UL 469

STANDARD FOR SAFETY

Musical Instruments and Accessories

UL Standard for Safety for Musical Instruments and Accessories, UL 469

Fourth Edition, Dated November 3, 2006

Summary of Topics

This revision to UL 469 is being issued to remove the reference to the withdrawal date of UL 873 and to address universal upkeep of UL Standards for Safety. These revisions are considered to be non-substantive and not subject to UL's STP process.

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

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a ″SUPERSEDED REQUIREMENTS″ notice.

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1

UL 469

Standard for Musical Instruments and Accessories

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Fourth Edition

November 3, 2006

This UL Standard for Safety consists of the Fourth Edition including revisions through October 3, 2013.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

No Text on This Page

CONTENTS

INTRODUCTION

CONSTRUCTION

PROTECTION AGAINST INJURY TO PERSONS

PERFORMANCE

MANUFACTURING AND PRODUCTION TESTS

RATING

MARKING

INSTRUCTIONS

APPENDIX A

INTRODUCTION

1 Scope

1.1 These requirements cover power-operated musical instruments and accessories rated 300 volts or less, intended for household and commercial use on supply circuits in accordance with the National Electrical Code, NFPA 70.

1.2 Musical instruments include organs, electronic pianos, music synthesizers, and other such products that produce music under the direct control of the player.

1.3 These requirements also cover accessories for use with musical instruments, such as rhythm generators and similar equipment having self-contained tone generators, tone cabinets, music tuners, and the like.

1.4 These requirements do not cover commercial audio equipment, such as amplifiers, mixers, and signal processors for general use; or special effects units, amplifier-speakers, and the like, that are intended for use by professional and semiprofessional musicians.

1.5 These requirements do not cover musical instruments that are categorized as electrically operated toys and are covered by the Standard for Electric Toys, UL 696.

1.6 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involves a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific provisions of this standard cannot be judged to comply with this standard. Where considered appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

2 General

2.1 Components

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

2.1.2 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.

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

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

2.2 Units of measurement

2.2.1 When a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

2.2.2 All applicable alternating-current electrical measurements are in root-mean-square (rms) units unless otherwise stated.

2.3 Undated references

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

3 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 FIBER – Where the term fiber is used, vulcanized fiber is meant.

3.3 HAZARDOUS CIRCUITRY – Circuitry involving a risk of electric shock as described in the Leakage-Current and Shock-Current Tests, Section 36, or a risk of fire as described in Risk of Fire, Section 26.

3.4 INSULATION, BASIC – The insulation necessary for the proper functioning of the product and for basic protection against electric shock.

3.5 INSULATION, REINFORCED – An improved basic insulation with such mechanical and electrical qualities that it, in itself, provides the same degree of protection against electric shock as an insulation system comprising both basic insulation and supplementary insulation.

3.6 INSULATION, SUPPLEMENTARY – An independent insulation provided in addition to the basic insulation to protect against electric shock in case of electrical breakdown of the basic insulation.

3.7 LOW-VOLTAGE CIRCUIT – A circuit involving a peak open-circuit potential of not more than:

a) The applicable values specified in Table 36.1, where wet contact is not likely to occur or

b) 21.2 volts peak where wet contact is likely to occur.

3.8 ORDINARY TOOL – A flat-bladed or cross-recessed screwdriver or pliers.

3.9 PRODUCT, COMMERCIAL – A product intended for use in commercial establishments, hotels, motels, houses of worship, schools, studios, and businesses.

3.10 PRODUCT, HOUSEHO

3.11 PRODUCT, PORTABLE – A product that is intended to be moved or that can easily be moved from one place to another in normal use.

3.12 PRODUCT, STATIONARY – A product for which there is a dedicated location or that is not easily moved from one place to another in normal use.

3.13 UNRELIABLE COMPONENT – The following are considered to be unreliable components: electrolytic capacitors, transistors, diodes, vacuum tubes, and the like.

3.14 USER SERVICING – User servicing includes:

a) Battery – Replacement of a battery other than one intended to be soldered in place.

b) Fuse – Replacement of a fuse other than:

1) A fuse intended to be soldered in place.

2) A fuse not readily perceptible to the user. A fuse is not readily perceptible if it is located within a chassis, compartment, or enclosure within the overall product that makes the fuse invisible to the user. If the enclosure has a cover, it is to be one that does not need to be opened or removed in normal operation or user servicing, can be opened or removed only with a tool, and is prevented from being discarded. A fuse is readily perceptible if it is recognizable during normal operation or user servicing, either visually or by touch; or if the fuse is indicated, either on the product or on literature packed with it.

c) Vacuum Tube – Replacement of a vacuum tube other than a tube intended to be soldered in place.

d) User Adjustment – Adjustment of a marked adjustable control or an adjustable component if the adjustment can be accomplished using an ordinary tool, with the product in operation, and without defeating an interlock.

e) Unmarked Adjustment – Adjustment of an unmarked adjustable control if the adjustment can be accomplished without a tool, with the product in operation, and without defeating an interlock.

f) Terminals, Jacks, Connectors – Interconnection to terminals, jacks, and connectors that are readily perceptible to the user and are intended for connection of other accessories and equipment, such as microphones, speakers, tone cabinets, tape recorders, amplifiers, and preamplifiers.

1) A terminal, jack, or connector is readily perceptible if recognizable during normal operation or user servicing, either visually or by touch; or if it is indicated on the product or on literature packed with it.

2) A terminal, jack, or connector is not readily perceptible if located within a chassis, compartment, or enclosure within the overall product so that it is not visible to the user. If the enclosure has a cover, it is to be one that does not need to be opened or removed in normal operation or user servicing, can be opened or removed only with a tool, and is prevented from being discarded.

g) Piano Strings – Tuning of piano strings, but not replacement of piano strings or other servicing operations intended to be performed by a qualified piano service technician.

h) Lamp – Replacement of an incandescent lamp, whether it be a single lamp or one of a series or parallel string, intended for connection directly across the supply circuit – nominal 120 or 220 volts – or a fluorescent lamp, for example, a low-pressure mercury electric-discharge lamp with a fluorescing coating.

Exception No. 1: A lamp that is intended to be soldered in place and is soldered in place in the product.

Exception No. 2: A neon lamp, for example an electric-discharge lamp with neon as the filling gas.

Exception No. 3: Low-voltage – less than 30 volts – vacuum-fluorescent display device.

CONSTRUCTION

4 General

4.1 The construction of a product shall be such that:

a) Normal use and user servicing does not result in a risk of fire, electric shock, or injury to persons;

b) Materials and components are used within their electrical, mechanical, and temperature limits; and

c) The assembly protects components and wiring from being displaced or damaged.

4.2 The materials and components referred to in 4.1 and elsewhere in the requirements are those involving a risk of fire, electric shock, or injury to persons and are so considered unless specifically indicated otherwise.

4.3 A product shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it might be subjected, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

5 Enclosure

5.1 A product shall be provided with an enclosure that houses all vacuum tubes, motor-driven parts, and live parts, other than cords and cables, that involve a risk of fire, electric shock, or injury to persons. The enclosure shall be constructed so that it will protect the various parts of the product against mechanical damage.

5.2 The bottom shall be complete so as to protect all electrical parts. In judging the bottom of a portable product, consideration shall be given to the possibility of the product being placed on objects that may damage wiring or other electrical components.

5.3 The thickness of a sheet-metal enclosure shall not be less than the applicable value specified in Table 5.1.

Exception: The thickness may be less than that specified in Table 5.1 if investigated and found to provide equivalent strength.

Table 5.1
Thickness of sheet metal

Maximum dimensions of enclosure				Minimum thickness											
				Steel								Copper, brass, or aluminum			
				Without supporting frame				With supporting frame or equivalent reinforcing				Without supporting frame,		With supporting frame or equivalent reinforcing,	
Length or width,		Area,		Zinc coated,		Uncoated,		Zinc coated,		Uncoated,					
inches	(m)	in^2	(m^2)	inch	(mm)	inch	(mm)	inch	(mm)	inch	(mm)	inch	(mm)	inch	(mm)
12	0.30	90	0.06	0.036	0.91	0.032	0.81	0.025[a]	0.64	0.021[a]	0.53	0.045	1.14	0.029	0.74
18	0.46	135	0.09	0.046	1.17	0.043	1.09	0.036	0.91	0.032	0.81	0.058	1.47	0.045	1.14
24	0.61	360	0.23	0.057	1.45	0.054	1.37	0.046	1.17	0.043	1.09	0.075	1.91	0.058	1.47
48	1.22	1200	0.77	0.071	1.80	0.067	1.70	0.057	1.45	0.054	1.37	0.095	2.41	0.075	1.91
60	1.52	1500	0.97	0.098	2.49	0.095	2.41	0.057	1.45	0.054	1.37	0.122	3.10	0.075	1.91
Over 60		Over 1500		0.127	3.23	0.124	3.15	0.057	1.45	0.054	1.37	0.153	3.89	0.075	1.91

[a] Sheet steel for an enclosure intended for outdoor use (raintight) shall not be less than 0.036 inch thick if zinc coated and not less than 0.032 inch thick if uncoated.

5.4 The thickness of a cast-metal enclosure shall not be less than the applicable value specified in Table 5.2.

Table 5.2
Thickness of cast metal

Metal	Minimum thickness			
	At base of threads, at small, flat unreinforced surfaces and at surfaces that are reinforced by curving, ribbing, or the like or are otherwise of a shape or size to provide mechanical strength,		At relatively large, unreinforced, flat surfaces,	
	inch	(mm)	inch	(mm)
Die-cast metal	3/64	1.2	5/64	2.0
Cast malleable iron or permanent mold cast aluminum	1/16	1.6	3/32	2.4
Other cast metal	3/32	2.4	1/8	3.2

5.5 A wooden enclosure shall not be less than 1/2 inch (12.7 mm) thick at portions of the enclosure that serve as a supporting frame for a product that weighs 10 pounds (4.54 kg) or more. Portions of the enclosure that do not serve to support parts or as structural members of the frame shall not be less than 1/8 inch (3.2 mm) thick.

Exception: A wooden enclosure may be less than 1/2 inch thick if investigated and found to provide equivalent strength.

5.6 A polymeric enclosure or polymeric part of an enclosure shall comply with the applicable requirements in Table 7.1.

6 Mechanical Assembly

6.1 A switch, lampholder, attachment plug, or similar component shall be mounted securely and shall be prevented from turning.

Exception No. 1: The requirement that a switch be prevented from turning may be waived if all four of the following conditions are met:

a) The switch is a plunger or other type that does not tend to rotate when operated. A toggle switch is considered to be subject to forces that tend to turn the switch during the normal operation of the switch.

b) The means of mounting the switch make it unlikely that operation of the switch will loosen it.

c) Spacings are not reduced below the minimum acceptable values if the switch rotates.

d) Normal operation of the switch is by mechanical means rather than by direct contact by persons.

Exception No. 2: A lampholder of a type in which the lamp cannot be replaced, such as a neon pilot or indicator light where the lamp is sealed in by a nonremovable jewel, need not be prevented from turning if rotation will not reduce spacings below the minimum acceptable values.

6.2 The means for preventing the turning mentioned in 6.1 is to consist of more than friction between surfaces; for example, a lock washer is acceptable as a means for preventing a small stem-mounted switch or other device that has a single-hole mounting means from turning.

6.3 An uninsulated live part shall be secured to the base or mounting surface so that it will be prevented from turning or shifting in position if such displacement may result in a reduction of spacings below the minimum acceptable values. Friction between surfaces is not acceptable as a means to prevent shifting or turning of a live part; but a properly applied lock washer is acceptable.

7 Materials

7.1 General

7.1.1 Cellulose nitrate or any comparably flammable material shall not be used.

7.1.2 A material shall comply with applicable requirements in Table 7.1.

Exception No. 1: The requirements do not apply to the internal insulating systems of components or where component requirements exist.

Exception No. 2: An external or internal part located in nonhazardous circuitry or used in nonelectrical applications and not specifically described in Table 7.1 need not comply with the flammability requirements in Table 7.1; however, the part shall comply with the requirement in 7.1.1.

Exception No. 3: The requirements do not apply to fiber and similar material that is 0.01 inch (0.25 mm) thick or less.

Exception No. 4: The requirements do not comply to small parts as indicated in Table 7.1.

Table 7.1
Material requirements for various applications

Table 7.1 revised March 18, 2010

Application	Material	Minimum flammability classification[a]	Resistance to ignition		Dielectric strength and volume resistivity[b]	Small parts exception[c]
			Hot wire[b]	High current[b]		
Enclosure	Polymeric	V-2[d]	Required	Not required	Not required	Not applicable
Dust cover, key, music rack, pedal, stop, and tab not part of a required enclosure	Polymeric	HB	Not required	Not required	Not required	Yes

Table 7.1 Continued

Application			Material	Minimum flammability classification[a]	Resistance to ignition		Dielectric strength and volume resistivity[b]	Small parts exception[c]
					Hot wire[b]	High current[b]		
Material in contact with current-carrying part connected in	Hazardous circuitry	Polarity only on material[e]	Polymeric	HB	Required	Required	Required	No – electrical Yes – flammability and resistance to ignition
				V-2	Not required	Not required	Required	
		Opposite polarity on material[e,f]		V-1	Not required	Not required	Required	No
	LVLE[g] circuitry			HB	Not required	Not required	Not required	Yes
	Hazardous circuitry	Polarity only on material[e]	Low density polymeric foam[h]	HBF	Required	Required	Required	No – electrical Yes – flammability and resistance to ignition
				HF-2	Not required	Not required	Required	
		Opposite polarity on material[e]		HF-1	Not required	Not required	Required	No
	LVLE[g] circuitry			HBF	Not required	Not required	Not required	Yes
Speaker or decorative grille, not part of required enclosure			Foam[h]	HBF	Not required	Not required	Not required	Yes
			Molded	HB	Not required	Not required	Not required	Yes
			Woven (cloth)	See Section 57	See Section 57			Yes
Printed-wiring board	Hazardous circuitry		All	V-1	Not required	Not required	Required	No
	LVLE[g] circuitry			HB	Not required	Not required	Not required	No
	Nonhazardous circuitry			HB[i]	Not required	Not required	Not required	Yes

[a] The flammability classifications V-0, V-1, V-2, HB, HF-1, HF-2, and HBF are to be determined as described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. A material classified using 1/16-inch (1.6-mm) thick bar specimens is acceptable in lesser thicknesses in the end product.

[b] These columns refer to the following requirements:

1) The part shall have a minimum resistance to hot-wire ignition of 7 seconds, or a minimum resistance to high-current-arc ignition of 60 arcs, or both, as stated. See 7.1.3 and 7.1.4.

2) The dielectric strength of the part shall be at least 175 volts per mil (7000 V/mm) and the volume resistivity shall be at least 50 megohm-centimeters. See 7.1.6 and 7.1.7.

[c] In order for the small part exception to apply, the part shall comply with the following:

1) The maximum volume shall not exceed 4000 mm^3,

2) The maximum dimension shall not exceed 60 mm, and

3) The part shall be located so it cannot propagate flame from one area to another or act as a bridge between a possible source of ignition and other ignitable parts.

Table 7.1 Continued

Application	Material	Minimum flammability classification[a]	Resistance to ignition		Dielectric strength and volume resistivity[b]	Small parts exception[c]
			Hot wire[b]	High current[b]		

[d] A polymeric enclosure material having a flammability classification of HB may be used if the material is not employed to render live parts involving a risk of electric shock inaccessible.

[e] Polarity is defined as the condition of being electrically energized positive or negative with respect to some electrical reference point. For the purpose of the table:

1) Opposite polarity across material means that the positive or negative and the reference point are both in contact with the material in question, such as illustrated in parts (A) and (B) in Figure 7.1 where the absolute value of V_1 is greater than the absolute value of V_2.

2) Polarity only on material means that the positive or negative only is located on the material and the reference point is not in contact with the same material, such as part (C) in Figure 7.1 where the absolute value of V_1 is greater than the absolute value of V_2.

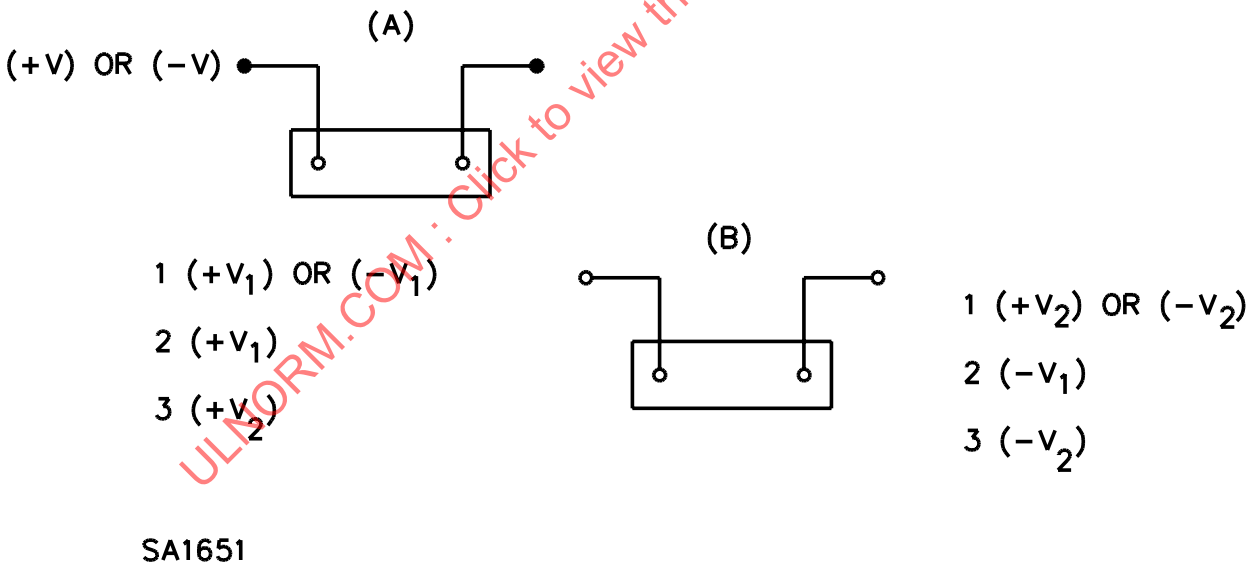
[f] Insulating material having a flammability classification of V-2 or HB may be used as direct support of live parts provided the material complies with the direct-support requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

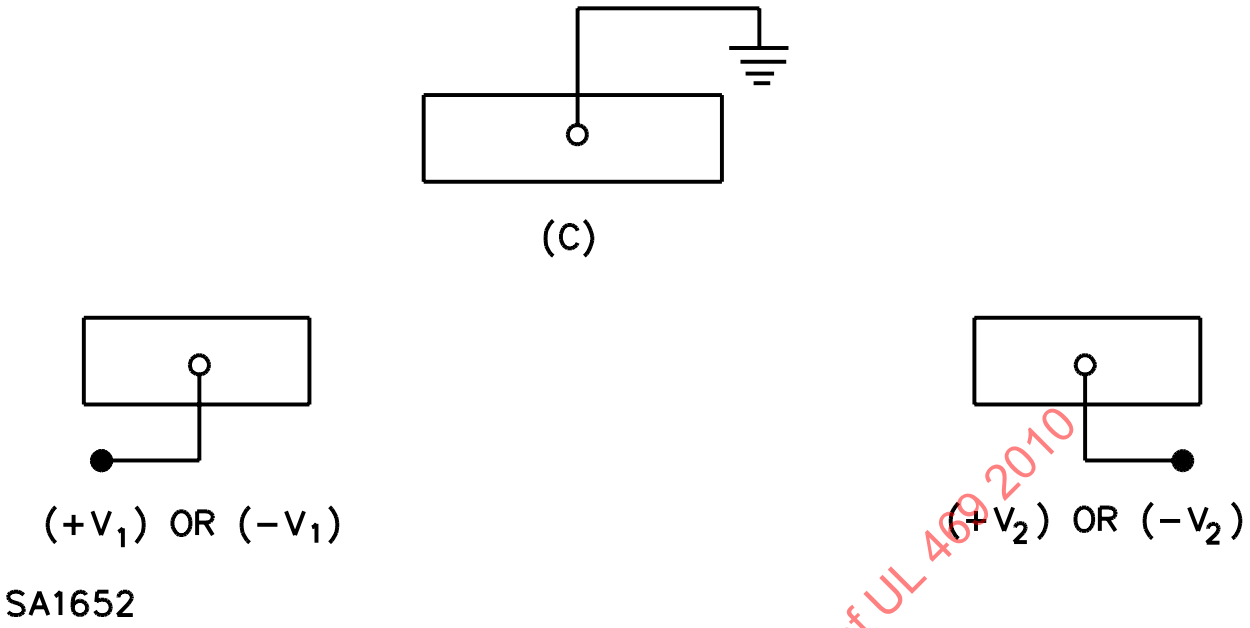
[g] LVLE signifies low-voltage, limited-energy. See 27.1.2.

[h] Foam having a specific gravity of less than 0.6 is considered to be low-density foam. Material having a specific gravity of 0.6 or greater is considered to be polymeric and is to be judged accordingly.

[i] Applies to base material only.

Figure 7.1
Polarity on material





7.1.3 Resistance to hot-wire ignition, as mentioned in note (b)(1) of Table 7.1, is the number of seconds needed to ignite a sample that is wrapped with resistance wire that dissipates a specified level of electrical energy. See 7.1.5.

7.1.4 High-ampere arc resistance to ignition, as mentioned in note (b)(1) of Table 7.1, is expressed as the number of arc-rupture exposures – standardized as to electrode type and shape and electrical circuit – that are necessary to ignite a material when they are applied as a specified rate on the surface of the material. See 7.1.5.

7.1.5 With reference to 7.1.3 and 7.1.4, bar samples are to be used for the tests. A material classified using 1/16-inch (1.6-mm) thick bar specimens is acceptable in lesser thicknesses in the end product. The tests are to be conducted in accordance with the requirements in the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A.

7.1.6 A material for which the requirement in note (b)(2) of Table 7.1 applies shall have a dielectric strength of at least 175 volts per mil (7000 V/mm) as determined after conditioning for 40 hours at 23.0 ±1.0°C (73.4 ±1.8°F) and 90 ±5 percent relative humidity, conducted in accordance with the Standard Method of Tests for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies, ASTM D149-1975. These are minimum values usually characteristic of the majority of materials classed as insulators.

7.1.7 A material for which the requirement in note (b)(2) of Table 7.1 applies shall have a volume resistivity of at least 50 megohm-centimeters as measured after conditioning for 40 hours at 23.0 ±1.0°C (73.4 ±1.8°F) and 50 ±5 percent relative humidity as indicated in Procedure A of the Standard Method of Tests for Conditioning Plastics and Electrical Insulating Materials for Testing, ASTM D618-1971, and 10 megohm-centimeters after being conditioned for 96 hours at 35.0 ±1.0°C (96.8 ±1.8°F) and 90 ±5 percent relative humidity as indicated in Procedure C, conducted in accordance with the Standard Methods of Tests for D-C Resistance or Conductance of Insulating Materials, ASTM D257-1976. These are minimum values usually characteristic of the majority of materials classed as insulators.

7.1.8 A molded part shall have the necessary mechanical strength and rigidity to withstand the stresses of actual service.

7.2 Guard and barrier insulating material for rendering live parts inaccessible

7.2.1 A guard or barrier of insulating material employed to render live parts inaccessible shall:

a) Not be less than 0.028 inch (0.71 mm) thick.

Exception No. 1: Fiber, or the equivalent, that is not less than 0.013 inch (0.33 mm) thick may be used to cover a splice within the overall enclosure.

Exception No. 2: A covering of paper that is not less than 0.028 inch (0.71 mm) thick may be used on an electrolytic capacitor or similar part.

Exception No. 3: A fiber shell of a metal-jacketed pilot lampholder covering all live parts may be not less than 0.020 inch (0.51 mm) thick.

b) Comply with the requirement in 7.1.2.

8 Protection Against Corrosion

8.1 An iron or steel part shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means, if corrosion of the unprotected part would result in a risk of fire, electric shock, or injury to persons.

Exception No. 1: This requirement does not apply to surfaces of a sheet steel or cast-iron part within an enclosure if the oxidation of the iron or steel due to the exposure of the metal to air or moisture is not likely to be appreciable – the thickness of metal and temperature also being factors.

Exception No. 2: This requirement does not apply to a bearing, laminations, or a minor part, such as a washer, screw, and the like.

9 Current-Carrying Parts

9.1 A current-carrying part shall be of silver, copper, a copper-base alloy, stainless steel, aluminum, or other material acceptable for the intended use.

Exception No. 1: Plated steel may be used for secondary-circuit parts, and for some primary-circuit parts, such as for capacitor terminals where a glass-to-metal seal is necessary and for leads or threaded studs of semiconductor devices.

Exception No. 2: Blued steel or steel with an equivalent corrosion resistance is acceptable for the current-carrying arms of a mechanically or magnetically operated leaf switch, but not elsewhere.

9.2 A contact of a socket, separable connector, and the like, connected in a circuit involving a risk of fire shall be made of nonferrous spring metal acceptable for the intended use.

10 Accessibility of Live Parts

10.1 General

10.1.1 A live part, including an audio output or speaker terminal, that involves a risk of electric shock shall not be accessible to the extent that it can be touched during normal operation or user servicing.

10.1.2 The accessibility of a live part is to be determined in accordance with Table 10.1.

Table 10.1
Recessing of live parts

Maximum width of slots – inches (mm)	Diameter of round holes – inches (mm)	Minimum distance between opening and live part[a]
Less than 1 (25.4)	Less than 1 (25.4)	Probe[b]
	1 but not more than 2 (50.8)	5D
1 (25.4) but not more than 2 (50.8)	More than 2 (50.8) but not more than 3 (76.2)	6D
More than 2 (50.8) but not more than 3 (76.2)		7D

[a] D is the diameter of the largest sphere that can pass through the opening.
[b] See 10.1.3.

10.1.3 An opening that will not permit the entrance of a 1-inch (25.4-mm) diameter rod is acceptable, if the probe illustrated in Figure 10.1 cannot be made to touch any uninsulated live part or film-coated wire when inserted into the opening. The probe may be articulated into any configuration and may be rotated or angled to any position before, during, or after insertion into the opening, and the penetration may be to any depth allowed by the opening size, including minimal depth combined with maximum articulation. No force is to be applied to the probe.

Figure 10.1
Probe for determining accessibility of live parts