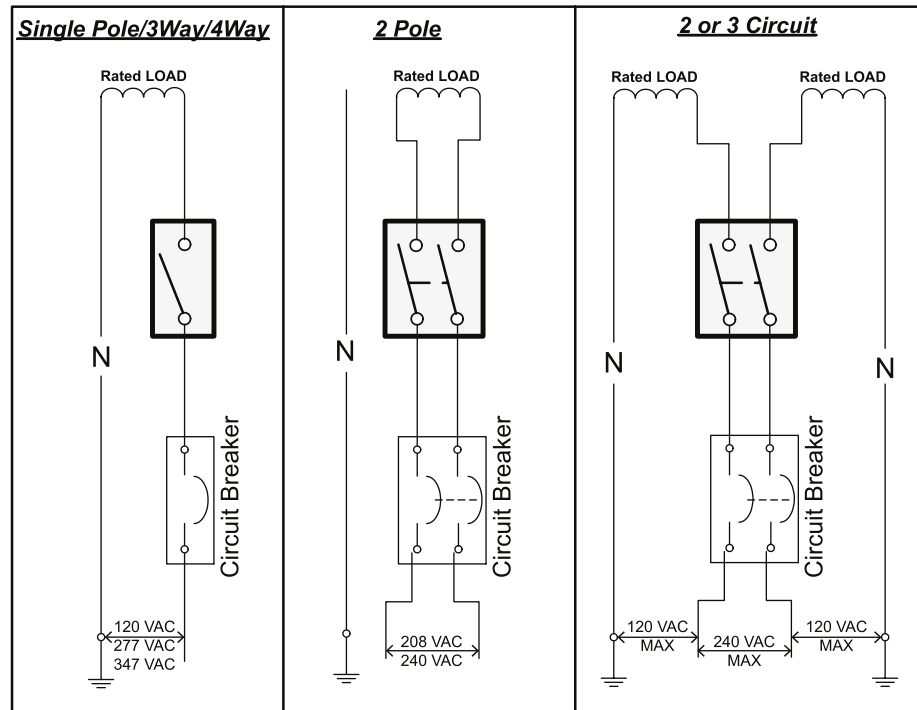
2.9 PENDANT SWITCH – A switch intended to be installed at the end of a flexible cord for use in branch-circuit pendant applications.

2.10 SELF-CONTAINED SWITCH – A switch intended for flush mounting without a separate outlet box for connection to one or more nonmetallic sheathed cables containing copper conductors.

2.11 SEPARABLE JUMPER CONNECTOR – Consists of shorted pins or tabs located within the body of the connector. It is intended to mate with a special purpose connector during an electrical installation to simulate an installed switch on a separable terminal assembly for the purpose of verifying circuit integrity.

2.12 SINGLE POLE, 3-WAY, 4-WAY, OR 2 POLE SWITCHES – Is intended to be supplied by a single branch circuit and to control a single set of loads. The circuit and loads can be connected line-to-neutral (e.g., 120 V ac, 277 V ac) or line-to-line (e.g., 208 V ac, 240 V ac). See [Figure 2.1](#) for details.

Figure 2.1
Wiring Diagram for Switches



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2.13 SURFACE SWITCH – A switch provided with a separable base and cover primarily intended for branch-circuit installation on exposed wiring consisting of open wiring on insulators or nonmetallic sheathed cable.

2.14 SYNTHETIC LOAD – The use of a combination of resistances and capacitances instead of tungsten-filament-lamps as a load.

2.15 TERMINAL ASSEMBLY, SEPARABLE – A two-piece terminal assembly provided with an integral mechanical latching mechanism(s). Consists of permanently attached pins or tabs located on the body of the switch which are capable of receiving a special purpose connector or back plate connector with leads or wiring terminals for connection to the branch circuit conductors. May be one of the constructions described below:

- a) A back plate connector that is secured to the device box; or
- b) A special-purpose connector that is installed into a device box.

2.16 TERMINAL, COMBINATION WIRE BINDING/PRESSURE-TYPE – A wire binding screw with an integrally machined pressure ring. Pressure ring terminals accept both single and multiple conductors that are captured under the machine formed pressure ring. These terminals may be wired with a single conductor using the conventional 3/4 loop around the wire-binding screw.

2.17 TERMINAL, INSULATION DISPLACEMENT – A terminal having a contacting member that forces the conductor insulation aside and presses against the side of the conductor to make contact.

2.18 **TERMINAL, PIN-TYPE** – A terminal having a contact pin that punctures the conductor insulation to contact the current-carrying conductor.

2.19 **TERMINAL, PRESSURE-WIRE** – A terminal where the conductor is clamped under a pressure plate or saddle by one or more screws or nuts.

2.20 **TERMINAL, PUSH-IN** – A terminal where 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.

2.21 **TERMINAL, SET-SCREW** – A terminal where the clamping pressure is applied by the end of the screw bearing directly on the conductor.

2.22 **TERMINAL, SPRING ACTION CLAMP** – A terminal where the stripped end of a conductor is inserted into the terminal and a manually operated integral lever enables clamping pressure to a spring mechanism, without the use of screws.

2.23 **TERMINAL, WIRE-BINDING SCREW** – A terminal in which the conductor is bent around the screw and is clamped directly under the head of the screw when it is tightened.

2.24 **THROUGH-CORD SWITCH** – A switch intended to be installed along the length of flexible cord such as for use in power-supply cords or cord sets.

2.25 **TWO- OR THREE-CIRCUIT SWITCHES** – Consists of a two- or three-pole switch, respectively, intended to be supplied by multiple single-phase branch circuits and to control multiple sets of single-phase loads, each of no more than 120 V ac line-to-neutral or 240 V ac line to line, and no more than 240 V ac between circuits; see [58.5](#). See [Figure 2.1](#) for details.

3 Components

In Mexico, [3.1](#) – [3.4](#) are not applicable.

3.1 Except as indicated in [3.2](#), a component of a product covered by this Standard shall comply with the requirements for that component. See Annex [C](#) for a list of Standards covering components generally used in the products covered by this Standard. A component shall comply with the CSA Group or the UL standards as appropriate for the country where the product is to be used.

3.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed in the application of the component in the product covered by this Standard; or
- b) Is superseded by a requirement in this Standard.

3.3 A component shall be used in accordance with its ratings for the intended conditions of use.

3.4 Specific components are accepted as being incomplete in construction features, or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as temperatures not exceeding specified limits, and shall be used only under those specified conditions for which they have been evaluated.

3.5 In Canada, general requirements applicable to this Standard are specified in CSA C22.2 No. 0.

4 Units of Measurement

4.1 The values given in SI (metric) units shall be normative, except for AWG conductor sizes. Any other values given are for information purposes only.

5 Referenced Publications

5.1 Where reference is made to any Standards, such reference shall be considered to refer to the latest editions and revisions thereto available at the time of printing, unless otherwise specified.

5.2 Products covered by this Standard shall comply with the referenced installation codes and standards noted in this Section as appropriate for the country where the product is to be used. When the product is intended for use in more than one country, the product shall comply with the installation codes and standards for all countries where it is intended to be used.

ANSI C82.11, *Lamp Ballasts – High Frequency Fluorescent Lamp Ballasts*

ANSI C82.14, *Lamp Ballasts – Low-Frequency Square Wave Electronic Ballasts for Metal Halide Lamps*

C22.1, *Canadian Electrical Code, Part I*

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

CSA C22.2 No. 0.17, *Evaluation of Properties of Polymeric Materials*

CSA C22.2 No. 14, *Industrial Control Equipment*

CSA C22.2 No. 18.1, *Metallic Outlet Boxes*

CSA C22.2 No. 18.2, *Nonmetallic Outlet Boxes*

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

CSA C22.2 No. 42.1, *Cover Plates for Flush-Mounted Wiring Devices*

CSA C22.2 No. 55, *Special Use Switches*

CSA C22.2 No. 65, *Wire Connectors*

CSA C22.2 No. 94.1, *Enclosures for Electrical Equipment, Non-environmental Considerations*

CSA C22.2 No. 94.2, *Enclosures for Electrical Equipment, Environmental Considerations*

CSA C22.2 No. 156, *Solid-State Speed Controls*

CSA C22.2 No. 159, *Plugs, Connectors, Receptacles, and Similar Wiring Devices for Use in Hazardous Locations*

CSA C22.2 No. 177, *Clock-Operated Switches*

CSA C22.2 No. 184.1, *Solid State Dimming Controls*

CSA C22.2 No. 61058-1, *Switches for Appliances – Part 1: General Requirements*

NEMA WD6, *Wiring Devices – Dimensional Specifications*

NEMA 410, *Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts*

NMX-J-023/1-ANCE, *Metallic Outlet Boxes Part 1: Specifications and Test Methods*

NMX-J-235/1-ANCE, *Enclosures for Electrical Equipment, Non-environmental Considerations*

NMX-J-235/2-ANCE, *Enclosures for Electrical Equipment, Environmental Considerations*

NMX-J-574-ANCE, *Method for the Determination of the Proof and the Comparative Tracking Indices of Solid Insulating Materials*

NOM-001-SEDE, *Standard for Electrical Installations*

UL 50, *Enclosures for Electrical Equipment, Non-Environmental Considerations*

UL 50E, *Enclosures for Electrical Equipment, Environmental Considerations*

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

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

UL 498, *Attachment Plugs and Receptacles*

UL 508, *Industrial Control Equipment*

UL 514A, *Metallic Outlet Boxes*

UL 514C, *Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*

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

UL 746A, *Polymeric Materials – Short Term Property Evaluations*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 917, *Clock-Operated Switches*

UL 1203, *ExplosionProof and Dust-IgnitionProof Electrical Equipment for Use in Hazardous (Classified) Locations*

UL 1310, *Class 2 Power Units*

UL 1472, *Solid-State Dimming Controls*

UL 1567, *Receptacles and Switches Intended for Use with Aluminum Wire*

UL 1917, *Solid-State Fan Speed Controls*

UL 61058-1, *Switches for Appliances – Part 1: General Requirements*

5.3 Where reference is made to the following Standards not under the jurisdiction of ULSE or of the CSA Steering Committee on the Canadian Electrical Code, Part II, such reference shall be considered to refer to the dated edition and all revisions published to that edition up to the time the Standard was approved.

ASTM E28-99, *Test Methods for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus*

NFPA 70, *National Electrical Code*

CONSTRUCTION

6 Enclosure

6.1 Switches shall be provided with complete enclosures that house all live parts, except that switches designed to be installed in device boxes or cut-out boxes or intended specifically for use in devices where they will be so enclosed as to prevent the exposure of live parts to accidental contact, need not be provided with such enclosures.

6.2 A key-operated switch shall be constructed so that a 0.5 mm (0.02 inch) diameter rigid steel wire cannot be inserted into the key slot so as to contact live electrical parts.

6.3 A metal enclosure of a switch (such as the cover of a surface-type switch or the shell of a fixture or pendant-type switch) shall be not less than 0.33 mm (0.013 inch) thick. Heavier metal shall be employed to provide strength and rigidity if the switch is rated more than 5 A, 250 V; 10 A, 125 V; or if the size or shape of the enclosure warrants such increased metal thickness.

In Mexico, the following applies: A metal enclosure of a switch (such as a cover of a surface-type switch or the shell of a fixture or pendant-type switch) shall have the mechanical strength to enable it to comply with the specifications and test methods listed in this Standard.

6.4 A nipple (male or female) through which wires can pass shall have not less than five full, clean-cut threads of standard pitch as indicated in [Table 6.1](#). The wireway provided by the nipple shall be free from burrs, fins, sharp edges, and the like that can damage wiring.

Table 6.1
Threading for Nipples

Pipe trade size, inch	Threading per inch
1/8	27 threads
1/4	18
3/8	18
1/2	14
3/4	14

6.5 A nipple that is not integral with the body of a switch shall be secured to prevent turning relative to the enclosure, and to provide mechanical strength equivalent to that of a unit piece.

6.6 A female nipple in a fixture-type switch shall be provided with a No. 8 – 40 setscrew.

NOTE: The setscrew may be omitted in the nipple of a fixture-type switch if the nipple is of the 1/2 inch or larger pipe size, has a tapered thread, and is intended to be tightened with a wrench.

6.7 A threaded nipple for attachment to rigid metal conduit of the 1/2 inch 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 wiring that enters the switch enclosure from the conduit. Providing a positive end stop and bushing shall not be required for a hole tapped for rigid metal conduit in the wall of an outlet box or equivalent enclosure that is provided with a switch.

6.8 A switch intended to be exposed to a specific environment shall comply with the requirements of UL 50, UL 50E, CSA C22.2. No. 94.1, CSA C22.2. No. 94.2, or NMX-J-235/1-ANCE and NMX-J-235/2-ANCE.

6.9 A through-cord switch shall be provided with two distinct holes to accept and pass through the intended flexible cord. If a through-cord type switch is provided with one hole and provisions such as a knock out, the device is considered to be a pendant switch

6.10 A door switch shall be provided with an outlet box and cover plate. The outlet box and cover plate shall comply with the performance requirements of either UL 514A or NMX-J-023/1-ANCE, or UL 514C, as appropriate, or CSA C22.2 No. 18.1 and CSA C22.2 No. 18.2.

7 Lining

7.1 If a part of the enclosure of a switch is removable for wiring and is wholly or partly of conductive material, the inside surface of all such conductive material shall be lined completely with insulation not less than 0.71 mm (0.028 inch) thick.

NOTE: The lining of a fixture switch may be less than 0.71 mm (0.028 inch) thick but not less than 0.33 mm (0.013 inch) thick.

7.2 An insulating lining shall be secured so that it will remain in place under conditions of intended service, and shall prevent the enclosure from becoming a live part even if a wire inside the switch should become loose or detached from its termination. The lining of the cover of a surface-type switch shall extend beyond the edge of the cover.

7.3 In switches having molded covers protected by a metal armor, the armor may be flush with the cover if the construction of the switch is such that the armor is not likely to make contact with any live parts when the cover is being put in place on the switch.

8 Bushings and Strain Relief

8.1 The cord-inlet hole in a pendant or through-cord switch that has a metal enclosure shall be provided with an insulating bushing or the equivalent. The material of the bushing shall be of porcelain, phenolic, or cold-molded composition, or other insulating material determined to be acceptable for the purpose.

8.2 Hard fiber may be provided as the insulating material if the bushing is not less than 1.19 mm (0.047 inch) thick and if it is formed and secured in place so that it will not be affected by conditions of ordinary moisture.

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

8.4 A pendant or through-cord switch shall have provision for strain relief so that a pull exerted on the flexible cord cannot be transmitted directly to wiring terminals. If space is provided within the switch enclosure for a strain-relief knot, all parts of the enclosure on which the cord can touch shall be smooth and well-insulated.

8.5 A metal cord grip may be provided on a pendant switch intended particularly for use with jacketed flexible cord, such as Type S or SJ, if the diameter of the cord-inlet hole is not less than 7.9 mm (0.31 inch).

9 Bases and Bodies

9.1 General

9.1.1 A base or body in or on which live parts are mounted shall be of insulating material determined to be acceptable for the particular application. See [14.2](#) and [14.3](#).

9.1.2 A hole for the entrance of wire in a base intended for surface mounting shall be as indicated in [Table 9.1](#).

Table 9.1
Holes for Entrance of Wire

Switch rating A	Diameter of smallest hole that may be provided mm (inch)
0 – 15	5.6 (0.219)
16 – 25	6.4 (0.250)
26 – 35	7.1 (0.281)

9.1.3 A sub-base for a surface-type switch for use with open wiring shall be constructed so that it will separate the wires leading to the switch not less than 13 mm (1/2 inch) from the surface wired over. A sub-base shall be of insulating material determined to be acceptable for the purpose.

9.1.4 The body of a switch employing a combination wire binding/pressure-type terminal shall employ integrally formed channels/guides within the body to:

- a) Properly position the individual conductor; and
- b) Provide a means to reduce the likelihood of the conductor(s) being displaced from under the terminal ring when conductor(s) are installed.

Compliance is determined by the Compliance Wire Binding/Pressure-Type Terminal Assembly Test described in Section [51](#).

9.2 Means for mounting

9.2.1 A base intended for surface mounting shall have two or more holes for mounting screws, and a base with an area of more than 0.016 m² (25 inch²) shall have three or more holes for mounting screws. A mounting-screw hole shall be countersunk not less than 3 mm (1/8 inch) in the material of the base; and there shall be a spacing over the surface of insulating material, between the head of the screw or washer, and the nearest uninsulated live part, in accordance with [18.1](#).

9.2.2 A flush switch shall be provided with means for mounting in a standard flush-device box or on a standard outlet-box cover in accordance with Section [20](#), Provisions for Grounding. Flush-type switches rated 347 V shall be provided with means for mounting in a specific-use box having tapped holes, spaced on 89.69 mm (3-17/32 inch) centers, that are intended for the mounting of the switch. The mounting screws for a switch that is intended for mounting in a standard flush-device box shall be No. 6 – 32 and shall be spaced 83.34 mm (3-9/32 inch) apart.

In Mexico, the mounting screws for a switch may be a size other than No. 6 – 32.

9.2.3 A metal yoke, strap, or mounting ears shall not be less than 1.02 mm (0.040 inch) or more than 2.3 mm (0.09 inch) 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 inch) thick steel. The yoke, strap, or mounting ears may be provided with extension plaster ears, which may be scored so that they can be broken off if not needed.

In Mexico, the following applies: A metal yoke, strap, or mounting ears shall provide the mechanical strength to enable it to comply with the specifications and test methods in this Standard. The yoke, strap, or mounting ears may be provided with extension plaster ears, which may be scored so that they can be broken off if not needed.

9.2.4 If a yoke, mounting ears, or strap as described in [9.2.3](#) is made of steel, the corrosion protection for a switch 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 inch) thick in accordance with the method for determining protection against corrosion in UL 514A, or NMX-J-023/1-ANCE, or CSA C22.2 No. 0, or other coatings determined to be acceptable for the particular application.

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

9.2.6 A screw provided for use in mounting the switch to an outlet box or other enclosure shall project not more than 22 mm (7/8 inch) beyond the strap or cover and shall have a flat or blunt end. The end of the screw shall have no burrs, fins, or sharp edges that can damage wiring. This does not preclude thread-cleaning slots or grooves in the end of a screw.

9.2.7 A flush switch that is provided with an adjustable screw, or screws if more than one is provided, or any other adjustment hardware shall not project more than 22.2 mm (7/8 inch) beyond the plane of the mounting yoke where secured to the outlet box. The end of the adjustable hardware shall have a flat or blunt end. If an adjustment screw is provided, it may have thread-cleaning slots or grooves but shall not have any burrs, fins, or other sharp edges that could damage wiring.

9.2.8 The adjustment means of an adjustable flush switch shall not permit installation in an application where the front edge of the installed outlet box, plaster ring, extension ring or outlet box extender is set back from the finished surface (for example, drywall) more than 6.4 mm (1/4 inch). Compliance shall be checked by measurement.

9.3 Sealing

9.3.1 Live screw heads or nuts on the underside of a base intended for surface mounting shall be covered with a waterproof, insulating sealing compound with a softening point of 65 °C (149 °F) or higher. If such parts are spaced not less than 6.4 mm (1/4 inch) through-air from the mounting surface and are staked, upset, or otherwise reliably prevented from loosening, sealing compound need not be provided.

9.3.2 Sulphur shall not be used as a sealing material.

9.3.3 Determination of the softening point of a sealing compound shall be made in accordance with the test method specified in ASTM E28-99.

10 Current-Carrying Parts

10.1 General

10.1.1 Current-carrying parts and wire-binding nuts and screws shall be of metal and shall have the strength, rigidity, and ampacity to comply with the requirements outlined in Section [10](#). A switching contact in a general-use ac switch shall not be of copper, copper alloy, steel, or other material that is likely to corrode in service so as to adversely affect the switch performance, particularly the heating.

NOTE: A corrosion-resistant (stainless) steel alloy may be used for hermetically sealed switching contacts and for other current-carrying parts not subject to arcing.

10.1.2 Current-carrying parts shall not be permitted to be iron or steel, plain or plated.

NOTE 1: Current-carrying parts may be made of sheet steel clad on both surfaces with copper in the thickness ratio of 10 % copper, 80 % steel, and 10 % copper, and with all cut edges coated with zinc, or an equivalent coating if the applicable overload and endurance tests show that the parts are not subject to arcing.

NOTE 2: Steel that is corrosion-resistant (stainless) or steel that is protected against corrosion by zinc plating, or an equivalent coating, may be used for grounding terminals, wire-binding nuts, clamps, and screws.

10.2 Live parts

10.2.1 Uninsulated live parts shall be secured in place so that turning will not adversely affect performance and so that there is no likelihood of a reduction in spacings to values less than the minimum required spacings specified in [Table 18.1](#). Contact jaws shall be prevented from turning or shifting in position by means other than friction between surfaces.

10.2.2 Except for a wiring terminal, an uninsulated live part mounted on insulating material that wiring can touch shall be recessed into the insulating material so that the wiring cannot touch the live part.

10.3 Terminals and leads

10.3.1 Switches shall be provided with wire leads or wiring terminals for the connection of conductors that have an ampacity not less than the maximum current rating of the switch. Wire-binding screws shall be as specified in [10.3.10](#).

10.3.2 The means for connection of conductors shall be one of the following:

- a) Positive binding-screw pressure on a bared conductor plus upturned lugs or the equivalent to retain the wire under the screw head;
- b) Soldering, welding, riveting, or crimping; or
- c) Other means if shown to be acceptable for the purpose by tests to determine the adequacy of the current-carrying ability and mechanical features of the connecting means. See [10.3.3](#).

10.3.3 A push-in (screwless) terminal shall comply with the performance requirements in Push-In Terminal Tests, Section [31](#), and shall be:

- a) For use only with a solid copper conductor;
- b) For a current-carrying connection only, not for grounding; and
- c) Marked as indicated in [58.2](#).

10.3.4 Push-in terminals intended for use on branch circuit wiring shall be designed so that they will permit the use of a solid 14 AWG (2.1 mm²) conductor but will reject a 12 AWG (3.3 mm²) or larger solid conductor. The opening provided for the conductor shall reject a No. 48 drill rod, 1.981 ±0.0076 mm (0.076 ±0.0003 inch) in diameter. The rod shall be applied with 22 N (5 lbf). Openings, other than those intended for wire termination, such as wire release openings, shall not permit electrical contact to be made with a 14 AWG (2.1 mm²) conductor.

10.3.5 A switch employing "push-in" terminations may be provided with a means to release the conductors. Where an opening in the insulating body is provided for such purpose behind the plane of the mounting means, it shall not permit entry of a 14 AWG (2.1 mm²) solid conductor. The wire release means, if provided, shall be subject to the Push-In Terminal Tests, Section [31](#).

10.3.6 A release mechanism shall be located or guarded so that it cannot be unintentionally actuated during installation. The release mechanism may be guarded by recessing, ribs, barriers, or the like.

10.3.7 Switches having terminals of a set screw type shall meet the performance requirements for copper conductors AWG sizes 14, 12, and 10 (2.1 mm², 3.3 mm², and 5.3 mm²) as specified in UL 486E or CSA C22.2 No. 65.

10.3.8 Switches employing a combination wire binding/pressure-type terminal shall be limited to 10, 12 or 14 AWG conductors. The terminals shall comply with the applicable performance requirements as specified in UL 486E. See also [1.11](#) for terminals intended for use with aluminum conductors.

10.3.9 Terminals of switches rated 20 amperes or less and also identified for connection to copper-clad aluminum conductor shall be capable of being assembled to 12 AWG (3.3 mm²) solid conductor for switches rated 15 amperes and 10 AWG (5.3 mm²) solid conductor for switches rated 20 amperes. Compliance shall be checked by Terminal Strength Test, Section [55](#) for switches employing:

- a) Wire-binding screws alone or in combination with push-in terminals.
- b) Pressure-wire terminals only;
- c) Wire-binding screws in combination with pressure-wire terminals.

For switches employing set screw type terminals see [10.3.7](#).

10.3.10 The minimum sizes of wire-binding screws used in making electrical connections shall conform to [Table 10.1](#).

Table 10.1
Minimum Sizes of Wire Binding Screws

Rating of switch A	Minimum size of screw	Minimum head diameter	Maximum number of threads per inch
20 or less	No. 6	0.275 inch	36
20 or less	M3.5	7.0 mm	—
30	No. 8	0.315 inch	32
30	M4	8.0 mm	—

10.3.11 A terminal plate for a soldering lug or pressure wire connector shall not be less than 0.76 mm (0.030 inch) thick, and the tapped hole shall not have less than two full threads in the metal for a terminal screw.

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

10.3.13 In a terminal plate formed from stock which has the minimum required thickness, as given in [10.3.11](#) and [10.3.12](#), the metal may be extruded at the tapped hole for the binding screw to provide two full threads.

10.3.14 With reference to the requirements in [10.3.11](#) and [10.3.12](#), metal not less than 1.52 mm (0.060 inch) thick may be used for a tapped hole for a screw having 32 threads per inch.

10.3.15 A wire-binding screw shall thread into metal.

10.3.16 Switches intended for mounting in outlet boxes shall have their terminals located or protected so that they will not be pressed, in normal assembly, against the wiring in the box when the switches are installed.

10.3.17 Exposed-back wiring terminals shall not be used on a general-use switch intended for installation in a flush-device box, but may be used on a switch intended specifically for mounting in a box that is to be supported by rigid metal conduit, or on a surface-type switch mounted in or on (integral with) an outlet-box cover.

10.3.18 Copper or copper alloy terminal parts that come into contact with branch-circuit conductors, other than the grounding conductor, shall not have a coating of zinc or cadmium.

10.3.19 Wire leads provided on a switch shall be insulated conductors of a type suitable for the purpose and not less than 100 mm (4 inch) in length. The ampacity of the leads shall be not less than the maximum current rating of the switch. If provided, a grounding conductor may be a bare solid copper wire, or if insulated, the insulation shall be green with or without one or more yellow stripes. The length of a grounding lead shall not be less than 152 mm (6 inches).

NOTE: The length of the leads is not specified for a fixture switch intended to be incorporated in a wiring harness provided the harness and fixture switch are assembled at the same factory.

10.3.20 A switch employing a separable terminal assembly shall have solid or stranded copper conductors 12 AWG (3.3 mm²) or larger.

10.3.21 A modular switch assembly with a special-purpose connector type may be rated either 15 or 20 A only and shall have solid or stranded 14 AWG (2.1 mm²) copper conductors for 15 A, or 12 AWG (3.3 mm²) for 20 A. The special-purpose connector shall be keyed to prevent interchangeability of differently rated devices.

10.3.22 A modular switch assembly with a back plate connector type shall be rated 15 A only. The back plate shall have solid or stranded 14 AWG (2.1 mm²) copper conductors or larger or provided with field wiring terminals.

10.3.23 The wire leads of a general-use switch shall be made of copper and not be smaller in size than indicated in [Table 10.2](#).

NOTE: Leads provided for external connection of a pilot light or other signal or sensing circuits in a switch may be 18 AWG (0.82 mm²) or larger, regardless of the switch rating.

Table 10.2
Minimum Sizes of Switch Leads

Current rating of switch A	Copper supply leads AWG	Copper grounding leads AWG
0 – 6	18	18
6.1 – 10	16	16
10.1 – 15	14	14
15.1 – 20	12	12
20.1 – 30	10	10
30.1 – 40	8	10
40.1 – 50	6	10
50.1 – 60	4	10

10.3.24 Pressure cable connectors included in the package of an individually packaged general-use snap switch employing wire leads shall be rated for the intended wire connections of the switch as identified by the switch manufacturer and rated for the size(s) and the number of wires expected to be joined. Switches shall comply with [62.8](#).

10.3.25 In a general-use switch rated less than 30 A and having provision for the connection of two or more conductors of the circuit (including an identified (grounded) conductor), one set of wiring terminals or leads shall be identified for the identified (grounded) conductor, unless the electrical connection between a pair of terminals intended to be connected to the identified (grounded) conductor is clearly evident, or unless (as in the case of a straight 2-pole switch) it does not make any difference to which set of terminals the identified (grounded) conductor is connected.

10.3.26 If identification of wiring terminals is necessary, a terminal for the connection of an identified (grounded) conductor shall be identified by one of the following means:

- a) Being covered with a white metallic coating;
- b) Being made of metal substantially white in color; or
- c) Having the word "white" or "W" marked on or directly adjacently to the terminal.

In Mexico, "B" may be used as an acceptable marking.

Other terminals shall be readily distinguishable. See also [10.3.28](#).

10.3.27 The white-colored head of a wire-binding screw that is not readily removable from its terminal plate, and that does not appear to relate to other parts, may serve as the terminal identification specified in [10.3.26](#).

10.3.28 If the terminal that is plated white to comply with [10.3.26](#) is not visible, the wire-entrance hole for connection to that terminal shall be marked with the word "white" or the letter "W", or colored white directly adjacent to the hole.

In Mexico, "B" may be used as an acceptable marking.

10.3.29 The identification of leads shall be in accordance with [Table 10.3](#).

Table 10.3
Polarity Identification of Leads

Identification obtained by	Acceptable combinations ^a	
	Identified (Grounded) conductor (unswitched leads)	All other conductors (switched leads)
Color of braid ^b	Solid white or gray (without tracer) Color other than white, gray, or green, with tracer in braid	White or gray with tracer in braid Solid color other than white, gray, or green (without tracer)
Color of insulation ^b	Solid white or gray, stripe, white or gray, on contrasting color other than green	Solid color other than white, gray, or green
Color of separator ^b	Solid white or gray	Solid color other than white, gray, or green
Conductor tinning ^c	Tin or other acceptable metal on all strands of the conductor	No tin or other white metal on the strands of the conductor
^a A bare solid copper wire, or green wire, with or without one or more yellow stripes, shall be used only as an equipment grounding conductor. ^b If color of braid, insulation, or separator is used for identification, all conductors shall either be tinned or not tinned. ^c If conductor tinning is used for identification, all braids and/or insulation shall have the same color and shape.		

11 Separable Jumper Connector for Separable Terminals

11.1 A separable jumper connector shall consist of permanently attached shorted pins or tabs located within the insulated enclosure to simulate an installed switch. It shall be reliably keyed by a physical or mechanical means to maintain correct polarity consistent with the intended use.

11.2 A separable jumper connector shall not provide any means of connecting the grounding conductor.

12 Separable Terminal Assembly

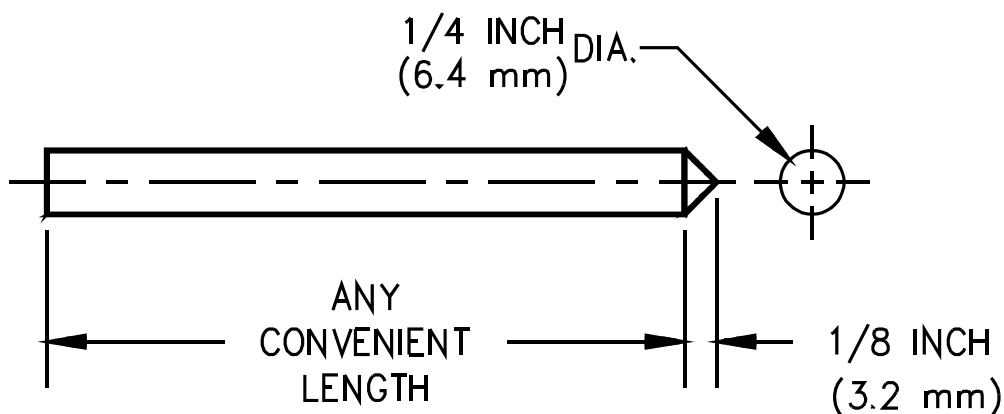
12.1 A separable terminal assembly shall consist of permanently attached pins or tabs located on the switch body and shall be capable of receiving a special purpose connector with leads for connection to the branch circuit.

12.2 A separable terminal assembly shall:

- a) Be provided with a mechanical means such as a lock, latch or similar means which prohibits unintentional separation when in the mated condition, and shall comply with the Latching Mechanism Test described in Section [45](#);
- b) Be reliably keyed by a physical or mechanical means to maintain correct polarity consistent with the intended use. The terminals shall be marked identifying the terminals for connection of the ungrounded circuit conductor, the grounded circuit conductor, and the grounding conductor. Color-coding of integral wire leads is an acceptable means of terminal identification; and
- c) Be constructed such that the grounding terminal makes first and breaks last when connecting and disconnecting the terminal assembly.

12.3 When disconnected, the contacts of the special purpose connector shall not be accessible to contact by the probe in [Figure 12.1](#).

Figure 12.1
Accessibility Probe



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13 Spring Action Clamp Terminals

13.1 In addition to the requirements contained in this Standard, a switch employing a spring action clamp terminal shall also comply with the applicable requirements, as specified in UL 486E. All tests shall be investigated with minimum and maximum conductor AWG size and for each type of conductor (solid and stranded), for each device construction.

13.2 A switch employing spring action clamp terminals are intended for either stranded or solid or both, and type of conductor as specified by the manufacturer.

13.3 A switch employing spring action clamp terminals are intended for the connection of a single conductor only.

13.4 A switch that is provided with spring action clamp terminal shall be provided with a positive means to prevent unintentional separation of the conductor from the terminal and shall comply with the Spring Action Clamp Terminal Pull Test described in Section [41](#).

14 Insulating Material

14.1 Insulating materials shall be judged with reference to the particular form, size, and purpose of the parts for which they are used, the manner of their assembly, and their location and security in the switch.

14.2 Insulating material in contact with current-carrying members shall be recognized as suitable for the particular application, and may include certain ceramic, thermoset, thermoplastic, and elastomeric materials.

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

14.4 A switch intended for use in a flush-device box or on an outlet-box cover shall employ insulating materials described in [14.5](#) that have been investigated and determined to have a comparative tracking index of at least 175 V in accordance with the method for determining the comparative tracking index of solid insulating material under moist conditions, in UL 746A (Performance Level Category of 3 or better), CSA C22.2 No. 0.17, or NMX-J-574-ANCE, with the test solution A.

14.5 The insulating materials referred to in [14.4](#) are those used for the sole support of live parts, maintenance of electrical spacings, or the prevention of arcing between live parts.

14.6 In Canada, insulating materials in contact with current-carrying members of switches shall have a flammability classification of V-2 or better in accordance with CSA C22.2 No. 0.17, in a thickness of 1.6 mm or in the minimum thickness in contact with that current-carrying member, whichever thickness is greater.

14.7 In Canada, as an alternative to the requirement of [14.6](#), a thermosetting material, such as phenolic, melamine, or urea may be used as an insulating material in contact with current-carrying members of switches provided that material has the following characteristics:

- a) The flammability classification is HB or better in accordance with CSA C22.2 No. 0.17; and
- b) The relative thermal index, mechanical without impact, is a minimum of 100 °C (212 °F) in accordance with CSA C22.2 No. 0.17.

15 Actuating Members

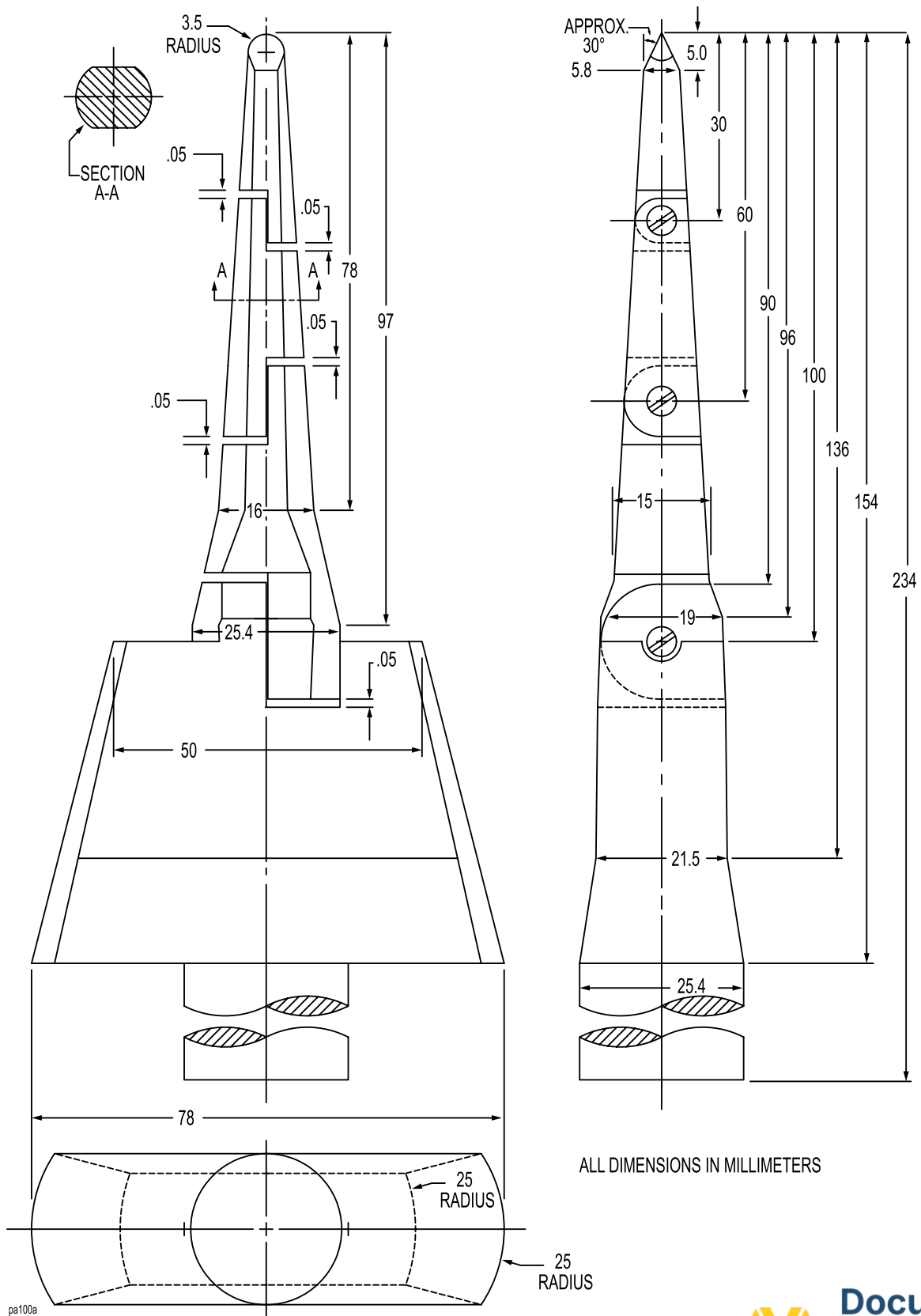
15.1 Actuating members may be made of insulating material. If of metal, they shall be either insulated from current-carrying parts or covered, where otherwise exposed to personal contact, with suitable insulating material. See also [14.2](#) with regard to type of insulation required.

15.2 An actuating member of other than thermoset insulating material shall comply with Section [32](#).

16 Field Replacement Actuator

16.1 A flush switch provided with a field replacement actuator shall not permit contact to be made between the articulated probe shown in [Figure 16.1](#) and any live part when the actuator is removed. Compliance is checked by inspection and if necessary, the field replacement actuator test, Section [53](#).

Figure 16.1
Articulated Probe With Web Stop



17 Magnetic Assisted Switch Actuator

17.1 A switch toggle or rocker actuator provided with permanent magnet shall comply with all of the following:

- a) The mounting yoke shall be designed to prevent flush mounting in a multi-gang outlet box. Only intended for single gang outlet box installation. See [57.17](#) for installation details.
- b) Permanent magnets are only intended to provide physical magnetic attraction and/or repulsion of toggle or rocker switch actuator. Permanent magnets shall not be located in cavity where switching contacts operate.
- c) The permanent magnet shall be protected against corrosion with one of the following:
 - 1) A zinc coating having an average thickness not less than 0.013 mm (0.0005 inch) and a minimum thickness of not less than 0.0102 mm (0.0004 inch); or
 - 2) A nickel coating having a thickness not less than 0.0038 mm (0.00015 inch); or
 - 3) A tin over nickel coating having an overall thickness of not less than 0.0038 mm (0.00015 inch).
- d) There shall be no magnetic field greater than 5 Gauss (G) (0.5mT) when measured with a suitable indicator such as a gauss meter when from a distance of 50.8 mm (2 inch) and beyond the external surface of the switch actuator. Compliance is checked by Magnetic field strength test, Section, [54](#).

18 Creepage Distances, Clearances, and Distances Through Sealing Compounds

18.1 Creepage distances, clearances, and distances through sealing compounds shall not be less than the values shown in [Table 18.1](#).

Table 18.1
Creepage Distances, Clearances, and Distances Through Sealing Compounds

Description	mm	(inch)
Creepage distances and clearances		
Between non-arcing live parts, with the exception of terminals, of different polarity		
Between non-arcing live parts, with the exception of terminals, and identified (grounded) material		
Between non-arcing live parts, with the exception of terminals, and accessible dead metal parts, with the exception of a recessed screw head, rivet, or the like (see Section 18)		
Between terminals of different polarity		
Between terminals and identified (grounded) metal parts, or dead metal parts likely to be identified (grounded)		
Between terminals and accessible dead metal parts, with the exception of a recessed screw head, rivet, or the like (see Section 18)		
ac/dc switches rated 250 V or less	1.2	(3/64)
ac/dc switches rated greater than 250 V to 600 V	3.2	(1/8)
ac-only switches rated 300 V ac or less	1.2	(3/64)

Table 18.1 Continued on Next Page

Table 18.1 Continued

Description	mm	(inch)
ac-only switches rated greater than 300 V ac	3.2	(1/8)
self-contained switches	1.6	(1/16)
Clearances		
Between non-arcing live parts and metal flush-device cover plates		
ac/dc switches	3.2	(1/8)
ac-only switches rated 300 V ac or less	3.2	(1/8)
ac-only switches rated greater than 300 V ac	6.4	(1/4)
Self contained switches		
Between non-arcing live parts and the surface on which the base of a surface switch mounts	3.2	(1/8)
Distances through insulating sealing compound		
Between non-arcing live parts covered with at least 1.6 mm (1/16 inch) of sealing compound and the surface on which the base of a surface switch mounts	3.0	(0.118)

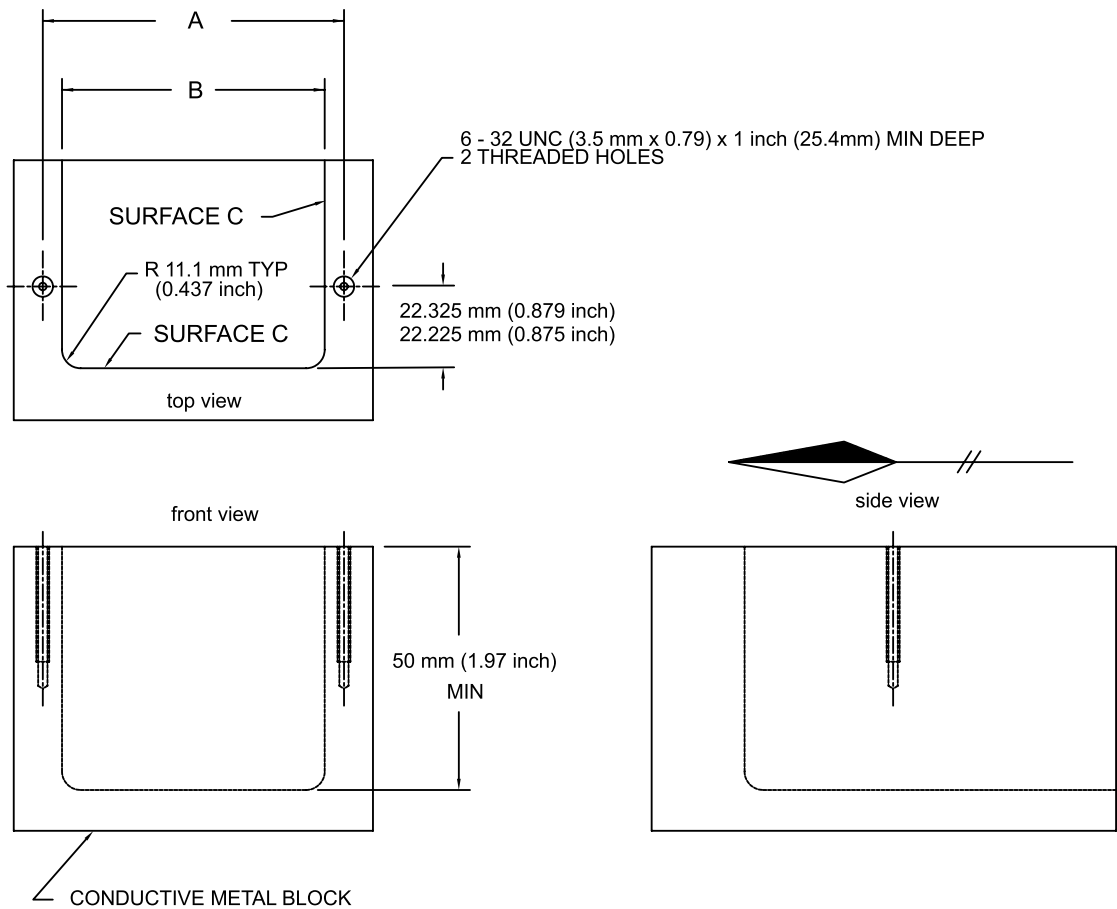
18.2 For a flush switch, a barrier boss, shoulder, recessing, or similar means may be employed to provide the minimum creepage distances and clearances between any uninsulated live part and the wall of a flush-device box in which the switch may be mounted.

18.3 Compliance shall be checked by measurement.

18.4 A flush switch without integral wire leads shall be wired with the following solid copper wires connected to each terminal: 14, 12, and 10 AWG (2.1 mm², 3.3 mm², and 5.3 mm²) sizes for switches having 15 ampere (or less), 20 ampere, and 30 ampere ratings, respectively.

18.5 A flush switch shall be mounted in a metal gauge that simulates a flush-device box, as shown in [Figure 18.1](#).

Figure 18.1
Test Fixture for Flush Device Clearance to Flush-Device Box



s5037c

Dimensions	Flush devices			
	All except 347 V ac switches		347 V ac switches	
	mm	(inch)	mm	(inch)
A	83.44 mm	(3.285) max	89.80 mm	(3.535) max
	83.24 mm	(3.277) min	89.60 mm	(3.528) min
B	71.625 mm	(2.820) max	85.10 mm	(3.350) max
	71.425 mm	(2.812) min	84.90 mm	(3.342) min

NOTES When determining the clearance of live parts of the device to Surface C:

- (a) thread the device's mounting screws through the slot in the device's mounting yoke into the holes in the metal block. Do not tighten the device to the block;
- (b) position the device shown by the arrow until the slot in the device's mounting yoke contacts the mounting screw;
- (c) perform the continuity test, and;
- (d) if the device is asymmetrical, repeat steps (a) – (c) with the device reoriented 180° within its proper mounting.

18.6 External switch clearances to the box gauge's walls shall be checked with the switch mounted in any position permitted by the mounting screws and holes.

18.7 A dead metal screw head, rivet, or the like shall not be considered exposed to contact by persons after the switch is installed in the intended manner, if the dead metal is located in a hole not more than 7.1 mm (9/32 inch) in diameter and recessed not less than 4.8 mm (3/16 inch) in the clear.

18.8 In measuring a creepage distance or clearance, an isolated dead metal part interposed between uninsulated live parts of different polarity, or between an uninsulated live part and an identified (grounded) or exposed dead metal part, reduces the creepage distance or clearance by an amount equal to the dimension of the isolated dead metal part in the direction of the measurement.

18.9 In measuring a creepage distance or clearance between non-arcing live parts of different polarity in a pilot or locator switch, the wire lead separation of a current-limited lamp-and-resistor assembly at points on the same side of the current-limiting resistor shall not be considered as reducing the creepage distance or clearance.

18.10 An indicating device, such as an ohmmeter, a battery-and-buzzer combination, or the like, shall be used to determine that continuity between the switch terminal(s) and the gauge does not exist with the switch mounted in any position permitted.

19 Assembly

19.1 General

19.1.1 A switch shall be capable of being readily wired as intended.

19.1.2 Sealing, staking, or an equivalent means shall be employed so that screws upon which the general assembly of a switch depends cannot loosen or back out.

19.1.3 An assembly screw that must be loosened or removed in order to wire or install a switch shall be capable of being tightened with a torque of 0.68 N-m (6 lbf-in), without impairing the serviceability of the assembly means.

19.2 AC/DC fixture switch

19.2.1 The chain of an ac/dc fixture switch having a pull-type mechanism shall not become energized external to the enclosure, the external non-current-carrying parts of the fixture switch shall not become live, nor shall the chain cause the mechanism to jam when the chain is suddenly and completely released after having been pulled to the full "on" position and the full "off" position.

19.2.2 An AC/DC fixture switch having pull-type switch mechanisms shall have the operating means in the form of:

- a) A cord made of suitable insulating material;
- b) A chain with a link of suitable insulating material, connected to the metal chain as close as possible to where the chain emerges from the enclosure and that complies with the dielectric and mechanical strength test in [33.2.3](#) and [33.2.4](#); or
- c) A metal chain without an external insulating link, provided that the complete assembly complies with the dielectric voltage-withstand test outlined in Section [29](#).

19.3 Insulating links

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

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

19.4 Pendant and through-cord switch

19.4.1 A pendant or through-cord switch provided with pin terminals shall be capable of being assembled to the flexible cord types for which it is intended to be used. The switch shall physically exclude flexible cord types for which it is not intended. A switch intended for use with any group of flexible cords similar in appearance shall be capable of use with all such types unless the cords are distinguishable by marking or are physically excluded by the switch construction. See [57.9](#).

19.5 Door switch

19.5.1 A special switch box used to house a door switch shall have a volume sufficient to accommodate the electrical installation of the switch into the box. See [38.1](#).

20 Provision for Grounding

20.1 A flush-type switch intended for mounting in a flush-device box shall be constructed so that a metal flush plate will be bonded to a grounded outlet box when installed in the intended manner.

In Mexico, this requirement does not apply for a switch intended to be installed with a non-metallic yoke in which the mounted metal flush plate is not in contact with live parts.

20.2 A flush-type switch that is provided with either a grounding terminal or lead shall comply with the requirements described in [10.3.1](#), [10.3.2](#), and [10.3.10 – 10.3.24](#). The construction shall also conductively connect a metal flush device cover plate to the grounding terminal or lead. See [57.14](#) for marking requirements.

20.3 Insulating material provided to separate the switch arcing chamber from the metal mounting yoke or metal flush plate shall be permanently secured to the flush switch. The flush plate mounting screws, when in place, shall not touch any part of the switch that is live. Switch assembly parts, such as assembly screws or flush plate screws, if of conductive material, shall not enter the switch arcing chamber or protrude into the outlet box, beyond the back of the switch.

20.4 If a device is provided with a grounding terminal, it shall be identified by one of the means identified in [Table 20.1](#).

20.5 A part relied upon to provide the terminal identification required in [Table 20.1](#) shall not be readily removable. A suitably staked terminal screw shall be considered to comply with this requirement.

20.6 The minimum size and the maximum number of threads per inch of a wire-binding screw shall comply with [Table 10.1](#).

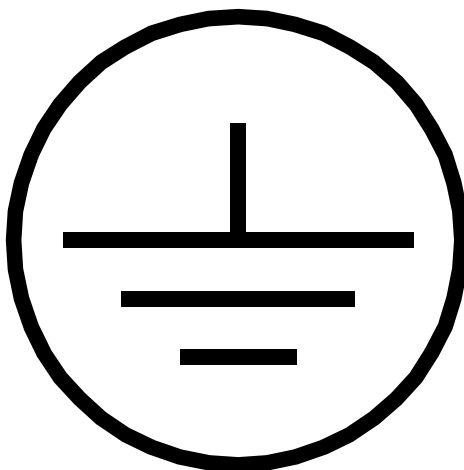
20.7 If the device is provided with a grounding lead, it shall be made of copper and not be smaller in size than indicated in [Table 10.2](#).

20.8 A flush-type switch that is provided with a grounding terminal shall only accept a single grounding conductor and shall not serve as a connection point for two separate conductors.

Table 20.1
Identification of the Grounding Terminal

Identification by	Grounding terminal	All other terminals
Wire-binding screw	Hexagonal, green-colored nut ^a or slotted screw head ^a	Other than white or green circular screw head
Pressure wire terminal visible	Green-colored connector, screw, or appendage ^a	Other than white- or green-colored connector
Pressure wire terminal concealed	Distinct green-colored area adjacent to wire entrance hole or the word "green" or "ground", the letters "G" or "GR" ^b or the grounding symbol distinctively marked adjacent to wire entrance hole ^d	Other than white or green area adjacent to wire entrance hole
Terminal plate	In Mexico, the use of a grounding symbol is not required.	Other than white or green metal or plating
Insulating enclosure or terminal	The word "green" or "ground", the letters "G" or "GR" or the grounding symbol marked on or directly adjacent to terminal ^d or Green-colored terminal In Mexico, the use of a grounding symbol is not required.	Other than white- or green-colored terminal
Color of braid ^c	Solid color green (without tracer)	Solid color other than white, gray, or green (without tracer)
Color of insulation ^c	A bare solid copper wire, or green wire with or without one or more yellow stripes	Solid color other than white, gray, or green
Color of separator ^c	Solid color green	Solid color other than white, gray, or green
^a The screw should not be readily removable; see 20.5 . ^b In letters minimum 1.6 mm (1/16 inch) high. ^c If color of braid, insulation, or separator is used for identification, all conductors shall be either tinned or not tinned. ^d See Figure 20.1 for the grounding symbol, which shall be permitted with or without the circle.		

Figure 20.1
Grounding Symbol



PERFORMANCE

21 General

21.1 A switch shall be investigated by subjecting it to the tests described in [22.1](#) – [22.13](#). Unless otherwise specified, one set of 6 devices shall be used during this test program.

21.2 A switch that has a horsepower rating or ratings in addition to a current rating shall be subjected to overload tests for both horsepower and current ratings, unless it is obvious that one would represent the other. If both overload tests are conducted, each test for a horsepower rating shall be conducted on a separate set of 6 devices.

21.3 A switch employing a separable terminal assembly shall also comply with the performance requirements in Sections [39](#) – [48](#).

21.4 A separable jumper connector for a switch employing a separable terminal assembly shall comply with the performance requirements in [22.13](#).

22 Test Sequence

22.1 The test sequence for a switch shall be as listed in [22.2](#) – [22.13](#).

22.2 AC/DC door switch testing

	Reference
a) Overload	26.1 , 26.2
b) Endurance No. 1 (inductive)	27.1 , 27.2
c) Endurance No. 2 (tungsten)	27.3
d) Temperature	28.1
e) Dielectric	29.1
f) Security of leads	Section 30
g) Pull-out/push-in terminals	31.1 , 31.2
h) Temperature/push-in terminals	31.3 – 31.8
i) Resistance to heat (70 °C)	Section 37
j) Effect of heat on actuating members	Section 32
k) Door Switch Assembly	Section 38

22.3 AC-only door switch testing

	Reference
a) Overload	26.8 – 26.12
b) Endurance (inductive)	27.7
c) Endurance (tungsten)	27.8
d) Endurance (electronic ballast)	52.1
e) Temperature	28.1
f) Dielectric	29.1