



*C22.2 No. 55-M1986*  
*(Reaffirmed 1999)*  
***Special Use Switches***

*Wiring Products*

*Forming Part of*  
*Canadian Electrical Code,*  
*Part II*  
*Safety Standards for*  
*Electrical Equipment*

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# **Update No. 3**

## **C22.2 No. 55-M1986**

### **July 2001**

**Note:** General Instructions for CSA Standards are now called Updates. Please contact CSA Information Products Sales or visit [www.csa.ca](http://www.csa.ca) for information about the **CSA Standards Update Service**.

**Title:** *Special Use Switches* — originally published August 1996

**Revisions issued:** General Instruction No. 2 — January 1992  
If you are missing any General Instruction or Update, please contact CSA Information Products Sales or visit [www.csa.ca](http://www.csa.ca).

The following revisions have been formally approved and are marked by the symbol delta ( $\Delta$ ) in the margin on the attached replacement pages:

<b>Revised</b>	
<b>New</b>	Clause 1.2(c)
<b>Deleted</b>	

CSA Standard C22.2 No. 55-M1986 originally consisted of **28 pages**, each dated **August 1998**. It now consists of the following pages:

<b>August 1986</b>	3–8 and 13–28
<b>January 1992</b>	11 and 12
<b>June 2001</b>	9 and 10

- Update your copy by inserting these revised pages.
- Keep the pages you remove for reference.

# C22.2 No. 55-M1986

## Special Use Switches

### 1. Scope

#### 1.1

This Standard applies to manually operated and mechanically operated special use switches that are

- (a) for use on dc, ac/dc, or ac only ;and
- (b) rated at not more than
  - (i) 60 A at 250 V or less; or
  - (ii) 30 A or 2 hp at 600 V or less.

#### 1.2

This Standard does not apply to

- (a) switches forming parts either of electrothermal appliances or automatic temperature-responsive switches;
- (b) switching mechanisms built into lampholders covered in CSA Standard C22.2 No. 43;
- Δ (c) general use switches, pendant and through-cord type switches with one “on” and one “off” position, door switches and fixture switches, covered in CSA Standard C22.2 No. 111;
- (d) solid-state single-phase motor speed controls covered in CSA Standard C22.2 No. 156;
- (e) dimmers covered in CSA Standard C22.2 No. 184;
- (f) clock-operated switches covered in CSA Standard C22.2 No. 177;
- (g) switches for use in hazardous locations.

### 2. Definitions

#### 2.1

The following definitions apply in this Standard:

**Actuating member** means that part which is pulled, pushed, or turned in operating the switch mechanism.

**Base** means that part on or in which are fastened the frame and the operating parts of the switch mechanism.

**General use switch** means a switch intended for use in general distribution and branch circuits. It is rated in amperes and is capable of interrupting its rated current at rated voltage.

**Lining** means insulating material covering the interior surface of the metal cover of a switch to prevent electrical contact between bare live parts and the cover.

**Special use switch** means a switch intended specifically for use as part of some device or appliance or for some extraordinary application, and constructed so that it cannot be readily installed in a device box or on an outlet-box cover.

**Note:** *Switches for installation in vacuum cleaner handles, radio or television receivers, and through-cord or pendant type switches are examples of special use switches.*

**Television switch** means a switch intended for use as a supply-circuit control switch in a radio or television receiver or other audio or video equipment.

### 3. General Requirements

#### 3.1

General requirements applicable to this Standard are given in CSA Standard C22.2 No.0.

#### 3.2 Reference Publications

##### 3.2.1

Where reference is made to CSA Standards of the Canadian Electrical Code, Parts I and II, such reference shall be considered to refer to the latest editions and amendments thereto. This Standard refers to the following such Standards and the year dates shown indicate the latest editions available at the time of printing:

##### CSA Standards

C22.1-1986,  
Canadian Electrical Code, Part I;  
C22.2 No. 0-M1982,  
General Requirements—Canadian Electrical Code, Part II;  
C22.2 No. 0.6-M1982,  
Flammability Testing of Polymeric Materials;  
C22.2 No. 21-M1984,  
Cord Sets and Power Supply Cords;  
C22.2 No. 43-M1984,  
Lampholders;

C22.2 No. 94-1976,  
 Special Purpose Enclosures 2, 3, 4 and 5;  
 C22.2 No. 111-M1986,  
 General Use Switches;  
 C22.2 No. 156-M\*,  
 Solid-State Single-Phase Motor Speed Controls;  
 C22.2 No. 177-1981,  
 Clock-Operated Switches;  
 C22.2 No. 184-M1986,  
 Dimmers.

*\*Under preparation.*

### 3.2.2

Where reference is made to the following Publications not under the jurisdiction of the Standards Steering Committee on CE Code, Part II, such reference shall be considered to refer to that edition listed below:

#### CSA Standard

B35.2-1963 (R1969),  
 Binding Head Screws;

#### CGSB\* Standard

CGSB 67-GP-7M, 1978,  
 Cotton, Absorbent, Sterile and Nonsterile;

#### ASTM Standards

D495-1973 (Reapproved 1979),  
 High-Voltage, Low-Current, Dry Arc Resistance of  
 Solid Electrical Insulation.

*\*Canadian General Standards Board.*

## 4. Construction

### 4.1 General

Component parts of switches shall be of types specifically approved for the use intended, or shall be approved as an integral part of, and with, the device.

### 4.2 Insulating Materials—Television Switches

#### 4.2.1

Insulating materials used as part of the switch enclosure or for a part that is in, or projects into, an opening in the switch enclosure shall have a flammability classification of at least 0.6 V-O in accordance with CSA Standard C22.2 No. 0.6.

#### 4.2.2

Except as permitted by Clause 4.2.4, insulating material as described in Clause 4.2.1 on which

contacts are mounted directly shall be capable of meeting the arc-tracking requirement of Clause 6.15.

#### 4.2.3

Insulating materials used within the enclosure of a switch shall have a flammability classification of at least 0.6 HB in accordance with CSA Standard C22.2 No. 0.6.

#### 4.2.4

An actuator made of an insulating material need not comply with the requirement of Clause 4.2.2 if

- the area occupied by the actuator, where it passes through the plane of the enclosure, plus the area of all other openings in the enclosure does not exceed 32 mm<sup>2</sup>; and
- the actuator complies with the requirement of Clause 4.2.1.

## 4.3 Enclosures

### 4.3.1

Switches shall be provided with complete enclosures that house all live parts, except that switches 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.

### 4.3.2

Enclosures of switches (such as the cover of a surface type switch or the shell of a luminaire or pendant type switch), if of metal, shall be not less than 0.33 mm thick unless adequately reinforced, and metal having a greater thickness shall be employed in order to secure adequate strength and rigidity if the rating of the switch is greater than 5 A at 250 V or 10 A at 125 V, or if the size or shape, or both, of the enclosure necessitate such increased thickness.

### 4.3.3

A switch intended to be exposed to a specific environment shall comply with the requirements of Clause 6.14.

### 4.3.4

For a television switch the total portion of all openings in a switch enclosure shall not exceed 32 mm<sup>2</sup> in area. Parts of the switch mechanism that are not in the plane of the openings shall be disregarded in making this measurement.

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# General Instruction No. 2 C22.2 No. 55-M1986 January 1992

CSA Standard C22.2 No. 55-M1986, *Special Use Switches*, was published in August 1986; it consisted of **28 pages**, each dated **August 1986**.

An amendment to Clause 4.10.2 and the addition of Clause 4.10.5 have been approved and are incorporated (and identified by a vertical line in the margin) in the attached replacement pages.

CSA Standard C22.2 No. 55-M1986 now consists of the following pages:

**3-10** and **13-28** dated **August 1986**; and

**11** and **12** dated **January 1992**.

These replacement pages are to be inserted into your copy of the Standard; the pages replaced should be kept for reference.

## 4.4 Nipples

### 4.4.1

Nipples (male or female) through which wires may pass shall have not fewer than five clean-cut full threads of standard pitch as indicated in Table 1. The wireway provided by the nipple shall be free from burrs, fins, sharp edges, and the like that may damage wiring.

### 4.4.2

Nipples that are not integral to the bodies of switches shall be so secured as to prevent turning relative to the enclosure, and so as to provide mechanical strength at least equal to that of one that is integral.

### 4.4.3

Female nipples shall be provided with No. 8-40 set screws. The set screw may be omitted if the nipple is of trade size 1/2 or larger, has a tapered thread, and is intended to be tightened with a wrench or is provided with an alternative locking means.

### 4.4.4

Switches intended for attachment to rigid conduit trade size 1/2 or larger shall be provided with a positive end-stop for the conduit and with a bushing or an equivalent smooth, well-rounded surface to prevent abrasion of the insulation on conductors entering the switch enclosure from the conduit.

## 4.5 Linings

### 4.5.1

If the enclosure is either wholly or partly of metal, provision shall be made to prevent the enclosure from becoming live should the conductors inside the enclosure become loosened or detached from their positions under the terminal screws.

### 4.5.2

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

## 4.6 Bushings and Strain Reliefs for Through-Cord and Pendent Type Switches

### 4.6.1

The diameter of cord inlet holes in switches shall be not less than the following:

- (a) for unreinforced flexible cord: 7.1 mm;

- (b) for either reinforced or jacketed flexible cord: 10.3 mm.

If openings are of an oval shape, they shall be large enough to accommodate flexible cord of at least No. 18 AWG Type SPT-2.

### 4.6.2

Cord inlet holes in switches having metal enclosures shall be smooth (eg, metal grommets may be used). If the bushing is of insulating material, it shall consist of porcelain, phenolic composition, or some equivalent, except that hard fibre may be used if the bushing is

- (a) not less than 1.2 mm thick; and
- (b) formed and secured so that it will not be adversely affected by moisture as encountered in normal use.

### 4.6.3

Threaded insulating bushings shall not be used in threaded nipples to form switches if the pipe size of the nipple is smaller than trade size 1/4.

### 4.6.4

Strain relief shall be provided in switches so that mechanical strain on the flexible cord will not be transmitted directly to the point of connection of the wiring terminals. If a knot is used, the surface against which it may bear or with which it may come into contact shall be of insulating material and free from projections, sharp edges, etc.

**Note:** *Metal cord-grips may be provided as part of switches designed particularly for use with a jacketed type of flexible cord such as Type SJ or S if the diameter of the inlet holes is not less than 7.9 mm.*

### 4.6.5

Switches of other than the heating-pad type shall be provided with strain relief that will comply with the requirements of Clause 6.13.

## 4.7 Bases and Bodies

Bases or bodies on which live parts are mounted shall be of suitable moisture absorption-resistant insulating material having a flammability classification of 0.6 HB or better in accordance with CSA Standard C22.2 No. 0.6.

## 4.8 Protection (Mounting)

The yoke, strap, or mounting ears, if of steel, shall be suitably treated to prevent rusting in accordance with CSA Standard C22.2 No. 0.

## 4.9 Sealing

### 4.9.1

Live parts on the underside of bases designed for surface mounting shall be recessed not less than 3 mm below the surface of the base. They shall be covered with a waterproof, insulating sealing compound that will not melt or flow at a temperature lower than 65°C, unless such parts have a spacing through air from the mounting surface of not less than 6 mm and are staked, upset, or otherwise reliably prevented from loosening.

### 4.9.2

The depth or thickness of sealing compound over a nut or screw head shall be not less than 1.5 mm, but if the underside of the base is not recessed or if it is in contact with the surface upon which the switch is mounted, the depth or thickness of the sealing compound shall be not less than 3 mm.

## 4.10 Current-Carrying Parts

### 4.10.1

Current-carrying parts and wire-binding nuts and screws shall be of metal and shall have the necessary strength, rigidity, and current-carrying capacity to comply with the test requirements.

### 4.10.2\*

Except as specified in Clause 4.10.5, current-carrying parts shall be of copper or copper alloy.

*\*Effective Date — January 31, 1993*

### 4.10.3

Switches shall be judged in connection with their application, ie, the wiring method used in installation. Improper routing of wires, which might result in leads coming into contact with uninsulated current-carrying parts, shall be avoided.

**Note:** *Current-carrying parts, which may be in contact with flexible cords, need not be recessed.*

### 4.10.4

Soldered connections shall be such that good electrical contact will always be maintained; there will be no subsequent reduction of spacings between live and non-current-carrying metal parts of switches; and mechanical security will be ensured.

### 4.10.5\*

Except for quick-connect terminations, push-in terminals, solder-type terminals, and parts subject to arcing, current-carrying parts made of stainless steel shall be permitted.

**Note:** *Evidence of arcing can be determined during the applicable tests described in Clauses 6.2 and 6.3.*

*\*Effective Date — January 31, 1993*

## 4.11 Terminal Parts and Leads

### 4.11.1

Switches shall be provided with wire leads, terminals, or other suitable means for the connection of conductors.

### 4.11.2

Terminal screws used in making electrical connections shall conform to Table 2.

### 4.11.3

Switches having terminals of a special type, such as the set screw or spring lock type, shall be the subject of investigation.

### 4.11.4

Wiring terminal screws shall thread into metal, or the connection shall be subject to investigation.

### 4.11.5

Wire leads provided on a switch shall be of a size, type, or length that is suitable for the intended end use.

### 4.11.6

For switches intended for mounting in luminaire canopies, leads shall be not smaller than No. 18 AWG.

### 4.11.7

Switches rated at less than 30 A, and intended for connection to two or more conductors of a circuit or to a grounded conductor, shall have one set of terminals properly identified; unless it is clearly evident that the electrical connections should be between a pair of terminals intended to be connected to the grounded conductor; or unless (as in the case of a straight 2-pole switch) it makes no difference to which set of terminals the grounded conductor is connected.

### 4.11.8

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.

## 4.12 Air Gaps and Creepage Distances

### 4.12.1

Except for television switches and for switches that withstand the dielectric strength test in Clause 6.5.4, air gaps and creepage distances between non-arcing, insulated parts of opposite polarity, and



# General Instruction No. 1

C22.2 No. 55-M1986

August 1986

CSA Standard C22.2 No. 55-M1986, Special Use Switches, consists of **28** pages, each dated **August 1986**.

This Standard, like all CSA Standards, is subject to periodic review, and amendments in the form of replacement pages may be issued from time to time; such pages will be mailed automatically to those purchasers who complete and return the attached card.\* Some Standards require frequent revision between editions, whereas others require none at all. It is planned to issue new editions of the Standard, regardless of the amount of revision, at intervals not greater than 5 years. Except in unusual circumstances, replacement pages will not be issued during the last year of that edition.

*\*This card will appear with General Instruction No. 1 only.*

Although any replacement pages that have been issued will be sold with the Standard, it is for the purchaser to insert them where they apply. The responsibility for ensuring that his or her copy is complete rests with the holder of the Standard, who should, for the sake of reference, retain those pages which have been replaced.

**Note:** A General Instruction sheet will accompany replacement pages each time they are issued and will list the latest date of each page of the Standard.

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**G.F. Ground** Canadian Standards Association,  
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*Standards  
Administrator*

*The following also made valuable contribution to the development of this Standard:*

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# Preface

This is the third edition of No. 55 of a series of Standards issued by the Canadian Standards Association under Part II of the Canadian Electrical Code. It is written in SI (metric) units and supersedes previous editions published in 1942 and 1957.

This edition incorporates published amendments 1, 2, and 3 and the applicable requirements of the following bulletins:

Bulletin No.	Date	Subject of Bulletin
850	November 11, 1971	Strain Relief Test on Through-Cord Switches
966	August 21, 1974	Limitation of Use of Iron or Steel Terminal Screws for Wiring Devices (Receptacles and Switches)
1027A	November 20, 1975	Banning of Zinc Plating on Current Carrying Terminal Parts of Receptacles, Switches, and Lampholders
1059	June 4, 1976	Clarification and Revision of Requirements for Snap Switches Covering Length and Type of Leads, Provision for Bonding Metal Flush Plates and Weatherproofness, Temperature and Crushing Tests
1059A	July 21, 1978	Clarification and Revision of Requirements for Snap Switches Covering Length and Type of Leads and Crushing Test
1059B	January 7, 1981	Clarification and Amendment of Requirements for Snap Switches

Requirements for television switches have been included in the Standard. A flammability classification has been defined for insulating materials. The reference to "snap switch" has been deleted, as this is an obsolete term.

For general information on the Standards of the Canadian Electrical Code, Part II, see the preface of CSA Standard C22.2 No. 0, General Requirements—Canadian Electrical Code, Part II.

This Standard was prepared by a Subcommittee of the Technical Committee on Wiring Products under the jurisdiction of the Standards Steering Committee on CE Code, Part II, and was formally approved by the Technical Committee.

August 1986

**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 user of the Standard to judge its suitability for his or her particular purpose.

CSA Standards are subject to periodic review and suggestions for their improvement will be referred to the appropriate committee. All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, Standards Division, 178 Rexdale Boulevard, Rexdale (Toronto), Ontario M9W 1R3. Requests for interpretation should

- (a) define the problem, making reference to a specific Clause, and, where appropriate, include an illustrative sketch;
- (b) provide an explanation of circumstances surrounding the actual field condition; and
- (c) be phrased, where possible, to permit a specific "yes" or "no" answer.

Interpretations are published in "CSA Information Update". For subscription details and a free sample copy, write to CSA Marketing or telephone (416) 747-2292.

Special Use Switches  
August 1986

# Foreword

Canadian Standards Association provides certification services for manufacturers who, under license from CSA, wish to use the appropriate registered CSA Marks on certain products of their manufacture to indicate conformity with CSA Standards.

CSA Certification for a number of products is provided in the interest of maintaining agreed-upon standards of quality, performance, interchangeability and/or safety, as appropriate. Where applicable, certification may form the basis for acceptance by inspection authorities responsible for enforcement of regulations. Where feasible, programs will be developed for additional products for which certification is desired by producers, consumers or other interests.

In performing its functions in accordance with its objectives, CSA does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of the Association represent its professional judgement given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed.

Products in substantial accord with this Standard but which exhibit a minor difference or a new feature may be deemed to meet the Standard providing the feature or difference is found acceptable utilizing appropriate CSA Certification Division Operating Procedures. Products which comply with this Standard shall not be certified if they are found to have additional features which are inconsistent with the intent of this Standard. Products shall not be certifiable if they are discovered to contravene applicable Federal laws or regulations.

Testing techniques, test procedures and instrumentation frequently must be prescribed by the CSA Certification Division in addition to the technical requirements contained in Standards of CSA. In addition to markings specified in the Standard the CSA Certification and Testing Division may require special cautions, markings and instructions that are not specified by the Standard.

Some tests required by CSA Standards may be inherently hazardous. The Association neither assumes nor accepts any responsibility for any injury or damage that may occur during or as the result of tests, wherever performed, whether performed in whole or in part by the manufacturer or the Association, and whether or not any equipment, facility or personnel for or in connection with the test is furnished by the manufacturer or the Association.

Manufacturers should note that, in the event of the failure of the CSA Certification and Testing Division to resolve an issue arising from the interpretation of requirements, there is an appeal procedure: the complainant should submit the matter, in writing, to the Secretary of the Canadian Standards Association.

If this Standard is to be used in obtaining CSA Certification please remember, when making application for certification, to request all current Amendments, Bulletins, Notices and Technical Information Letters that may be applicable and for which there may be a nominal charge. For such information or for further information concerning details about CSA Certification please address your inquiry to the Applications and Records Section, Canadian Standards Association, 178 Rexdale Boulevard, Rexdale (Toronto), Ontario M9W 1R3.

**Publication Date**—August 31, 1986

(ie, the date on or after which this Standard may, at the discretion of the applicant, be used for certification).

**Effective Date**—August 31, 1986\*

\*(ie, the date on which this Standard shall be applicable to equipment being submitted for certification and to equipment already certified and manufactured on or after that date).

*\*Unless otherwise noted in the text or General Instruction.*



# C22.2 No. 55-M1986

## Special Use Switches

### 1. Scope

#### 1.1

This Standard applies to manually operated and mechanically operated special use switches that are

- (a) for use on dc, ac/dc, or ac only; and
- (b) rated at not more than
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This Standard does not apply to

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- (f) clock-operated switches covered in CSA Standard C22.2 No. 177;
- (g) switches for use in hazardous locations.

### 2. Definitions

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The following definitions apply in this Standard:

**Actuating member** means that part which is pulled, pushed, or turned in operating the switch mechanism.

**Base** means that part on or in which are fastened the frame and the operating parts of the switch mechanism.

**General use switch** means a switch intended for use in general distribution and branch circuits. It is rated in amperes and is capable of interrupting its rated current at rated voltage.

**Lining** means insulating material covering the interior surface of the metal cover of a switch to prevent electrical contact between bare live parts and the cover.

Special Use Switches  
August 1986

**Special use switch** means a switch intended specifically for use as part of some device or appliance or for some extraordinary application, and constructed so that it cannot be readily installed in a device box or on an outlet-box cover.

**Note:** *Switches for installation in vacuum cleaner handles, radio or television receivers, and through-cord or pendant type switches are examples of special use switches.*

**Television switch** means a switch intended for use as a supply-circuit control switch in a radio or television receiver or other audio or video equipment.

### 3. General Requirements

#### 3.1

General requirements applicable to this Standard are given in CSA Standard C22.2 No.0.

#### 3.2 Reference Publications

##### 3.2.1

Where reference is made to CSA Standards of the Canadian Electrical Code, Parts I and II, such reference shall be considered to refer to the latest editions and amendments thereto. This Standard refers to the following such Standards and the year dates shown indicate the latest editions available at the time of printing:

##### CSA Standards

C22.1-1986,  
Canadian Electrical Code, Part I;  
C22.2 No. 0-M1982,  
General Requirements—Canadian Electrical Code, Part II;  
C22.2 No. 0.6-M1982,  
Flammability Testing of Polymeric Materials;  
C22.2 No. 21-M1984,  
Cord Sets and Power Supply Cords;  
C22.2 No. 43-M1984,  
Lampholders;

C22.2 No. 94-1976,  
Special Purpose Enclosures 2, 3, 4 and 5;  
C22.2 No. 111-M1986,  
General Use Switches;  
C22.2 No. 156-M\*,  
Solid-State Single-Phase Motor Speed Controls;  
C22.2 No. 177-1981,  
Clock-Operated Switches;  
C22.2 No. 184-M1986,  
Dimmers.

\*Under preparation.

### 3.2.2

Where reference is made to the following Publications not under the jurisdiction of the Standards Steering Committee on CE Code, Part II, such reference shall be considered to refer to that edition listed below:

#### CSA Standard

B35.2-1963 (R1969),  
Binding Head Screws;

#### CGSB\* Standard

CGSB 67-GP-7M, 1978,  
Cotton, Absorbent, Sterile and Nonsterile;

#### ASTM Standards

D495-1973 (Reapproved 1979),  
High-Voltage, Low-Current, Dry Arc Resistance of  
Solid Electrical Insulation.

\*Canadian General Standards Board.

## 4. Construction

### 4.1 General

Component parts of switches shall be of types specifically approved for the use intended, or shall be approved as an integral part of, and with, the device.

### 4.2 Insulating Materials—Television Switches

#### 4.2.1

Insulating materials used as part of the switch enclosure or for a part that is in, or projects into, an opening in the switch enclosure shall have a flammability classification of at least 0.6 V-O in accordance with CSA Standard C22.2 No. 0.6.

#### 4.2.2

Except as permitted by Clause 4.2.4, insulating material as described in Clause 4.2.1 on which

contacts are mounted directly shall be capable of meeting the arc-tracking requirement of Clause 6.15.

#### 4.2.3

Insulating materials used within the enclosure of a switch shall have a flammability classification of at least 0.6 HB in accordance with CSA Standard C22.2 No. 0.6.

#### 4.2.4

An actuator made of an insulating material need not comply with the requirement of Clause 4.2.2 if

(a) the area occupied by the actuator, where it passes through the plane of the enclosure, plus the area of all other openings in the enclosure does not exceed 32 mm<sup>2</sup>; and

(b) the actuator complies with the requirement of Clause 4.2.1.

## 4.3 Enclosures

### 4.3.1

Switches shall be provided with complete enclosures that house all live parts, except that switches 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.

### 4.3.2

Enclosures of switches (such as the cover of a surface type switch or the shell of a luminaire or pendent type switch), if of metal, shall be not less than 0.33 mm thick unless adequately reinforced, and metal having a greater thickness shall be employed in order to secure adequate strength and rigidity if the rating of the switch is greater than 5 A at 250 V or 10 A at 125 V, or if the size or shape, or both, of the enclosure necessitate such increased thickness.

### 4.3.3

A switch intended to be exposed to a specific environment shall comply with the requirements of Clause 6.14.

### 4.3.4

For a television switch the total portion of all openings in a switch enclosure shall not exceed 32 mm<sup>2</sup> in area. Parts of the switch mechanism that are not in the plane of the openings shall be disregarded in making this measurement.

## 4.4 Nipples

### 4.4.1

Nipples (male or female) through which wires may pass shall have not fewer than five clean-cut full threads of standard pitch as indicated in Table 1. The wireway provided by the nipple shall be free from burrs, fins, sharp edges, and the like that may damage wiring.

### 4.4.2

Nipples that are not integral to the bodies of switches shall be so secured as to prevent turning relative to the enclosure, and so as to provide mechanical strength at least equal to that of one that is integral.

### 4.4.3

Female nipples shall be provided with No. 8-40 set screws. The set screw may be omitted if the nipple is of trade size 1/2 or larger, has a tapered thread, and is intended to be tightened with a wrench or is provided with an alternative locking means.

### 4.4.4

Switches intended for attachment to rigid conduit trade size 1/2 or larger shall be provided with a positive end-stop for the conduit and with a bushing or an equivalent smooth, well-rounded surface to prevent abrasion of the insulation on conductors entering the switch enclosure from the conduit.

## 4.5 Linings

### 4.5.1

If the enclosure is either wholly or partly of metal, provision shall be made to prevent the enclosure from becoming live should the conductors inside the enclosure become loosened or detached from their positions under the terminal screws.

### 4.5.2

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

## 4.6 Bushings and Strain Reliefs for Through-Cord and Pendent Type Switches

### 4.6.1

The diameter of cord inlet holes in switches shall be not less than the following:

- (a) for unreinforced flexible cord: 7.1 mm;

- (b) for either reinforced or jacketed flexible cord: 10.3 mm.

If openings are of an oval shape, they shall be large enough to accommodate flexible cord of at least No. 18 AWG Type SPT-2.

### 4.6.2

Cord inlet holes in switches having metal enclosures shall be smooth (eg, metal grommets may be used). If the bushing is of insulating material, it shall consist of porcelain, phenolic composition, or some equivalent, except that hard fibre may be used if the bushing is

- (a) not less than 1.2 mm thick; and
- (b) formed and secured so that it will not be adversely affected by moisture as encountered in normal use.

### 4.6.3

Threaded insulating bushings shall not be used in threaded nipples to form switches if the pipe size of the nipple is smaller than trade size 1/4.

### 4.6.4

Strain relief shall be provided in switches so that mechanical strain on the flexible cord will not be transmitted directly to the point of connection of the wiring terminals. If a knot is used, the surface against which it may bear or with which it may come into contact shall be of insulating material and free from projections, sharp edges, etc.

**Note:** *Metal cord-grips may be provided as part of switches designed particularly for use with a jacketed type of flexible cord such as Type SJ or S if the diameter of the inlet holes is not less than 7.9 mm.*

### 4.6.5

Switches of other than the heating-pad type shall be provided with strain relief that will comply with the requirements of Clause 6.13.

## 4.7 Bases and Bodies

Bases or bodies on which live parts are mounted shall be of suitable moisture absorption-resistant insulating material having a flammability classification of 0.6 HB or better in accordance with CSA Standard C22.2 No. 0.6.

## 4.8 Protection (Mounting)

The yoke, strap, or mounting ears, if of steel, shall be suitably treated to prevent rusting in accordance with CSA Standard C22.2 No. 0.

## 4.9 Sealing

### 4.9.1

Live parts on the underside of bases designed for surface mounting shall be recessed not less than 3 mm below the surface of the base. They shall be covered with a waterproof, insulating sealing compound that will not melt or flow at a temperature lower than 65°C, unless such parts have a spacing through air from the mounting surface of not less than 6 mm and are staked, upset, or otherwise reliably prevented from loosening.

### 4.9.2

The depth or thickness of sealing compound over a nut or screw head shall be not less than 1.5 mm, but if the underside of the base is not recessed or if it is in contact with the surface upon which the **switch** is mounted, the depth or thickness of the sealing compound shall be not less than 3 mm.

## 4.10 Current-Carrying Parts

### 4.10.1

Current-carrying parts and wire-binding nuts and screws shall be of metal and shall have the necessary strength, rigidity, and current-carrying capacity to comply with the test requirements.

### 4.10.2

With the exception of grounding terminals, iron or steel (plain or plated) shall not be used for parts that are intended to carry a significant portion of the current.

**Note:** *Wire-binding screws are considered to carry a significant portion of the current.*

### 4.10.3

Switches shall be judged in connection with their application, ie, the wiring method used in installation. Improper routing of wires, which might result in leads coming into contact with uninsulated current-carrying parts, shall be avoided.

**Note:** *Current-carrying parts, which may be in contact with flexible cords, need not be recessed.*

### 4.10.4

Soldered connections shall be such that good electrical contact will always be maintained; there will be no subsequent reduction of spacings between live and non-current-carrying metal parts of switches; and mechanical security will be ensured.

## 4.11 Terminal Parts and Leads

### 4.11.1

Switches shall be provided with wire leads, terminals, or other suitable means for the connection of conductors.

### 4.11.2

Terminal screws used in making electrical connections shall conform to Table 2.

### 4.11.3

Switches having terminals of a special type, such as the set screw or spring lock type, shall be the subject of investigation.

### 4.11.4

Wiring terminal screws shall thread into metal, or the connection shall be subject to investigation.

### 4.11.5

Wire leads provided on a switch shall be of a size, type, or length that is suitable for the intended end use.

### 4.11.6

For switches intended for mounting in luminaire canopies, leads shall be not smaller than No. 18 AWG.

### 4.11.7

Switches rated at less than 30 A, and intended for connection to two or more conductors of a circuit or to a grounded conductor, shall have one set of terminals properly identified; unless it is clearly evident that the electrical connections should be between a pair of terminals intended to be connected to the grounded conductor; or unless (as in the case of a straight 2-pole switch) it makes no difference to which set of terminals the grounded conductor is connected.

### 4.11.8

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.

## 4.12 Air Gaps and Creepage Distances

### 4.12.1

Except for television switches and for switches that withstand the dielectric strength test in Clause 6.5.4, air gaps and creepage distances between non-arcing, insulated parts of opposite polarity, and

between non-arcing, uninsulated current-carrying parts and parts (other than metal enclosures) that may be grounded when a switch is installed, shall be not less than the following:

- (a) for switches rated 0—250 V: 1.2 mm;
- (b) for switches rated 251—600 V: 3.2 mm.

#### 4.12.2

If a television switch includes one or more poles with no TV rating in the same enclosure as a TV-rated pole or poles, the through-air and over-surface spacings between arcing, bare live parts of the TV-rated poles and the non-TV-rated poles shall be not less than 1.6 mm (see also Clause 6.1.4).

### 4.13 Actuating Members

#### 4.13.1

Actuating members may be made of insulating material, but 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 Clause 4.7 with regard to the type of insulation required.

#### 4.13.2

An actuating member of other than thermoset insulating material shall comply with Clause 6.12.

### 4.14 Assembly

#### 4.14.1

Switches shall be capable of being readily wired as intended.

#### 4.14.2

Screws upon which the general assembly of switches depends shall be prevented from loosening or backing out during operation.

#### 4.14.3

Screws used in the assembly of switches shall thread into metal if they must be either loosened or removed in order that the switches may be installed or connected in a circuit. Other methods, if used, shall be the subject of investigation.

#### 4.14.4

Chains used on switches having a mechanism of the pull type shall neither become live nor cause the mechanism to jam when suddenly and completely released after having been pulled to the full ON or full OFF position.

### 4.15 Ratings

#### 4.15.1

Except for television switches, switches shall be rated in volts. In addition, a switch shall be rated in amperes or horsepower, or both. If ampere ratings are given at two voltages, the switch shall have both ratings and shall be capable of performing successfully at both ratings in accordance with the requirements. If only one ampere rating is given, the switch shall have only that rating.

#### 4.15.2

Television switches shall be rated for their steady-state current at 120 V ac, according to Table 7.

#### 4.15.3

The tungsten ("T" and "L") ratings of switches shall be limited to a 125 V maximum rating.

#### 4.15.4

The rating of switches (not more than 2 hp) may be determined from the results of test performance at one or more of the rated voltages.

## 5. Marking

### 5.1 General

#### 5.1.1

Switches shall be permanently and legibly marked with the following:

- (a) name, tradename, registered trademark, or other recognized symbol of identification of the manufacturer;
- (b) the electrical rating, including a horsepower value for switches that have been assigned a horsepower rating;
- (c) where practicable, the catalogue number or some suitable equivalent.

#### 5.1.2

Where additional instructions are necessary, they shall be provided with the switch.

### 5.2 Switch for the Control of Tungsten-Filament Lamps

#### 5.2.1

Switches intended for the control of tungsten-filament lamps on dc as well as ac shall be marked with the letter "T", located to indicate that it applies only to the rating at 125 V.

**5.2.2**

Switches intended for control of tungsten-filament lamps on ac only shall be marked with the letter “L”, located to indicate that it applies to the rating for 120 or 125 V ac.

**5.3**

Switches intended for use only on ac shall be marked “ac”; “~”, or the equivalent.

**5.4 Television Switch****5.4.1**

The following markings shall be shown on the switch:

- (a) the letters “TV”, followed by
- (b) a number designating the steady-state current.

**5.4.2**

The voltage rating, ie, 120 V ac, may be shown in addition to the markings of Clause 5.4.1.

**5.4.3**

If only one rating is marked on a multi-pole switch, the rating shall apply to all poles.

**5.4.4**

If two or more ratings are marked on a multi-pole switch, each pole shall be marked with either its rating or an identification mark that refers to the rating shown elsewhere on the switch.

**6. Tests****6.1 General**

**Note:** *Guidance for the minimum quantities of specimens to be used for the tests and the sequence in which the tests are to be performed are provided in Tables A1 and A2.*

**6.1.1**

Except for television switches, compliance with the requirements for overload, endurance, temperature, and dielectric strength shall be determined by subjecting a switch to the tests specified, in the order named, except as permitted by Clause 6.4.5. During or at the conclusion of the testing there shall be no electrical or mechanical failure.

**6.1.2**

For television switches, compliance with the requirements for overload, endurance, temperature, dielectric strength, endurance (continued), and dielectric strength (repeated) shall be determined by subjecting a specimen of a television switch to

the tests specified in the order named, except as permitted by Clause 6.4.5. During or at the conclusion of the testing there shall be no warping, cracking, or blistering of the enclosure and there shall be no electrical or mechanical failure of the switch. Discolouration of the enclosure shall not be considered a failure.

**6.1.3**

A television switch with more than one TV-rated pole shall be capable of meeting the requirements with each pole controlling a separate load, with opposite polarity between poles.

**6.1.4**

Television switches that include one or more non-TV-rated poles in the same enclosure as the TV-rated poles shall be capable of meeting these requirements with the non-TV-rated pole adjacent to the TV-rated pole connected in the circuit through a 1000  $\Omega$  series resistance, the adjacent poles being at opposite polarity.

This requirement pertains to arc-tracking between TV-rated and non-TV-rated poles, and is not a load requirement on the non-TV-rated pole.

**6.1.5**

For television switches, ac currents of the values specified in Table 7 and a tungsten filament lamp load shall be used for the overload and endurance tests. The tungsten filament lamp load and the supply circuit need only be sufficient to provide the test currents specified in Table 7 for the particular switch rating.

**6.1.6**

When a switch is tested on ac, its rated frequency, if any, shall be used. If no frequency is indicated on the switch, the test shall be made at 60 Hz or less, with the agreement of those concerned.

**6.1.7**

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

**Note:** *Under this Clause, the usual factory lubrication of factory-assembled switches is permitted before they are submitted to the Certification Agency.*

**6.1.8**

Of the number of specimens of any type of 3-way switch subjected to the following tests, one-half of the number of specimens shall be tested with the

right-hand contacts making and breaking the required test current. The other half shall be tested with the left-hand contacts making and breaking the required test current.

## 6.2 Overload

### 6.2.1 Ampere Rated

#### 6.2.1.1

A switch rated in amperes shall be capable of performing successfully when operated under the overload conditions described in Clauses 6.2.1.2 to 6.2.1.8.

#### 6.2.1.2

A switch shall be operated manually or mechanically by means of its actuating member for 50 cycles at the rate of 6—10 cycles/min, making and breaking the required test current, except that the rate of speed of operation may be greater than 10 cycles/min with the agreement of those concerned. If the rated current of the switch is 10 A or less, regardless of what the rated voltage may be, the test current shall be 150% of the rated current; and if the rated current is more than 10 A, the test current shall be 125% of the rated current.

#### 6.2.1.3

A switch shall be mounted and wired so that actual service conditions will be represented, and shall be connected to a suitable load and to a supply circuit the voltage of which is rated voltage ( $\pm 5\%$ ) of the switch. The characteristics of the test circuit shall be such that the voltage across the load will have the required value when the switch under test is closed on the circuit with the required overload test-current flowing.

**Note:** *It is impracticable to describe the details of connections that must be made in order to obtain operating conditions identical with those of actual service because of the different arrangements of terminals of switches of various makes. In any case, however, the connections to a switch in the test circuit should be such that the load controlled will have the same position, relative to the switch and the supply, that it will have in actual service; except that both 2-circuit and 3-circuit switches may be tested as single-pole devices.*

#### 6.2.1.4

A switch shall be tested with dc and with a non-inductive load, except that a switch constructed and marked for use only on ac circuits shall be tested with ac with an inductive load. The power factor of the inductive load shall be from 0.75 to 0.80, except

that a lower power factor may be used with the agreement of those concerned. Resistance and reactance components of the load shall not be connected in parallel; except that an air core reactor in any phase may be shunted by a resistor, the loss in which is approximately 1% of the total power loss in that phase.

**Note:** *If a switch has a double rating (such as 10 A—250 V, 20 A—125 V) an overload test at the higher voltage will ordinarily be sufficient, but it may also be tested at the lower voltage.*

#### 6.2.1.5

A switch shall be tested with exposed non-current-carrying metal parts (which may be grounded under conditions of actual service) connected through a 15 A fuse to ground, or to the grounded conductor of the test circuit, or to a conductor of the circuit having a voltage of not less than 125 V from at least one other conductor of the circuit; and the connection of the switch in the test circuit shall be such that the exposed non-current-carrying metal parts will be positive with respect to the nearest arcing point of the mechanism.

#### 6.2.1.6

With reference to Clause 6.2.1.5, the neutral or grounded conductor of a 125/250-V test circuit shall not be derived from a 2-wire, 250 V circuit by tapping off at the midpoint of resistors in series across the circuit.

#### 6.2.1.7

A switch shall be connected in the test circuit between the mains and the load, because in this position a short circuit condition in the switch will develop its full effect on the switch mechanism as it would in service.

#### 6.2.1.8

Two-circuit, 3-circuit, 3-pole, series-parallel, or other types of switches in which there are two or more ON and OFF positions of the switch mechanism shall be tested in the position requiring the making and breaking of the maximum current.

## 6.2.2 Horsepower Rated

### 6.2.2.1

A switch rated in horsepower and intended for use only on dc circuits shall be capable of withstanding an overload test with a dc noninductive load such that the switch will make and break a current equal to ten times the full-load current of a motor having the horsepower rating in question.

Compliance of a switch with the foregoing requirement shall be determined under the test conditions described in Clauses 6.2.1.2 to 6.2.1.8.

#### 6.2.2.2

A switch rated in horsepower and intended for use only on ac circuits shall be capable of withstanding an overload test with an ac inductive load such that the switch will make and break a current equal to six times the full-load current of a motor having the horsepower rating in question, and having a power factor of 0.40—0.50 unless the manufacturer prefers that a lower power factor be used.

Compliance of a switch with the foregoing requirements shall be determined under the test conditions described in Clauses 6.2.1.2 and 6.2.1.3 and 6.2.1.5 to 6.2.1.8 inclusive.

#### 6.2.2.3

A switch rated in horsepower and intended for use on ac as well as dc circuits shall be capable of withstanding both ac and dc tests in accordance with Clauses 6.2.2.1 and 6.2.2.2, different specimens being used for each test.

**Note:** *If a switch has the same horsepower rating at more than one voltage, a test at the highest voltage may be considered to be representative of tests at the lower voltages.*

#### 6.2.2.4

The appropriate value of overload test currents for switches rated in horsepower may be obtained from Table 3, 4, or 5, as applicable.

### 6.2.3 Television Switch

A television switch shall be capable of successfully making and breaking the overload current, as specified in Table 7, for 50 cycles.

Compliance of a switch with this requirement shall be determined under the test condition described in Clause 6.2.1.2.

## 6.3 Endurance

### 6.3.1 Ampere Rated

#### 6.3.1.1

A switch rated in amperes shall be capable of withstanding an endurance test under the conditions described in Clauses 6.3.1.2 to 6.3.1.4, as applicable.

#### 6.3.1.2

A switch shall be operated by means of its actuating members, either manually or by a suitable machine, for 6000 cycles at the rate of 6 to 10 cycles/min, making and breaking the rated current, except that a faster rate (but not exceeding 20 cycles/min) may be used with the agreement of those concerned. Where the rate of operation specified introduces a condition that would not occur in normal use, the switch may be operated at a reduced rate.

#### 6.3.1.3

A switch shall be mounted and wired so that actual service conditions will be represented, and shall be connected, as described in Clauses 6.3.1.2 to 6.3.1.4, as applicable, to a suitable load and to a supply circuit the voltage of which is rated voltage ( $\pm 5\%$ ) of the switch. The characteristics of the test circuit shall be such that the voltage across the load will have the required value when the switch under test is closed on the circuit with the required test current flowing.

#### 6.3.1.4

A switch shall be tested with a dc noninductive load, except that a switch constructed and marked for use only on ac circuits shall be tested with an ac inductive load. The power factor of the inductive load shall be from 0.75 to 0.80, except that a lower power factor may be used with the agreement of those concerned. Resistance and reactance components of the load shall not be connected in parallel, except that an air core reactor in any phase may be shunted by a resistor, the loss in which is approximately 1% of the total power loss in that phase.

### 6.3.2 Horsepower Rated

#### 6.3.2.1

Except as permitted by Clause 6.3.2.2, a switch rated in horsepower shall be tested under the conditions specified in Clauses 6.3.1.2 to 6.3.1.4, and the endurance test current shall be the appropriate value of full-load current specified in Table 3, 4, or 5, as applicable.

#### 6.3.2.2

The horsepower endurance test need not be performed if the switch is also rated in amperes equal to or greater than the horsepower full-load amperes as specified in Table 3, 4, or 5, as applicable.



### 6.3.3 "T" Rated (AC or DC)

#### 6.3.3.1

A switch intended for the control of tungsten-filament lamps shall be operated for 6000 cycles, in addition to the endurance test required by Clauses 6.3.1.1 to 6.3.1.4 inclusive, making and breaking a dc circuit with a load of tungsten-filament lamps or a load having equivalent current characteristics, and so adjusted that the normal current flow is the rated current of the switch. The open circuit voltage of the test circuit shall be  $125 \pm 5$  V, and the closed circuit voltage at the load with normal current flowing shall be  $\pm 5\%$  of the open circuit voltage. For switches having an additional rating less than 50 V, a further test on a second set of specimens shall be conducted for 6000 cycles with the open circuit voltage equal to the rated voltage ( $\pm 5\%$ ), and the load voltage with normal current shall be  $\pm 8\%$  of the open circuit voltage.

#### 6.3.3.2

For the testing of a switch with tungsten-filament lamps or with a load having equivalent current characteristics, the test circuit, including the generator or other source of supply, shall have sufficient ampere capacity to furnish a current inrush through the switch and load of not less than 8 times the rated current of the switch, when the circuit is closed, and the circuit shall be such that the peak value of the inrush current will be reached within  $1/240$  s after the circuit is closed. For a switch having an additional rating less than 50 V, the inrush current shall be not less than three times the rated current.

#### 6.3.3.3

The suitability of a test circuit, including the generator or other source of supply, for testing with tungsten-filament lamps or a load having equivalent current characteristics shall be determined by means of oscillograph studies. The current-inrush factor of 8 mentioned in Clause 6.3.3.2 shall be based on a normal current flow of 20 A, and testing equipment that has adequate capacity at this rating (20 A) will be acceptable for testing switches rated at more than 20 A. The characteristics of the test circuit shall be judged from a number of oscillograms (12 or more), and testing equipment will be acceptable if not fewer than one-half of the oscillograms show a current-inrush factor of 8 or more. With reference to a 60 Hz timing wave, the peak values of the inrush currents as shown by the

oscillograms are to be attained within  $1/4$  cycle. For a switch having an additional rating less than 50 V, a current inrush factor of 3 or more shall be shown.

#### 6.3.3.4

If tungsten-filament lamps are used as a load for a switch designed for use with such lamps, the load shall be made up of the smallest possible number of lamps having standard ratings of not more than 500 W (or if it is desirable to reduce still further the number of lamps in the test load, a 1000 W lamp may, for example, be substituted for two 500 W lamps), and the operating cycle shall be such that the lamps are OFF for at least 55 s of each cycle. If a switch is operated at the rate of 10 cycles/min, at least ten banks of lamps controlled by a commutator will be necessary for each switch under test. The load may consist of noninductive resistors if these are connected and controlled so that a portion of the resistance is shunted during the closing of the switch under test, or if a portion of the load is cut out during the opening of the switch; or the load may consist of a noninductive resistor or resistors and a capacitor, in parallel. If a synthetic load (a timed-circuit-breaker resistance load or a capacitor resistance load) is used in lieu of tungsten-filament lamps, it shall be calibrated against, and be the equivalent of, a tungsten-lamp load on the test circuit in question. The calibration of a synthetic load shall be checked from time to time by suitable means in order to ensure that none of the constants of either the circuit or the load change with time or use.

### 6.3.4 "L" Rated (AC)

A switch with an "L" rating shall be tested as in Clauses 6.3.3.1 to 6.3.3.4, except that the test shall be conducted with an ac supply.

### 6.3.5 Television Switch

A television switch shall be capable of successfully making and breaking the endurance test current specified in Table 7 when tested in accordance with the test conditions specified in Clause 6.3.1.2, except that the number of cycles shall be 10 000.

## 6.4 Temperature

### 6.4.1

The temperature of a switch shall be measured on the wiring terminals or on the wire leads in the case of switches provided with wire leads. Except for television switches (see Clause 6.4.8), the temperature rise on the wiring terminals or on the wire

leads used instead of wiring terminals shall be not more than 30°C while a switch is continuously carrying the maximum rated current. The current for the temperature test of a switch rated only in horsepower shall be the same as that specified for the endurance test.

#### 6.4.2

The temperature test described in Clause 6.4.1 may be conducted at any ambient temperature within the range of 10 to 40°C.

#### 6.4.3

During the temperature test, the switch shall be on a flat, horizontal, nonconductive surface. Switches that are intended to be mounted immediately adjacent to each other shall be tested while mounted in that manner. If the test fixture used to hold the switch during the endurance test does not affect the temperature of the switch, the fixture may be used for the temperature test.

#### 6.4.4

A switch that does not have a quick make-and-break mechanism and has two or more ON contact positions shall comply with the requirement in Clause 6.4.1 with the mechanism in any ON position in which it can be left.

#### 6.4.5

If there is any question regarding the ability of a switch to pass the temperature test before the blades and contacts have been worked in, the test may be conducted following the overload test and prior to the endurance test.

#### 6.4.6

To determine whether a switch complies with the requirements in Clauses 6.4.1 and 6.4.4, the switch shall carry its maximum current continuously, until constant temperatures are attained on the plates of wiring terminals or on the wire leads of switches provided with wire leads. Connections to a switch not provided with attached leads shall be made with leads not less than 300 mm long having 0.8 mm thick thermoplastic insulation and of the size specified in Table 6. The temperature test may be conducted at any convenient voltage, using either alternating or direct current.

#### 6.4.7

Measurements shall be made on the terminals adjacent to the switch enclosure. If a switch has wire leads, the measurements shall be made on the copper conductors at the point of entrance of the

lead to the switch. A temperature shall be considered to be constant when three successive readings, taken at 5 min intervals, indicate no change.

### 6.4.8 Television Switch

#### 6.4.8.1

For a television switch, contacts and terminals shall be capable of carrying the rated current of the switch after 50 cycles of operation, as specified in Clause 6.2.3, and 10 000 cycles of operation, as specified in Clause 6.3.5, without exceeding the following temperature rises:

- (a) copper 30°C;
- (b) silver 40°C.
- (c) Other nonferrous metal parts shall be the subject of investigation.

#### 6.4.8.2

To determine compliance with Clause 6.4.8.1, rated current shall be circulated continuously through the switch contacts until constant temperatures are attained. The test may be conducted at any convenient voltage, either ac or dc, up to the rating of the switch. Temperatures shall be measured by means of thermocouples.

Where current-carrying parts connected to contacts are exposed through the housing, the temperature shall be measured at the exposed external portion of the terminal using thermocouples suitably fastened to the terminals.

### 6.5 Dielectric Strength

#### 6.5.1

Except for television switches and as otherwise specified in Clause 6.5.4, immediately at the conclusion of the foregoing tests switches shall withstand, without breakdown, for a period of 1 min, the application of an ac voltage of suitable frequency between parts of opposite polarity and between live parts and exposed non-current-carrying metal parts as follows:

- (a) for switches rated at 250 V and less—1000 V;
- (b) for switches rated at more than 250 V—twice the rated voltage plus 1000 V.

#### 6.5.2

Compliance of switches with the requirements of Clauses 6.5.1 and 6.5.4 shall be determined by means of a suitable transformer of not less than 1/2 kVA capacity the output voltage of which can be

regulated, except that the capacity may be less than 1/2 kVA if there is a meter of not more than 2% error connected across the secondary terminals to directly measure the applied voltage. Starting from zero, the applied voltage shall be increased gradually and at a uniform rate until the required test value is reached or until breakdown occurs.

### 6.5.3 Television Switch

#### 6.5.3.1

Except as specified in Clause 6.5.4, at the conclusion of the temperature test specified in Clause 6.4.8, a television switch shall be capable of withstanding for 1 min without breakdown a dielectric strength voltage of 1000 V ac between

- (a) live parts and exposed non-current-carrying conductive parts;
- (b) switch contacts with the switch in open position; and
- (c) live parts of opposite polarity.

#### 6.5.3.2

Compliance with the requirements in Clause 6.5.3.1 shall be determined as follows: A dielectric strength voltage shall be applied gradually, starting at zero, and shall be increased at the rate of approximately 75 V/s until the test voltage is attained, and held for a period of 1 min.

#### 6.5.3.3

During the test the applied voltage shall be monitored by a suitable voltmeter having a minimum resistivity of 2000  $\Omega/V$ . Breakdown will be indicated by an abrupt decrease or retarded advance of the voltmeter reading.

#### 6.5.3.4

Switches shall be adjusted to the various operating positions that assure the connection of the switch in the circuit under test.

### 6.5.4

Instead of the test specified in Clause 6.5.1, a switch that does not have the minimum spacings required by Clause 4.12.1 shall withstand for 1 min, without breakdown, the application of an ac voltage of twice rated + 1000 V. The voltage shall be applied between live parts of opposite polarity and between live parts and non-current-carrying metal parts. The test shall be conducted immediately following conditioning of the switch for 48 h in a test chamber maintained at a temperature of  $32 \pm 1^\circ\text{C}$  and a relative humidity of 95—100%.

### 6.5.5

When conducting the test specified in Clause 6.5.4, a switch shall be mounted in its intended manner on flat sheet steel not less than 1.6 mm thick, so that the most severe normal conditions of spacing exist. However, screws or other mounting means shall be the smallest that are commercially obtainable and shall be adequate for securing the switch in place as in actual service.

### 6.6 Endurance (Continued)—Television Switch

Following the tests of Clauses 6.2.3, 6.3.5, 6.4.8 and 6.5.3, the switch shall be operated for an additional 15 000 cycles under the load and test conditions of Clause 6.3.5. At the conclusion of the test the switch shall be capable of making and breaking the test load.

### 6.7 Dielectric Strength (Repeated)-Television Switch

Following the test of Clause 6.6, the dielectric strength test of Clause 6.5.2 shall be repeated.

### 6.8 Pull-Out (Push-In Terminals)

#### 6.8.1

A terminal of the push-in type shall withstand, without pull-out or breakage of the conductor or any strand of the conductor, the application of a straight pull of 22 N applied for a period of 1 min between the conductor and the terminal.

#### 6.8.2

Conductors of the maximum and minimum sizes that may be used in the terminal shall be installed in the intended manner in the test specimens and if applicable, both solid and stranded conductors shall be included. The pull shall be applied gradually and it shall be in line with the path of entry into the terminal.

### 6.9 Lead Security

The connection of a lead wire to a switch shall be capable of withstanding without damage or disconnection from the terminal the application of a straight pull of 22 N for a period of 1 min. The pull shall be applied gradually and in the direction most likely to cause failure.

### 6.10 Limited Short Circuit

#### 6.10.1

A switch having mercury contacts shall be capable of performing successfully when tested in series

with a standard, nonrenewable, 30 A cartridge fuse for a switch rating of 0—30 A or a 60 A fuse if the rating of the switch is from 31 to 60 A, on a direct-current circuit of rated voltage; except that alternating current may be employed if the device is intended and marked for use on alternating current only. If the switch has a horsepower rating, the capacity of the fuse shall be not less than four times the full-load motor current corresponding to the switch rating, but not less than 30 A in any case. The test circuit shall be capable of delivering 3500 A when the system is short circuited at the testing terminals.

The enclosure and any other exposed noncurrent-carrying metal part shall be grounded, and Type 1, Class 2 surgical cotton to CGSB Standard 67-GP-7M shall be placed around all openings in the enclosure. There shall be no ignition of the cotton or the insulation on the circuit conductors, nor emission of flame or molten metal (mercury excepted) from the enclosure housing the switch. Wiring attached to the device, except leads to the mercury-contact switch, shall not be damaged. Successive operations shall be conducted by alternately closing the short circuit on the switch by means of a suitable switching device, and closing the switch on the short circuit.

### 6.10.2

To determine if a mercury-contact type of switch complies with the requirements of Clause 6.10.1, specimens of switches that have not been previously tested shall be subjected to three operations with sufficient time between successive operations on any one specimen to permit cooling to room temperature, unless the tube is damaged so as to open the circuit permanently before the specified number of tests are made. A switch need not be operative after the tests.

**CAUTION:** *Mercury is toxic and care must be observed with regard to ventilation, skin contact, and disposition of it. The use of rubber gloves is recommended. (Check applicable Federal, Provincial, and local regulations regarding any spillages.)*

## 6.11 Crushing

### 6.11.1

A switch of the through-cord or pendent type shall be capable of withstanding for a period of 1 min a crushing force of 333 N applied at right angles to the major axis of the body without complete and

permanent collapse, without damage to the switching mechanism, and without exposure of bare live parts to contact by the probe shown in Figure 1.

### 6.11.2

A specimen of the switch shall be laid flat on a slab of wood, such as hard maple, 12.7 mm thick, resting on a smooth steel plate suitably supported in a horizontal position. A round steel rod 19.1 mm in diameter shall be placed on the switch body at right-angles to the longitudinal axis of the switch and midway between the points of contact of the ends of the switch body with its supporting surface, except that modifications shall be made where necessary so that the force is not applied to an actuating member. By means of weights, levers, or other suitable means, forces gradually increasing up to the required values shall be applied to the rod in a direction normal to the surface of the wood slab.

## 6.12 Effect of Heat on Actuating Members

### 6.12.1

An actuating member of insulating material of other than thermoset material shall not soften or become damaged when caused to operate the mechanism after being exposed to a temperature of 65°C.

### 6.12.2

To determine if an actuating member complies with the requirement of Clause 6.12.1, the switch assembly shall be subjected to a temperature of  $65 \pm 3^\circ\text{C}$  for a period of 1 h.

### 6.12.3

The actuating member shall then be operated manually (not controlling a load) as in actual service and shall not be affected adversely to the extent that it is appreciably deformed or fails to operate the mechanism for 25 cycles of make and break.

### 6.12.4

In conducting this test the actuating member shall not be operated more violently than would be the case in normal service, and care shall be taken to conduct the test immediately after each individual specimen is removed from the oven.

## 6.13 Strain Relief—Through-Cord and Pendent Type Switches

### 6.13.1

Switches of the through-cord and pendent types, of other than a heating pad type, shall be capable of withstanding a pull, as indicated in Clause 6.13.2,

for a period of 1 min without transmitting the pull to the terminal connection of the switch terminal of the binding-screw type and without detachment of the conductor from the terminal for other types of terminals (eg, riveted, welded, crimped, and pin type).

### **6.13.2**

A specimen of the assembly of the flexible cord to a switch of other than a heating pad type shall have a pull of 89 N in the case of tinsel cord or if the switch, by reason of the design, is limited to use with Type SPT-1 cord, and 133 N for all other cases. The pull shall be applied between the free ends of the flexible cord with the switch in between in the case of a through-cord switch and between the switch and the free end of the flexible cord in the case of a pendent type switch.

## **6.14 Environmental**

A switch intended to be exposed to a specific environment shall be capable of complying with the applicable test of CSA Standard C22.2 No. 94.

## **6.15 Arc-Tracking—Television Switches**

A switch enclosure material on which contacts are mounted directly shall meet an arc-tracking requirement of 180 s minimum when a 3 mm representative plaque is tested in accordance with ASTM Standard D495 or, alternatively, shall meet an arc-tracking requirement of 125 s minimum when the test is made directly on the switch enclosure.

**Table 1**  
**Nipple Sizes and Pitch of Threads**  
(See Clause 4.4.1.)

Nominal nipple size	Threads per 25.4 mm
1/8	27
1/4	18
3/8	18
1/2	14
3/4	14

**Table 2**  
**Sizes of Terminal Screws\***  
(See Clause 4.11.2.)

Switch rating, A	Minimum size of terminal screws*	Special applications†
6 or less	5	3
Over 6 to 20	6	4
Over 20 to 30	8	6
Over 30	Subject to investigation	

\*See CSA Standard B35.2 for binding head screws.

†These smaller sizes of screws are acceptable only for switches that are intended for the connection of conductors provided with suitable end terminations.

**Table 3**  
**Current for DC Switches**  
(See Clauses 6.2.2.4, 6.3.2.1, and 6.3.2.2.)

Switch rating, hp	Full-load, A			Overload, A		
	120 V	240 V	500 V	120 V	240 V	500 V
1/4	2.9	1.5	—	29	15	—
1/3	3.6	1.8	—	36	18	—
1/2	5.2	2.6	—	52	26	—
3/4	7.4	3.7	1.8	74	37	18
1	9.4	4.7	2.3	94	47	23
1-1/2	13.2	6.6	3.2	132	66	32
2	17	8.5	4.1	170	85	41

**Table 4**  
**Current for 3-Phase AC Switches**  
 (See Clauses 6.2.2.4, 6.3.2.1, and 6.3.2.2.)

Switch rating, hp	Inductive load full-load, A				Inductive load overload, A			
	115 V	230 V	460 V	575 V	115 V	230 V	460 V	575 V
1/2	4	2	1	0.8	24	12	6	4.8
3/4	5.6	2.8	1.4	1.1	33.6	16.8	8.4	6.6
1	7.2	3.6	1.8	1.4	42.2	21.6	10.8	8.4
1-1/2	10.4	5.2	2.6	2.1	62.4	31.2	15.6	12.6
2	13.6	6.8	3.4	2.7	71.6	40.8	20.4	16.2

**Table 5**  
**Current for Single-Phase AC Switches**  
 (See Clauses 6.2.2.4, 6.3.2.1, and 6.3.2.2.)

Switch rating, hp	Full-load, A		Overload, A	
	115 V	230 V	115 V	230 V
1/6	4.4	2.2	26.4	13.2
1/4	5.8	2.9	34.8	17.4
1/3	7.2	3.6	43.2	21.6
1/2	9.8	4.9	58.8	29.4
3/4	13.8	6.9	82.8	41.4
1	16	8	96	48
1-1/2	20	10	120	60
2	24	12	144	72

**Table 6**  
**Wire Size for Temperature Test**  
 (See Clause 6.4.6.)

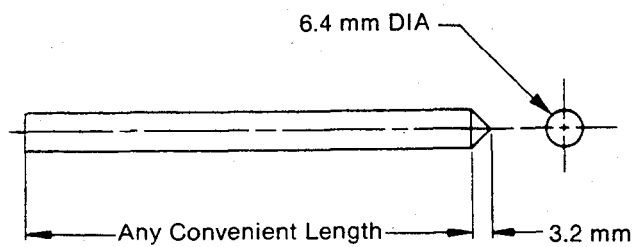
Test current, A	Wire size, AWG
0—6	18
6.1—10	16
10.1—15	14
15.1—20	12
20.1—30	10
30.1—45	8
45.1—60	6

**Table 7**  
**Overload and Endurance Test Currents**

(See Clauses 4.15.2, 6.1.5, 6.2.3, and 6.3.5.)

Switch rating, A	Overload		Endurance	
	Steady-state (rms), A	Minimum inrush (peak), A	Steady-state (rms), A	Minimum inrush (peak), A
1	1.5	27	1	18
2	3.0	51	2	35
3	4.5	71	3	51
4	6.0	91	4	65
5	7.5	111	5	78
6	9.0	130	6	92
7	10.5	147	7	105
8	12.0	163	8	117
9	13.5	178	9	130
10	15.0	191	10	141
11	16.0	199	11	153
12	16.8	205	12	163
13	17.6	211	13	173
14	18.2	215	14	183
15	18.8	219	15	191
16	20.0	226	16	199
17	21.25	230	17	207
18	22.5	239	18	214
19	23.75	243	19	220
20	25.0	247	20	226





**Figure 1**  
**Test Probe**  
(See Clause 6.11.1.)

## **Appendix A**

# **Guidance for the Minimum Quantities of Specimens to be Used for the Tests and the Sequence in Which the Tests are to be Performed**

**Note:** *This Appendix is not a mandatory part of this Standard.*

### **A1.**

Table A1 provides guidance for the minimum quantities of specimens to be used for the tests and the sequence in which the tests are to be performed except for the television switches.

### **A2.**

Table A2 provides guidance for the minimum quantities of specimens to be used for the tests and the sequence in which the tests are to be performed for television switches.

**Table A1**  
**Quantity of Switches and Test Sequence**  
**Except for Television Switches**  
(See Note to Clause 7.1.)

Clause/Quantity	6	6	6	6	6	3	6	6	6	6
6.2.1 Overload: ampere rated	1		1							
6.2.2 Overload: horsepower rated		1								
6.3.1 Endurance: ampere rated	2		2							
6.3.2 Endurance: horsepower		2								
6.3.3 Endurance: "T" rated Endurance "T" rated switches having an additional rating less than 50 V	3									1
6.3.4 Endurance: "L" rated			3							
6.4 Temperature	4	3	4							
6.5 Dielectric strength	5	4	5							
6.8 Pull-out				1						
6.9 Lead security					1					
6.10 Limited short circuit						1				
6.11 Crushing							1			
6.12 Effect of heat on actuating members								1		
6.13 Strain relief on through- cord and pendent type switches										1

**Table A2**  
**Quantity of Switches and Test Sequence**  
**for Television Switches**  
(See Note to Clause 6.1.)

Clause/Quantity	6
6.2.3 Overload	1
6.3.5 Endurance	2
6.4.8 Temperature	3
6.5.2 Dielectric strength	4
6.6 Endurance (continued)	5
6.7 Dielectric strength (repeated)	6

## ***Proposition de modification***

N'hésitez pas à nous faire part de vos suggestions et de vos commentaires. Prière d'utiliser le formulaire qui suit pour formuler les propositions de modification aux normes CSA et autres publications CSA. Il est recommandé d'inclure

- le numéro de la norme/publication
- le numéro de l'article, du tableau ou de la figure visé
- la formulation proposée
- la raison de cette modification.

## ***Proposal for change***

CSA welcomes your suggestions and comments. Please use the following form to submit your proposals for changes to CSA Standards and other CSA publications. Be sure to include the

- Standard/publication number
- relevant Clause, Table, and/or Figure number(s)
- wording of the proposed change
- rationale for the change.

**Nom/Name:** \_\_\_\_\_

**Affiliation:** \_\_\_\_\_

**Adresse/Address:** \_\_\_\_\_

**Ville/City:** \_\_\_\_\_

**État/Province/State:** \_\_\_\_\_

**Pays/Country:** \_\_\_\_\_ **Code postal/Postal/Zip code:** \_\_\_\_\_

**Téléphone/Telephone:** \_\_\_\_\_ **Télécopieur/Fax:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Proposition de modification/Proposed change:**

*(Si l'espace est insuffisant, utiliser le verso et des feuilles volantes/Use reverse and additional pages as required.)*