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Subject 150

333 Pfingsten Road
 Northbrook, IL 60062-2096
 February 9, 1996

TO: Subscribers to UL's Listing Service for Antenna Rotators

SUBJECT: Request for Comments on New and Revised Marking Requirements for the Third Edition of the Standard for Antenna Rotators, UL 150

SUMMARY

UL requests input on the consideration of revising existing UL markings and developing new UL marking requirements in accordance with ANSI Z535.4-1991

COMMENTS DUE: APRIL 5, 1996

BACKGROUND

The American National Standards Institute (ANSI) has developed and published a series of standards (the ANSI Z535 series) containing guidelines for developing cautionary and warning markings for use on products. The Standard for Product Safety Signs and Labels, ANSI Z535.4-1991, contains guidelines for the type of cautionary and warning markings most like those required by UL Standards.

DISCUSSION

UL would like to obtain manufacturer's views on the topic of evaluating the existing markings in UL 150 in order to determine how they correlate with the ANSI requirements. In addition, UL would like to obtain industry input regarding the possibility of revising the existing markings in accordance with the ANSI requirements and utilizing the ANSI requirements when developing new markings for the standard.

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Attached as Appendix A is a summary of product safety marking specifications in ANSI Z535.4-1991. A copy of the ANSI Z535.4-1991 standard may be obtained by contacting either of the following:

American National Standards Institute
11 W. 42nd Street
New York, NY 10036
(212) 642-4900

-or-

National Electrical Manufacturers Association
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209
(703) 841-3300

REQUEST FOR COMMENTS

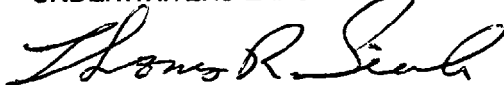
Please provide your comments by completing the attached Comment Form.

The completed form should be sent to the attention of Thomas R. Siwek UL's Northbrook office, 333 Pfingsten Rd., Northbrook, IL 60062. Please reference all correspondence to Subject 150.

All comments should be sent by April 5, 1996.

Because this proposal is of a preliminary nature, replies to comments will only be sent if requested.

UNDERWRITERS LABORATORIES INC.



THOMAS R. SIWEK (Ext. 42764)
Engineer
Standards Department

REVIEWED BY:



JOE STRODER (Ext. 42942)
Staff Engineer
Engineering Services 417D

SR:SAG

150BUL.L01

APPENDIX A
PRODUCT SAFETY MARKINGS:
SUMMARY OF SPECIFICATIONS IN ANSI Z535.4-1991
PRODUCT SAFETY SIGNS AND LABELS

This report identifies some of the product safety markings as specified in the ANSI Z535 series of standards (Safety Signs and Colors).

I. SCOPE: ANSI Z535.4 (Sec. 2) sets the performance requirements for the design, application, use and placement of permanently affixed safety signs and labels intended to identify potential hazards for persons operating or in close proximity to a wide variety of products.

II. SIGNAL WORD SELECTION: The signal words are DANGER, WARNING and CAUTION. ANSI Z535.4 (Para. 4.15.1 – 4.15.3, 5.2) specifies the conditions for using each signal word. DANGER indicates an *imminently* hazardous situation which if not avoided *will* cause death or serious injury. WARNING indicates a *potentially* hazardous situation which if not avoided *could* result in death or serious injury. CAUTION indicates a *potentially* hazardous situation which if not avoided *may* result in mild or moderate injury. It is the responsibility of the manufacturer to determine if federal, state or local regulations specify the signal word and if not, apply the definitions above in selecting the appropriate signal word.

III. LABEL FORMAT: The arrangement of the safety marking elements consists of the signal word, any symbols or pictorials, a border and a word message. ANSI Z535.4 (Sec. 6) specifies the acceptable arrangement of the label elements and provides seven examples. ANSI Z535.4 requires the use of the Safety Alert Symbol with any caution, warning, or danger marking.

IV. LABEL COLORS: The label colors help the observer to visually differentiate the various portions of the label format. ANSI Z535.4 (Sec. 7) specifies exactly which colors are to be used for each element of the label format. It also provides examples of the authorized colors and their composition. The use of colors is intended to create contrast with the background color of the base material. White letters on a red background shall be used for the signal word *DANGER*. Black letters on an orange background shall be used for the signal word *WARNING*. Black letters on a yellow background shall be used for the signal word *CAUTION*.

V. LETTER STYLE AND SIZE: The style and size of the letters shall enable a person with normal vision to read the marking at a safe viewing distance. ANSI Z535.4 (Sec. 8, Annex A) specifies the size for the Signal Word lettering shall be based on the safe viewing distance which will allow the observer to have a reasonable reaction time to avoid the hazard after seeing the marking. The size of the message lettering shall be large enough to be legible at a safe viewing distance. The signal word lettering shall be 50% larger than the message lettering. Formulas for determining the minimum letter height in both favorable and unfavorable reading conditions based upon the safe viewing distance are included in ANSI Z535.4. Bright sunlight is a consideration under lighting conditions. The signal words shall be in upper case sans serif letters only. The message letters shall be in sans serif and may be in combinations of upper and lower case or just upper case letters as appropriate. Acceptable lettering styles include Medium, Folio Medium, News Gothic Bold, Helvetica Bold or the equivalent.

VI. LABEL PLACEMENT: The location of the marking shall enable the viewer to readily see the marking. ANSI Z534.4 (Para. 9.1) specifies that the location of the markings shall be chosen to permit the viewer to readily see the marking.

VII. PERMANENCY OF MARKING: ANSI Z535.4 (Para. 9.2, Sec. 10) specifies that, when feasible, placement of the sign or label should provide protection from foreseeable damage, fading, or visual obstruction caused by abrasion, ultra-violet light, or substances such as lubricants, chemicals and dirt. Reasonable expected life shall take into consideration the expected life of the product and the foreseeable environment of use.

COMMENT FORM
INDUSTRY MEMBER FOR
ANTENNA ROTATORS, UL 150

(Please Print or Type)

NAME: _____

COMPANY: _____

ADDRESS: _____

☐ The markings in UL 150 should be evaluated in accordance with ANSI Z535.4 because

☐ The markings in UL 150 should not be evaluated in accordance with ANSI Z535.4 because

If you would like to provide additional comments, please provide an attachment.

Please send the completed form no later than April 5, 1996 to:

Underwriters Laboratories Inc.
333 Pfingsten Rd.
Northbrook, IL 60062

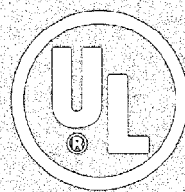
Attention: Thomas R. Siwek
Engineer
Standards Department
(847) 272-8800
(847) 509-6217 (Fax)

Standard for Safety

UL 150

ISBN 1-55989-633-7

Antenna Rotators



Underwriters Laboratories Inc.®

Standard

**Underwriters Laboratories Inc.®**

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Melville, New York • (516) 271-6200

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Underwriters Laboratories Inc., founded in 1894, is chartered as a not-for-profit organization without capital stock, under the laws of the State of Delaware, to establish, maintain, and operate laboratories for the examination and testing of devices, systems and materials to determine their relation to hazards to life and property, and to ascertain, define and publish standards, classifications and specifications for materials, devices, products, equipment, constructions, methods, and systems affecting such hazards.

UL Standards for Safety are developed under a procedure which provides for participation and comment from the affected public as well as industry. The procedure takes into consideration a survey of known existing standards and the needs and opinions of a wide variety of interests concerned with the subject matter of the standard. Thus manufacturers, consumers, individuals associated with consumer-oriented organizations, academicians, government officials, industrial and commercial users, inspection authorities, insurance interests and others provide input to UL in the formulating of UL Standards for Safety, to keep them consonant with social and technological advances.

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July 27, 1994

Standard for

Antenna Rotators

UL 150, Third Edition

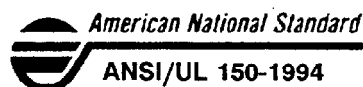
Attached to this transmittal notice is a copy of the Third edition of UL 150.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT.

As indicated on the title page, this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this standard outlining the procedures to be followed to retain the approved text of ANSI/UL 150-1994.

Revised and/or additional pages may be issued from time to time.

JULY 27, 1994



1

UL 150

Standard for

Antenna Rotators

First Edition – October, 1983
Second Edition – October, 1989

Third Edition

July 27, 1994

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated July 27, 1994. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

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

Approved as ANSI/UL 150-1984, July 6, 1984
Approved as ANSI/UL 150-1989, March 3, 1989
Approved as ANSI/UL 150-1994, April 13, 1994

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

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

b) The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

c) A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

d) A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover antenna rotators intended for household and commercial use on supply circuits in accordance with the National Electrical Code, NFPA 70.

1.2 An antenna rotator generally consists of:

- a) A mast-mounted (generally outdoors), motorized drive unit that rotates the antenna to the desired receiving azimuth,
- b) An indoor-located (usually near television- or radio-receiving equipment) user-operated control unit that delivers operating power and direction signals to the drive unit, and,
- c) A length of multiple-conductor Class-2 circuit cable to electrically interconnect the drive unit and the control unit.

Some antenna rotating units may control antenna elevation, either separately or in addition to azimuth. In some cases, the drive unit may be located indoors.

1.3 The power used to drive the motor of an antenna rotator is derived from a circuit complying with Class 2 limitations in accordance with Article 725 of the National Electrical Code, ANSI/NFPA 70-1993.

1.4 These requirements do not cover systems that use a stationary antenna and change or rotate the receiving pattern by electronic or switching means. Such systems are covered by the Standard for Low-Voltage Video Products Without Cathode-Ray-Tube Displays, UL 1409.

1.5 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 requirements or 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 A component of a product covered by this standard shall comply with the requirements for that component and shall be used in accordance with its recognized rating and other limitations of use. See Appendix A for a list of standards covering components generally used in products covered by this standard. 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 a product covered by this standard, or
- b) Is superseded by a requirement in this standard.

2.2 Units of measurement

2.2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

2.2.2 All applicable alternating-current electrical measurements are in 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 **ACCESSIBLE PART** — A part located so that it can be contacted by means of a probe. See Accessibility of Parts, Section 10.

3.3 **ADJUSTABLE CONTROL** — A control provided for making adjustments necessary to render the product capable of performing its intended functions.

3.4 **CONTROL UNIT** — A user-operated, indoor-mounted unit with total output limited to Class 2 levels (see 1.3), the primary function of which is to deliver power to and control a drive unit.

3.5 **DRIVE UNIT** — A mast-mounted (generally outdoors), motorized unit that may be user-installed and is intended to position an antenna and that requires an energy source limited to Class 2 levels. See 1.3.

3.6 **FIBER** — Vulcanized fiber.

3.7 **INSULATION, BASIC** — The insulation necessary for the intended functioning of the product and for basic protection to reduce the risk of electric shock.

3.8 **INSULATION, REINFORCED** — An improved basic insulation with mechanical and electrical qualities such that it, in itself, provides the same degree of protection to reduce the risk of electric shock as an insulation system comprised of both basic insulation and supplementary insulation.

3.9 **INSULATION, SUPPLEMENTARY** — An independent insulation provided in addition to the basic insulation to provide protection to reduce the risk of electric shock in case of electrical breakdown of the basic insulation.

3.10 **MAJOR ENCLOSURE PART** — A part of the enclosure that:

- a) Forms more than 50 percent of any one surface, and
- b) Is needed to comply with the requirements to
 - 1) Reduce the risk of fire, electric shock, or injury to persons, or
 - 2) Reduce the likelihood of mechanical damage to internal parts.

3.11 MINOR DIMENSION OF OPENING – The diameter of the largest sphere that can pass through the opening.

3.12 OPERATING CONTROL – A control, usually a knob, pushbutton, or lever, provided to enable the user to cause the product to perform its intended function, without the use of tools, when the product is in normal operating condition.

3.13 ORDINARY TOOLS – Flat-bladed and cross-head screwdrivers, nut-drivers, pliers, and the like.

3.14 POWER-SUPPLY CORD – The cord provided to connect the control unit to the supply circuit.

3.15 SUPPLY CIRCUIT – The branch circuit supplying electrical energy to the product.

3.16 UNINSULATED PART – A part that is bare (without insulation) or has insulation that is not in itself acceptable for the operating conditions (such as potential and temperature) involved.

3.17 USER SERVICING – User servicing includes:

a) 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:

i) Does not need to be opened or removed in normal operation or user servicing,

ii) Can be opened or removed only with a tool, and

iii) 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.

3) A clipped-in-type fuse that is within a compartment provided with the marking described in 53.4.1.

b) User Adjustment – Adjustment of a marked adjustable control or an adjustable component if the adjustment can be accomplished:

1) By using an ordinary tool,

2) With the product in operation, and

3) Without defeating an interlock.

c) Unmarked Adjustment – Adjustment of an unmarked adjustable control if the adjustment can be accomplished:

- 1) Without a tool,
- 2) With the product in operation, and
- 3) Without defeating an interlock.

d) Lamp – Replacement of lamp, whether a single lamp or one of a series or parallel string, intended for connection directly across the supply circuit of a nominal 120 or 220 volts.

Exception: This requirement does not apply to a lamp that is intended to be soldered in place and is soldered in place in the product, or a neon lamp, such as an electric-discharge lamp with neon as the filling gas.

3.18 WET LOCATION – In direct contact with earth and locations subject to saturation with water, or unprotected and exposed to weather.

CONSTRUCTION

4 General

4.1 The construction of a product shall be such that:

- a) Intended use and user servicing does not result in a risk of fire, electric shock, or injury to persons;
- b) The materials and components are used within their electrical, mechanical, and temperature limits; and
- c) The assembly protects the components and wiring from being displaced or damaged.

4.2 The materials and components referred to in 4.1 and elsewhere in these 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 causing a risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacing, loosening, or displacement of parts, or other serious defects.

5 Enclosure

5.1 Control unit

5.1.1 A control unit shall be provided with an enclosure that houses all live parts, other than cords and cables, that involves a risk of fire, electric shock, or injury to persons. The enclosure shall be constructed to reduce the likelihood of mechanical damage to the various parts of the product.

5.1.2 Major enclosure parts (see 3.10) that are molded of polymeric material shall be identified in accordance with the Standard for Polymeric Materials – Fabricated Parts, UL 746D.

5.2 Drive unit

5.2.1 A drive unit shall be provided with a metallic enclosure that renders all live parts that involve a risk of electric shock or injury to persons inaccessible as specified in Accessibility of Parts, Section 10.

Exception: A polymeric enclosure may be employed if found to be acceptable for the purpose when evaluated in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

6 Mechanical Assembly

6.1 A switch, lampholder, attachment plug, or similar component shall be mounted securely and 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) The 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 cannot reduce spacings below the minimum acceptable values.

Exception No. 3: A user-accessible lampholder intended to be readily removable without the use of a tool need not be prevented from turning.

6.2 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 can result in a reduction of spacings below the minimum acceptable values.

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

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 the applicable requirements in Table 7.1.

Exception: This requirement does not apply to a drive unit.

Table 7.1
Material flammability requirements

Material and application	Minimum flammability classification ^a
1. Fiber and similar material regardless of use or location	94V-1
2. Polymeric material in contact with an uninsulated part that involves a power greater than 15 watts ^{b, c}	94V-2 or 94HF-2
3. Polymeric material used as a required part of the enclosure	94V-2
4. Material in contact with an uninsulated part that involves a power equal to or less than 15 watts ^{b, c}	94HB or 94HBF
5. Material used in applications other than those specified in (1 – 4)	94HB or 94HBF

NOTE — The requirements in Table 7.1 do not apply to a small part. For the purpose of Table 7.1, a small part is defined as one that complies with all of the following items:

- 1) Its volume does not exceed 0.122 cubic inch (2 cm³).
- 2) Its maximum dimension does not exceed 1.18 inches (3 cm).
- 3) Its location is such that it cannot propagate flame from one area to another or act as a bridge between a possible source of ignition and other ignitable parts.

^a The flammability classifications (94V-0, 94V-1, 94V-2, and 94HB if the specific gravity is equal to or greater than 0.6; or, 94HF-1, 94HF-2, and 94HBF if the specific gravity is less than 0.6) are to be determined by the tests described in the Standard for Tests for Flammability of Plastic Materials in Devices and Appliances, UL 94. Test samples are to be flat stock approximately 5 inches (127 mm) long, 1/2 inch (12.7 mm) wide, and of the smallest thickness used; or, for an assembly, the samples may consist of the assembly. Printed-wiring boards, terminal strips, and the like can be tested as finished parts, or test samples can be cut from finished parts. In the case of small parts that might be consumed before the test is completed, larger samples of the same material can be tested, provided they represent thicknesses that are the same or less than the part in question. None of the larger samples is to be entirely consumed by flame. Samples that consist of an assembly or a section thereof, and that are not flat stock samples are to be positioned in what is considered to be the position most conducive to burning. A material for a part, other than the enclosure, rated using 1/16-inch (1.6-mm) thick bar specimens may be accepted in lesser thicknesses in the end product. For polymeric enclosures, a material rated using 1/8-inch (3.2-mm) thick bar specimens may be accepted in lesser thicknesses in the end product.

^b Does not apply to the internal insulation system of a component or where component requirements exist (see 2.1.1).

^c Power measured in accordance with 43.1.1.

7.1.3 A material in contact with an uninsulated live part shall comply with the requirements in 7.1.4 and 7.1.5.

7.1.4 A material in contact with an uninsulated live part shall have a dielectric strength of at least 175 volts per mil (7000 V/mm) after conditioning for 96 hours at $35.0 \pm 1.0^\circ\text{C}$ ($95.0 \pm 1.8^\circ\text{F}$) and 90 ± 5 percent relative humidity, conducted in accordance with the Test Methods for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies, ASTM D149-92.

7.1.5 A material in contact with an uninsulated live part shall have a volume resistivity of:

a) At least 50 megohm-centimeters as measured after conditioning for 40 hours at $23.0 \pm 1.0^\circ\text{C}$ ($73.4 \pm 1.8^\circ\text{F}$) and 50 ± 5 percent relative humidity as indicated in Procedure A of the Method for Conditioning Plastics and Electrical Insulating Materials for Testing, ASTM D618-61(1990), and

b) 10 megohm-centimeters after being conditioned for 96 hours at $35.0 \pm 1.0^\circ\text{C}$ ($96.8 \pm 1.8^\circ\text{F}$) and 95 ± 5 percent relative humidity as indicated in Procedure C conducted in accordance with the Test Methods for D-C Resistance or Conductance of Insulating Materials, ASTM D257-92.

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 parts involving a risk of electric shock or injury to persons 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 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 specified in 7.1.2.

8 Protection Against Corrosion

8.1 A metal part, unless inherently corrosion resistant, 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.

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 that is equivalently resistant to corrosion 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 Parts

10.1 General

10.1.1 A part that involves a risk of electric shock or injury to persons shall not be accessible to the extent that it can be touched during normal operation or user servicing. See Electric Shock, Section 11.

10.1.2 An opening in an enclosure is acceptable if the opening will not permit the entrance of a 1-inch (25.4-mm) diameter sphere and the probe illustrated in Figure 10.1 cannot be made to touch any uninsulated live part, film-coated wire, or moving part 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.

10.2 Control unit

10.2.1 When determining the accessibility of parts of a control unit, any of the following operations may be performed.

- a) Removal or opening of friction-fit knobs, snap covers, and similar loose parts;
- b) Removal, opening, or loosening of parts as described in the installation and operating instructions; and
- c) Removal of knobs not captive in accordance with Captive Parts, Section 21.

10.3 Drive unit

10.3.1 The accessibility of parts of a drive unit is to be determined only after the installation of the unit has been completed in accordance with the manufacturer's installation instructions.