UL 859

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Household Electric Personal Grooming Appliances

Underwriters Laboratories Inc. (UL)
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UL Standard for Safety for Household Electric Personal Grooming Appliances, UL 859

Tenth Edition, Dated August 30, 2002

Revisions: This Standard contains revisions through and including June 16, 2004.

Summary of Topics

This revision of UL 859 is being issued to revise the cord flexing test in Section 42; add a cord flexing test for appliance leakage current interrupters in new Section 42A; add an electrical insulation requirement in Section 16; add new and revised requirements for the normal temperature test in Section 37 and the Abnormal Operation Tests in Section 39; and revise paragraphs 1.3 and 6.5.3. This revision also updates American National Standards Institute (ANSI) approval of the new and revised material.

UL Standards for Safety are developed and maintained in the Standard Generalized Markup Language (SGML). SGML -- an international standard (ISO 8879-1986) -- is a descriptive markup language that describes a document's structure and purpose, rather than its physical appearance on a page. Due to formatting differences resulting from the use of UL's new electronic publishing system, please note that additional pages (on which no requirements have been changed) may be included in revision pages due to relocation of existing text and reformatting of the Standard.

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

The following table lists the future effective dates with the corresponding item.

Future Effective Date	Reference
August 30, 2004	Paragraph 59.2
July 1, 2007	Paragraphs 16.5, 37.5.1, 37.5.1.1, 37.5.1.2, 39.1.1, 39.2.1 – 39.2.4, 39.2A.1 – 39.2A.4; Section 42A; and Table 42.1

The new and/or revised requirements are substantially in accordance with UL's Bulletin(s) on this subject dated January 23, 2004 and April 5, 2004. The bulletin(s) is now obsolete and may be discarded.

As indicated on the title page (page 1), 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 this ANSI/UL Standard.

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

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

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.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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

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AUGUST 30, 2002
(Title Page Reprinted: June 16, 2004)

ANSI/UL 859-2004

UL 859

Standard for Household Electric Personal Grooming Appliances

The first, second, and third editions were titled Beauty-Parlor Equipment. The fourth, fifth, and sixth editions were titled Electric Personal Grooming Appliances.

First Edition – September, 1954
Second Edition – November, 1966
Third Edition – May, 1971
Fourth Edition – July, 1975
Fifth Edition – July, 1978
Sixth Edition – February, 1984
Seventh Edition – January, 1988
Eighth Edition – January, 1991
Ninth Edition – December, 1995

Tenth Edition

August 30, 2002

The most recent designation of ANSI/UL 859 as an American National Standard (ANSI) occurred on June 1, 2004.

This ANSI/UL Standard for Safety, which consists of the Tenth Edition with revisions through June 16, 2004, is under continuous maintenance, whereby each revision is ANSI approved upon publication. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Written comments are to be sent to UL-SC Standards Department, 1655 Scott Blvd., Santa Clara, CA 95050.

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

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

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INTRODUCTION

1 Scope

1.1 These requirements cover electric personal grooming appliances intended for household use, such as hair curlers and dryers, combs, brushes, and similar appliances to be used in accordance with the National Electrical Code, NFPA 70.

1.2 These requirements do not cover appliances rated more than 250 volts nor appliances covered in the following Standards for Safety:

a) The Standard for Medical and Dental Equipment, UL 544;

b) The Standard for Medical Electrical Equipment, Part 1: General Requirements for Safety, UL 2601–1;

c) The Standard for Personal Hygiene and Health Care Appliances, UL 1431;

d) The Standard for Hair Clipping and Shaving Appliances, UL 1028;

e) The Standard for Motor-Operated Massage and Exercise Machines, UL 1647;

f) The Standard for Electric Heating Pads, UL 130; and

g) The Standard for Commercial Electric Personal Grooming Appliances, UL 1727.

1.2 revised August 30, 2002

1.3 *Deleted June 16, 2004*

2 General

2.1 Components

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

2.1.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

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

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

2.2 Units of measurement

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

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

2.3 Undated references

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

3 Glossary

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

3.2 AUTOMATIC CONTROL – A device intended for automatic control of operating time, temperature, or pressure under conditions of intended operation and not for protection against conditions resulting from abnormal operations.

3.3 AUTOMATICALLY CONTROLLED APPLIANCE – An appliance that complies with one or more of the following conditions:

a) The repeated starting of the appliance is independent of any manual control if, after one complete cycle of operation, a limit device or similar component opens the circuit;

b) During any single preset cycle of operation, the motor is caused to stop and restart;

c) When the appliance is energized, the initial starting of the motor may be intentionally delayed beyond intended, conventional starting; and

d) For an appliance using a motor with a separate starting winding, during any single predetermined cycle of operation, automatic changing of the mechanical load reduces the motor speed sufficiently to re-establish starting-winding connections to the supply circuit.

3.4 BODY-SUPPORTED APPLIANCE – An appliance that is physically supported by any part of the body, other than the hand of the user, during the performance of its intended functions (such as a shoulder-, body-, or head-supported hair dryer). Reference is to be made to the user manual of the appliance in establishing the intended functions of the appliance.

3.5 COUNTER-SUPPORTED APPLIANCE – An appliance that is physically supported by a counter, table, or bench during the performance of its intended functions (such as a bonnet-type hair dryer). Reference is to be made to the user manual of the appliance in establishing the intended functions of the appliance.

3.6 DIRECT PLUG-IN APPLIANCE – An appliance, without a power supply cord, that is physically supported by direct insertion of its integral blades into a receptacle.

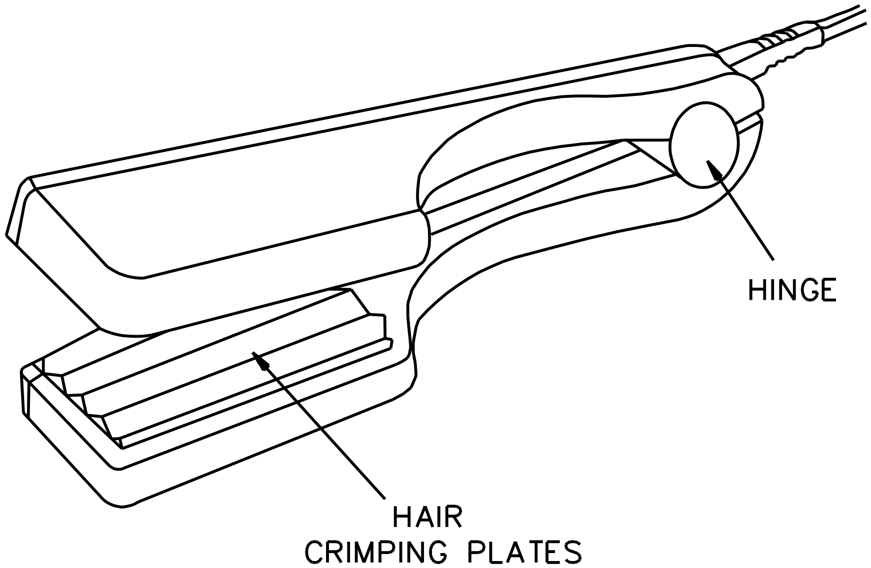
3.7 DUAL-VOLTAGE APPLIANCE – An appliance rated for use at 120 or 240 volts and provided with a means to change from one voltage to the other.

3.8 FIXED APPLIANCE – An appliance intended to be permanently connected electrically.

3.9 FLOOR-SUPPORTED APPLIANCE – An appliance that is physically supported by the floor during the performance of its intended functions (such as hair dryers with roll-about stands). Reference is to be made to the user manual of the appliance in establishing the intended functions of the appliance.

3.10 HAIR CRIMPING IRON – A hand-supported hair curling appliance having hinged arms and ridged or wavy surfaced electrically heated tongs between which hair is placed. A typical construction is shown in Figure 3.1.

Figure 3.1
Typical hair crimping iron



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3.11 HAIR CURLER HEATER (HAIR SETTER) – A counter-supported appliance having posts or wells on or in which hair curling devices (such as rollers) are heated before being applied to the hair. The term also applies to a construction that has individual electrical hair curlers (rollers) with built-in heating elements and male electrical fittings which plug into female contacts in the appliance.

3.12 HAIR STRAIGHTENING IRON – An appliance similar to a hair crimping iron described in 3.10 except that the hair crimping plates are replaced with flat plates.

3.13 HAND-HELD APPLIANCE/HAND-GUIDED APPLIANCE – A portable appliance that during intended use is contacted by the hand of the user for purposes of electrical or physical control but not for complete support.

3.14 HAND-SUPPORTED APPLIANCE – An appliance that is physically supported by the hand of the user during the performance of its intended functions (such as a curling iron). Reference is to be made to the user manual of the appliance in establishing the intended functions of the appliance.

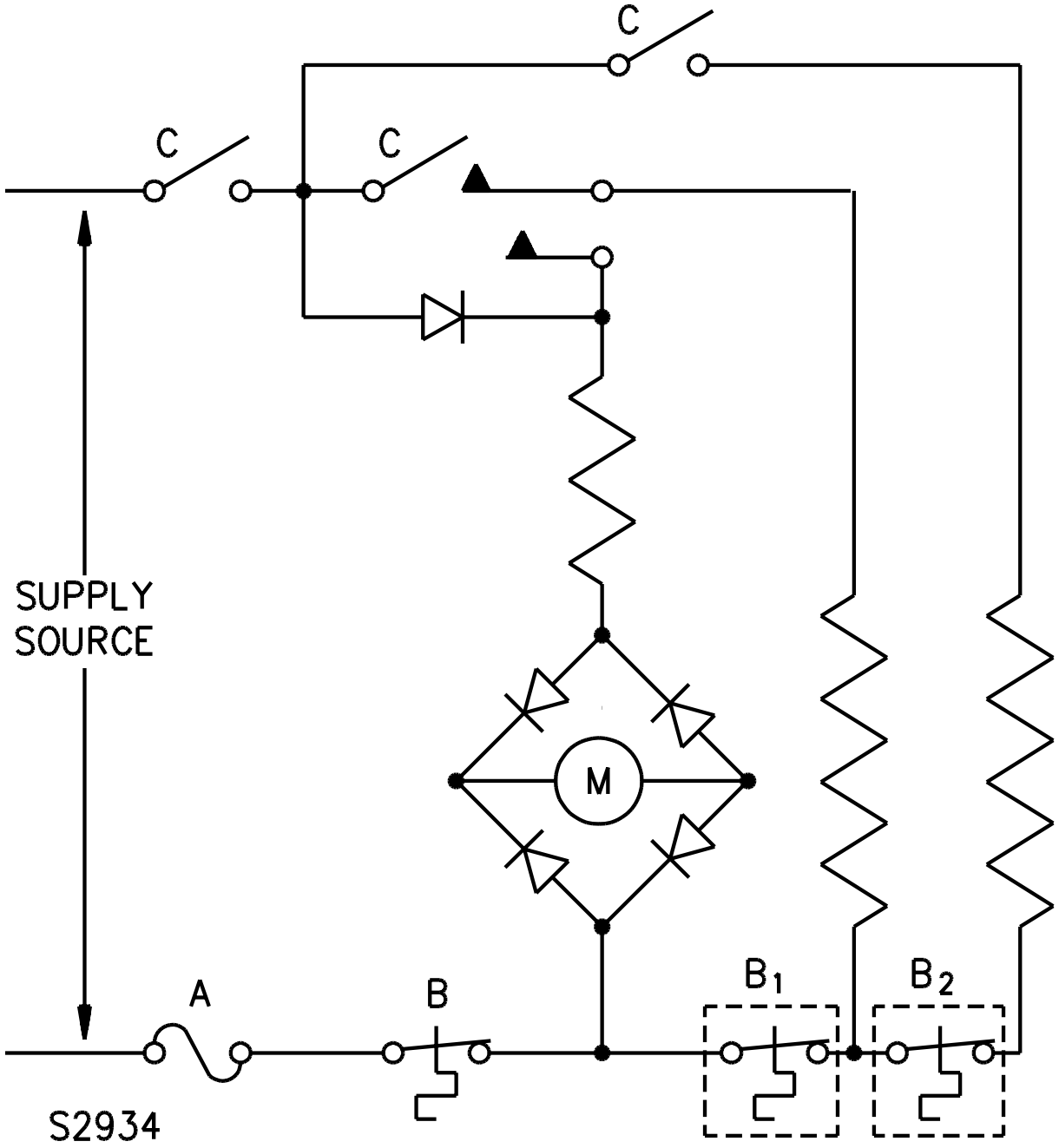
3.15 HEATED AIR CURLING IRON (or BRUSH) – A curling iron (or brush) in which a fan included in the appliance blows air over the heating elements and out through openings in the barrel of the appliance.

3.16 IMMERSION-DETECTION CIRCUIT-INTERRUPTER (IDCI) – A resettable or non-resettable device that interrupts (trips) the supply circuit to an immersed appliance when a conductive liquid enters the appliance and contacts both a live part and an internal sensor which causes the current flow between the live part and the sensor to exceed a predetermined level.

3.17 INPUT VOLTAGE SELECTOR – The means provided on an appliance to adjust for the available input voltage.

3.18 LIMIT CONTROL – As applicable to hand-supported hair dryers, a limit control, as shown in item A of Figure 3.2, is a non-resettable control (a control intended to operate only once) that operates to open all electrical circuits to reduce the risk of fire or electric shock.

Figure 3.2
Typical hair dryer circuit



A – Limit control (a non-resettable device, as defined in 3.18).

B – Temperature control (a calibrated automatic-reset device, as defined in 3.25).

B_1, B_2 – Temperature control shown at two other locations.

C – Switches.

M – Motor.

3.19 LIMITED ENERGY PRIMARY CIRCUIT – A line voltage circuit that incorporates a limiting impedance in series with the supply circuit so that:

a) The circuit potential on the load side of the limiting impedance does not exceed 42.4 volts peak (30 volts rms) under intended conditions; and

b) The maximum energy available at the load side of the limiting impedance circuit is 100 volt-amperes under any condition, including abnormal operation.

3.20 LINE VOLTAGE CIRCUIT – A circuit involving a potential of not more than 250 volts and having circuit characteristics in excess of those of a low-voltage circuit or a limited primary energy circuit.

3.21 LOW-VOLTAGE CIRCUIT – A circuit supplied by a primary battery, by a Class 2 transformer, or by a combination of a transformer and fixed impedance that, as a unit, complies with all performance requirements for Class 2 transformers and that does not involve an open circuit potential of more than 42.4 volts peak (30 volts rms).

3.22 PORTABLE APPLIANCE – An appliance capable of being carried or conveyed.

3.23 PREHEAT CYCLE – A cycle of operation, intended for rapid heating, in which the heating element operates at an initial higher level of energy for a period of time. The energy level then declines to a lower normal use temperature-maintenance level. It may fluctuate between the high and low levels during a use of the appliance. The energy level may be controlled by varying the amount of wattage, the duration or duty cycle, or a combination thereof. The change in the energy level may be initiated by a timer, a temperature controller, or a combination of the two. Appliances having a preheat cycle of operation are commonly known as ″Instant Heat″ type. The temperature transient condition associated with the operation of a positive temperature coefficient (PTC) heating element or a thermostat is not considered to be a preheat cycle.

The following are some examples of preheat type appliances:

a) The appliance operates at the higher preheat wattage level for a length of time determined by a timing device or circuit. The wattage then drops to a constant lower temperature-maintenance level for the remainder of operation.

b) The appliance operates at a higher preheat wattage level initially for varying lengths of time depending upon temperature. The wattage varies with time in response to the temperature controller to maintain normal operating temperature.

c) The appliance operates at a fixed wattage level for a predetermined length of time. Then the same amount of wattage is applied on a pre-programmed duty cycle by means of a switching mechanism to maintain normal operating temperature.

d) The appliance operates at a fixed wattage level for a predetermined length of time. Then the same amount of wattage is applied on a duty cycle that adjusts depending upon temperature by means of a switching mechanism and a temperature controller.

3.24 STATIONARY APPLIANCE – A cord-connected appliance intended to be fastened in place or located in a dedicated space.

3.25 TEMPERATURE CONTROL – As applicable to hand-supported hair dryers, a temperature control, as shown in item B of Figure 3.2, is an automatic-reset temperature-sensing control that opens an electrical circuit to limit temperatures during motor slowdown and abnormal operation. A temperature

control is calibrated and endurance tested for at least 6,000 cycles of operation and complies with all other requirements in the Standard for Limit Controls, UL 353, or the Standard for Temperature-Indicating and -Regulating Equipment, UL 873.

3.26 TEMPERATURE-REGULATING CONTROL – A control that functions only to regulate the temperature under conditions of intended use.

3.27 THERMAL CUT-OFF – A temperature- or temperature- and current-sensitive device that is replaceable but not resettable. It is intended to reduce the risk of fire, electric shock, or injury to persons due to overheating of an appliance during abnormal operation.

3.28 WALL-HUNG APPLIANCE – A cord-connected appliance that is provided with keyhole slots, hanger holes, similar feature for hanging on a wall during the performance of its intended function. A wall-hung appliance may consist of two interconnected units where one is intended to hang on a wall and the other is intended to be supported by hand during use. Reference is to be made to the user manual of the appliance in establishing the intended functions of the appliance.

3.29 WAX DEPILATORY APPLIANCE – An appliance intended for melting a wax-like material (hereafter referred to as wax) that is first applied to and then stripped from the body for the purpose of removing unwanted hair.

CONSTRUCTION

4 General

4.1 In the following text, a requirement that applies only to a specific type or types of appliances, such as a hand-supported hair dryer and a curling iron, is so identified by specific reference in that requirement to the type or types involved. Absence of such specific reference or use of the term ″appliance″ indicates that the requirement applies to all appliances covered by this standard.

4.2 An appliance that is a combination of two or more types (for example, an appliance having a hand-supported part and a counter-supported part), or an appliance that fits the definition of two or more types (for example, an appliance that can be used while supported by hand or while supported by a counter top), is to be investigated in accordance with the applicable requirements for the types of appliances involved. If two requirements that address the same condition differ, the appliance is to be investigated to the more severe requirement.

4.3 A heated air curling iron or brush, as defined in 3.15, shall comply with the requirements applicable to hand-supported hair dryers and curling irons.

4.4 A container for liquid intended for use with the appliance, and supplied as part of the appliance, shall comply with applicable construction requirements.

4.5 A curling iron that is likely to be laid on combustible material shall be provided with a stand made of material resistant to combustion upon which it may be placed when not in use.

Exception: A stand need not be provided if the temperature attained by the appliance is not sufficiently high to cause the ignition of the combustible material.

4.6 A curling iron that attains a temperature higher than 100°C (212°F) when operated continuously shall be provided with an integral stand. A stand provided for other types of appliances may be a separate device or integral with the appliance.

4.7 With respect to 4.6, an integral stand provided for a curling iron shall be of such design or shape that any surface of the curling iron exceeding 150°C (302°F) will not contact the supporting surface when the curling iron is supported in its intended manner by the stand.

4.8 A polymeric material used as an integral stand in compliance with the requirements in 4.7 shall be rated for the temperature it is subjected to during use.

5 Hair Dryer Immersion Protection

5.1 A hand-supported hair-drying appliance (such as a hair dryer, blower-styler, styler-dryer, heated air comb, heated-air hair curler, curling iron-hair dryer combination, a wall-hung hair dryer or the hand unit of a wall-mounted hair dryer, or a similar appliance) shall be constructed to reduce the risk of electric shock when the appliance is energized, with its power switch in either the ″on″ or ″off″ position, and immersed in water having an electrically conductive path to ground.

5.2 Compliance with 5.1 may be accomplished with the use of an:

a) Integral ground-fault circuit-interrupter (GFCI),

b) Integral immersion-detection circuit-interrupter (IDCI), or

c) Integral protective device of another type that de-energizes all current-carrying parts (hereafter referred to as a protective device) when the hand-supported hair-drying appliance is immersed in water having an electrically conductive path to ground.

5.3 If a hand-supported hair-drying appliance is provided with a GFCI, the GFCI shall comply with the requirements for Class A cord-connected GFCIs in the Standard for Ground-Fault Circuit-Interrupters, UL 943.

Exception: A GFCI located in the wall unit of a wall-mounted permanently-connected hair dryer shall comply with the requirements for Class A permanently-connected GFCIs in UL 943.

5.4 If a hand-supported hair-drying appliance is provided with an IDCI, the IDCI shall comply with the Standard for Immersion-Detection Circuit-Interrupters, UL 1664. An IDCI need not provide protection under the condition that any circuit conductor on the line side of the IDCI is open circuited. The combination of the hair dryer and the IDCI shall comply with the requirements specified in Sections 20 and 33 – 35 and 61.9.1 and 65.9.

5.5 If a hand-supported hair-drying appliance is provided with a protective device other than a GFCI or an IDCI, the protective device shall be investigated and determined to be acceptable for the application. Investigation of the protective device shall include, but need not be limited to, consideration of:

a) Electrical rating,

b) Operating temperatures,

c) Reliability of operation,

d) Resistance to the effects of abnormal operating conditions,

e) Resistance to mechanical abuse,

f) Resistance to electrical transients, and

g) Resistance to moisture.

The combination of hair-drying appliance and protective device shall comply with the test described in the Immersion-Detection Circuit-Interrupter (IDCI) Trip Time Measurement Test, Section 33.

Exception: A protective device is deemed acceptable for the application if it complies with the requirements for Class A cord-connected GFCIs in the Standard for Ground-Fault Circuit-Interrupters, UL 943, except that it is not required to:

a) Have a grounding conductor;

b) Have the same type of power supply cord;

c) Comply with the high-resistance ground faults test under the condition that any power conductor is open-circuited; or

d) Provide grounded neutral protection by compliance with the high-resistance ground faults test, under the test condition that the neutral conductor is grounded at a point in the load circuit.

The combination of a hand-supported hair-drying appliance and such a protective device is not required to be subjected to the test described in the Conductive Coating Test, Section 35.

5.6 A GFCI, IDCI, or other protective device shall be integral with the attachment plug of the hand-supported hair-drying appliance power supply cord.

Exception No. 1: For a wall-mounted permanently-connected hair dryer, the GFCI, IDCI, or other protective device may be located in the wall unit.

Exception No. 2: A GFCI, IDCI, or other protective device may be located in the power supply cord as a through-cord construction or in the hair dryer enclosure, after additional investigations with regard to acceptability after immersion, resistance to mechanical abuse, and similar considerations.

5.7 A user-resettable protective device shall incorporate a supervisory circuit as described in Immersion-Detection Circuit-Interrupters (IDCIs), Section 20, for IDCIs or as described in the Standard for Ground-Fault Circuit-Interrupters, UL 943, for GFCIs.

Exception: A user-resettable protective device may be provided with a reset feature not having a test function based on all of the following:

a) The protective device complies with the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991. If the computational investigation is conducted, the maximum predicted failure rate (λp) shall not exceed 1.5 failures per million hours predicted. If the demonstrated method is conducted, the test acceleration multiplier shall be 5763.

b) The instructions provided with the appliance alert the user to the reset feature and how and when to use it.

c) The instructions provided with the appliance alert the user to not reset and reuse the appliance should the protective device trip as a result of immersion.

5.8 A switch included for testing a user resettable protective device shall be permanently marked ″Test ″ and ″Reset ″ on or adjacent to the switch actuators.

5.9 After a protective device de-energizes current-carrying parts, it shall not automatically reset.

5.10 A protective device that is integral with the attachment plug of a hand-supported hair-drying appliance may be provided with a single outlet convenience receptacle when all of the following requirements are met:

a) The convenience receptacle is:

1) Of the same configuration as the attachment plug,

2) Wired on the load side of the protective device, and

3) Wired so that the same polarization as the attachment plug is maintained.

b) The convenience receptacle has a rating of 15 amperes, 125 volts and complies with the Standard for Attachment Plugs and Receptacles, UL 498.

c) The face of a convenience receptacle that is less than 5/8 inch (15.9 mm) wide or 7/8 inch (22.2 mm) long complies with the mounting clearance requirements specified in 21.7.

d) The area surrounding the convenience receptacle is free of any projections that might interfere with full insertion of the blades of an attachment plug having a face size as specified in Figure 5.1.

e) When an attachment plug, as shown in Figure 5.1, is fully inserted into the convenience receptacle, the test and reset buttons of a user-resettable protective device are accessible for testing and resetting the protective device without the use of a tool.

f) The protective device complies with the requirements for cord-connected GFCIs specified in the Standard for Ground-Fault Circuit-Interrupters, UL 943.

Exception No. 1: Flexible cord acceptable for use with hand-supported hair dryers as specified in Table 11.2 may be used.

Exception No. 2: Means for grounding need not be provided.

g) The convenience receptacle contact slots and grounding hole, if any, are located so that the line blades of a grounding-type plug cannot be mated by deliberate manual force, including manipulation, to deflect the grounding pin to the outside of the body of the protective device. An obstruction provided to comply with this requirement is to have minimum size and shape indicated by the shaded area in Figure 5.2. The obstructions are to be coplanar with the face or recessed by no more than 3/32 inch (2.4 mm). Constructions having rigid bodies, which are materials having a minimum hardness of 90 when measured on the ″A″ scale of a Shore Durometer, may have the indicated ″A″ dimensions reduced to 0.531 inch (13.5 mm).

h) The hair dryer immersion protective device complies with the abnormal operation test described in 39.9.1 – 39.9.5.

i) A permanent and legible marking is provided near the convenience receptacle to:

1) Specify the maximum current and wattage rating of an appliance intended to be plugged into the convenience receptacle as specified in 61.1.7,

2) Indicate that the appliance is to be unplugged immediately after use as specified in 61.10.1, and

3) Indicate that a direct plug-in (cordless) appliance is not to be used as specified in 61.10.1.

j) The instruction manual includes the operating instructions specified in 65.10.

Figure 5.1
Plug-face dimensions for determining acceptable convenience receptacle insertion clearance

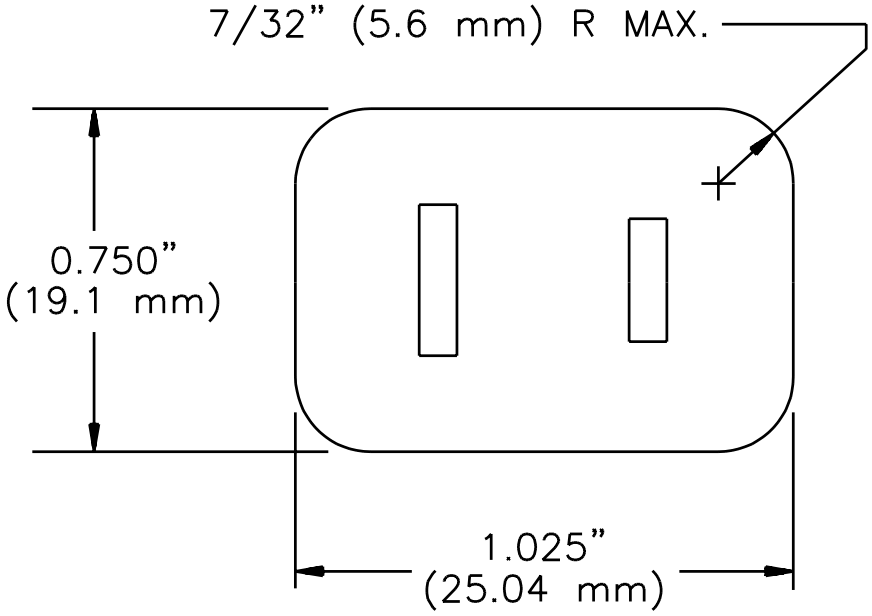
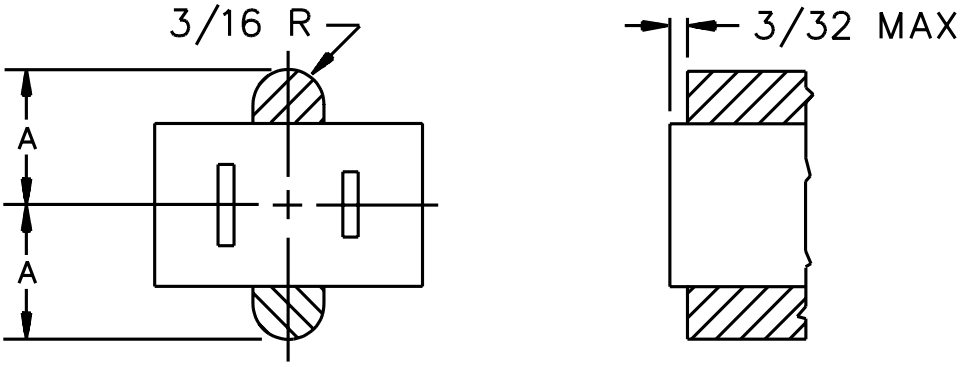
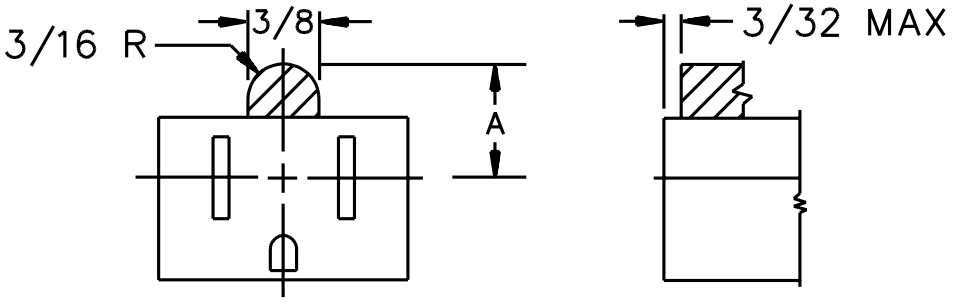


Figure 5.2
Face of a 15-ampere, 125-volt convenience receptacle showing the smallest acceptable obstruction (shown shaded) for the grounding pin on the mating plug



Obstruction for a 2–Pole, 2–Wire (Nongrounding) Receptacle



Obstruction for a 2–Pole, 3–Wire (Grounding) Receptacle

Inch	3/32	3/16
mm	2.4	4.8

Dimension A		Shore Durometer Hardness
Inch	mm	(Scale A)
0.625	15.9	less than 90
0.531	13.5	90 or more

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5.11 With regard to 5.10(f), each output circuit shall be considered if one is not representative of the other. For example, the short circuit test shall be conducted with each output short-circuited one at a time. The dielectric voltage-withstand test between line-connected circuits and load circuits shall include both load circuits. The temperature test shall be conducted with:

a) The hair dryer load circuit and the convenience receptacle each loaded to rated value and

b) The convenience receptacle loaded to 15 amperes with no load connected to the hair dryer load circuit.

6 Frame and Enclosure

6.1 General

6.1.1 The frame and enclosure of an appliance shall be sufficiently strong and rigid to resist the abuses likely to be encountered during service. The degree of resistance inherent in the appliance shall preclude total or partial collapse with the attendant reduction of spacings, loosening or displacement of parts, and other conditions which alone or in combination constitute an increase in the risk of fire, electric shock, or injury to persons.

6.1.2 Among the factors taken into consideration in evaluating an enclosure for acceptability are its:

a) Physical strength,

b) Resistance to impact,

c) Moisture absorptive properties,

d) Combustibility,

e) Resistance to corrosion, and

f) Resistance to distortion at temperatures to which the enclosure may be subjected under conditions of normal or abnormal use.

For a nonmetallic enclosure, all these factors are to be considered with respect to thermal aging.

6.2 Polymeric enclosures

6.2.1 A polymeric enclosure shall comply with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

Exception: The Abnormal Operation Tests, Section 39, shall be applied in lieu of the abnormal and severe conditions requirements specified in UL 746C. For the polymeric enclosure of an appliance other than a hand-supported hair dryer, the use of HB material may require additional abnormal or severe conditions tests.

6.2.1 revised August 30, 2002

6.3 Metal enclosures

6.3.1 The minimum thickness of a metal enclosure shall be as indicated in Table 6.1.

Table 6.1
Minimum thickness of enclosure metal

	Thickness at small, flat, unreinforced surfaces and at surfaces that are reinforced by curving, ribbing, and the like (or are otherwise of a shape or size) to ensure adequate physical strength,		Thickness at surfaces to which a wiring system is to be connected in the field,		Thickness at relatively large unreinforced flat surfaces,	
Metal	inch	(mm)	inch	(mm)	inch	(mm)
Die-cast	3/64	1.2	–	–	5/64	2.0
Cast malleable iron	1/16	1.6	–	–	3/32	2.4
Other cast metal	3/32	2.4	–	–	1/8	3.2
Uncoated sheet steel	0.026[a]	0.66	0.032	0.81	0.026	0.66
Galvanized sheet steel	0.029[a]	0.74	0.034	0.86	0.029	0.74
Nonferrous sheet metal	0.036[a]	0.91	0.045	1.14	0.036	0.91

[a] Thinner sheet metal may be used if determined to be acceptable when the enclosure is evaluated under considerations such as those specified in 6.1.2.

6.4 Corrosion resistance

6.4.1 Iron and steel parts shall be made corrosion resistant by painting, galvanizing, plating, or other equivalent means if the malfunction of such unprotected parts would result in a risk of fire, electric shock, or injury to persons.

Exception No. 1: In constructions in which the oxidation of iron or steel due to the exposure of the metal to air and moisture will not be appreciable – thickness of metal and temperature also being factors – surfaces of sheet steel and cast-iron parts within an enclosure not required to be made corrosion resistant.

Exception No. 2: Bearings, lamination, or minor parts of iron or steel, such as washers, screws, and similar parts are not required to be made corrosion resistant.

6.4.2 A container for liquid shall be made resistant to the possible corrosive effect of the liquid intended to be used in the container.

6.5 Accessibility of live parts

6.5.1 An electrical part of an appliance shall be located or enclosed so that unintentional contact with any uninsulated live part and internal wiring will be prevented.

6.5.2 A part of the outer enclosure that is capable of being opened or removed by the user without using a tool (to attach an accessory, to make an operating adjustment, to replace a fuse, or for other reasons) is to be opened or removed when determining compliance with 6.5.1.

6.5.3 The enclosure of an appliance shall have no opening that permits a probe, as illustrated in Figure 6.1, to touch any part that involves a risk of electric shock.

6.5.3 revised June 16, 2004

Figure 6.1
Articulate probe with web stop

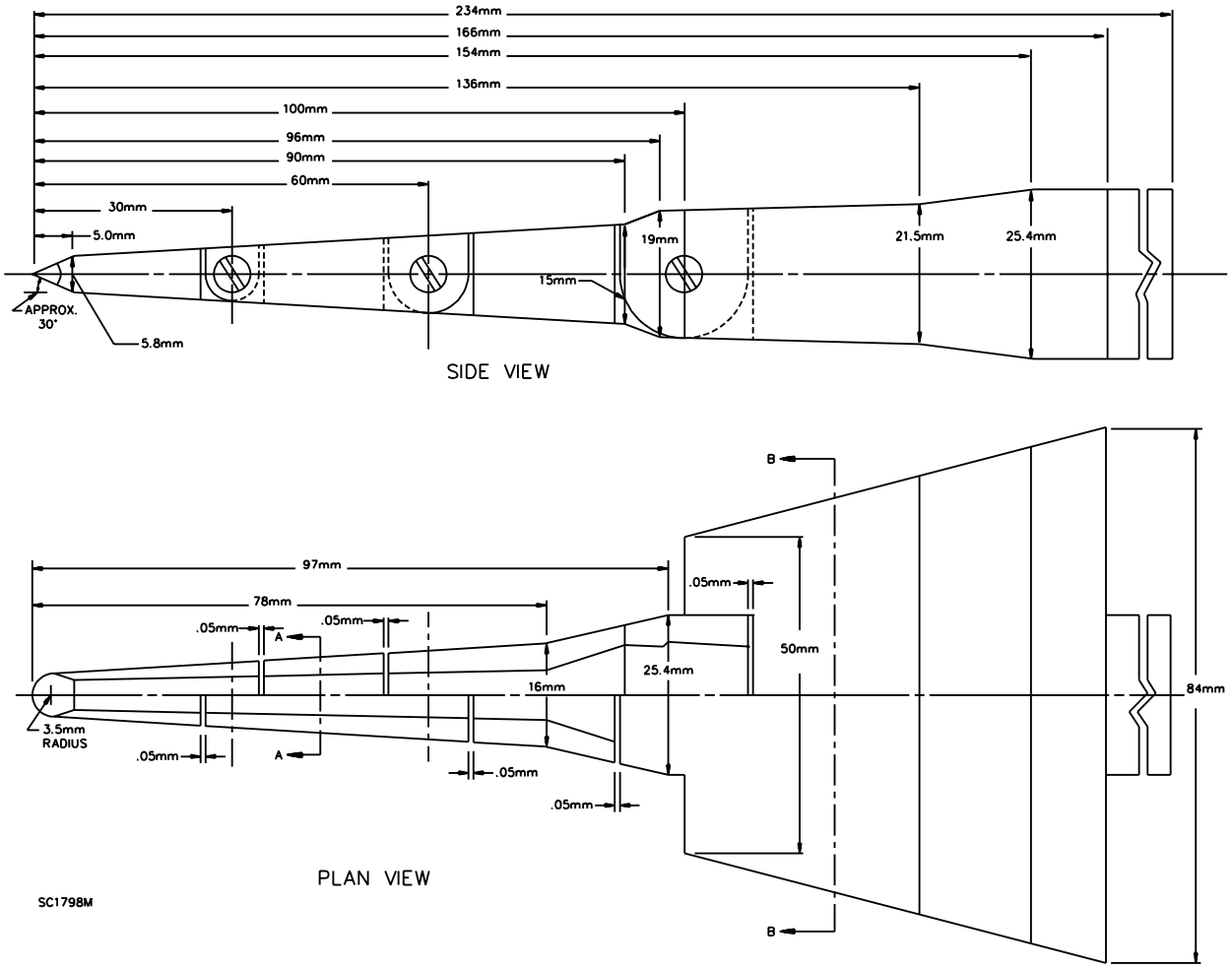
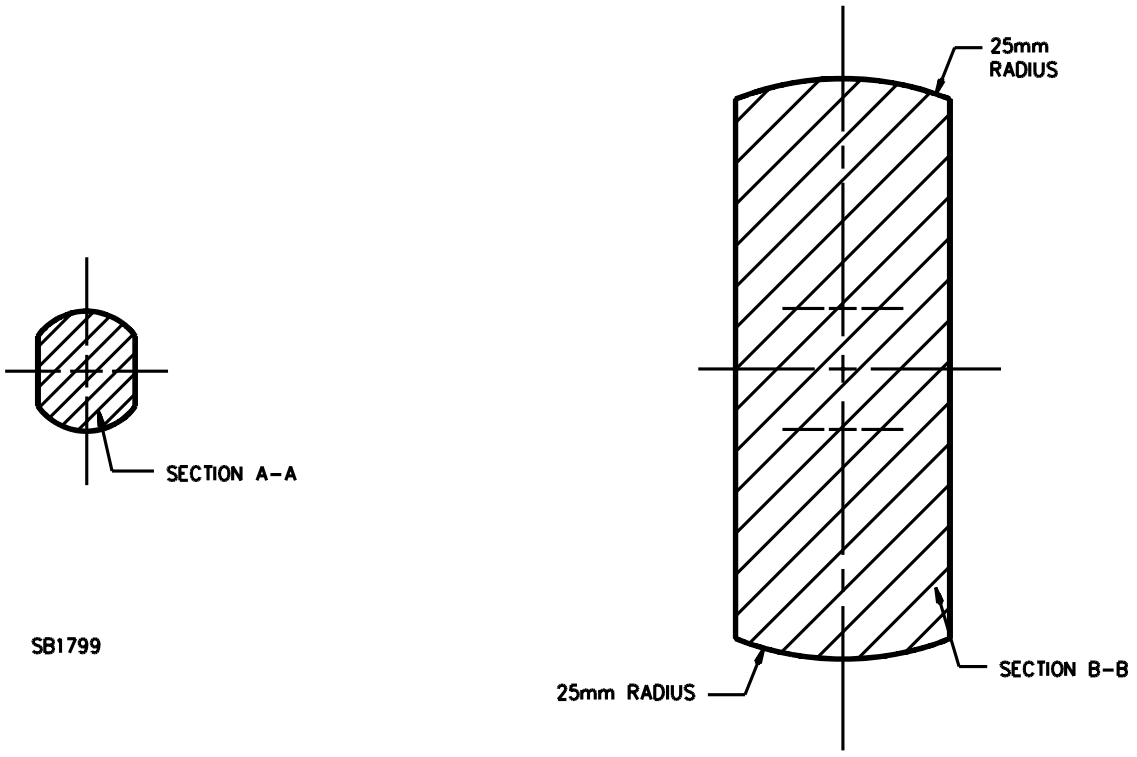


Figure 6.1 (Cont'd)

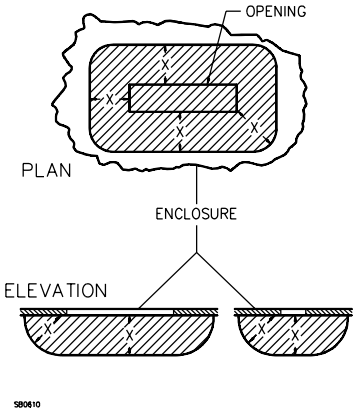


6.5.4 With regard to 6.5.3, the probe is to be articulated into any configuration and rotated or angled to any position before, during, or after insertion into the opening. The penetration shall be to any depth allowed by the opening size, including minimal depth combined with maximum articulation. The probe shall be applied with the minimum force required to determine accessibility and not as an instrument to evaluate the strength of a material.

6.5.4 revised August 30, 2002

6.5.5 An opening that will permit entrance of a 1-inch (25.4-mm) diameter rod is permitted when it complies with the conditions shown in Figure 6.2.

Figure 6.2
Opening in enclosure



NOTE – The opening is acceptable if, within the enclosure, there is no uninsulated live part or film-coated wire:

a) Less than X distance from the perimeter of the opening, as well as

b) Within the volume generated by projecting the perimeter X distance normal to its plane.

X equals five times the diameter of the largest diameter rod that can be inserted through the opening, but not less than 6-1/16 inches (154 mm).

6.5.6 A live part of a limited-energy circuit requires the same degree of protection against unintentional contact as a live part of a line voltage circuit.

6.5.7 Insulated brush caps do not require additional enclosure.

6.5.8 An area of an enclosure that is provided with a group of openings or with a guarded opening (such as a grille, louver, or screen) is to be subjected to the strength of enclosure test described in 28.1.

6.5.9 The enclosure of a remotely or automatically controlled appliance shall reduce the risk of molten metal, burning insulation, or flaming particles, from falling on combustible materials, including the surface upon which the appliance is supported.

6.5.10 The requirement in 6.5.9 will necessitate the use of a barrier of material that is resistant to combustion:

a) Under a motor unless:

1) The structural parts of the motor or of the appliance provide the equivalent of such a barrier;

2) The protection provided with the motor is such that no burning insulation or molten material falls to the surface that supports the appliance when the motor is energized under each of the following fault conditions:

i) Main winding opened;

ii) Starting winding opened;

iii) Starting switch short-circuited; and

iv) For a permanent split capacitor motor, the capacitor short-circuited (the short circuit is to be applied before the motor is energized, and the rotor is to be locked);

or

3) The motor is provided with a thermal motor protector (a protective device that is sensitive to temperature and current) that will prevent the temperature of the motor windings from exceeding 125°C (257°F) under the maximum load under which the motor will run without causing the protector to cycle, and from exceeding 150°C (302°F) with the rotor of the motor locked.

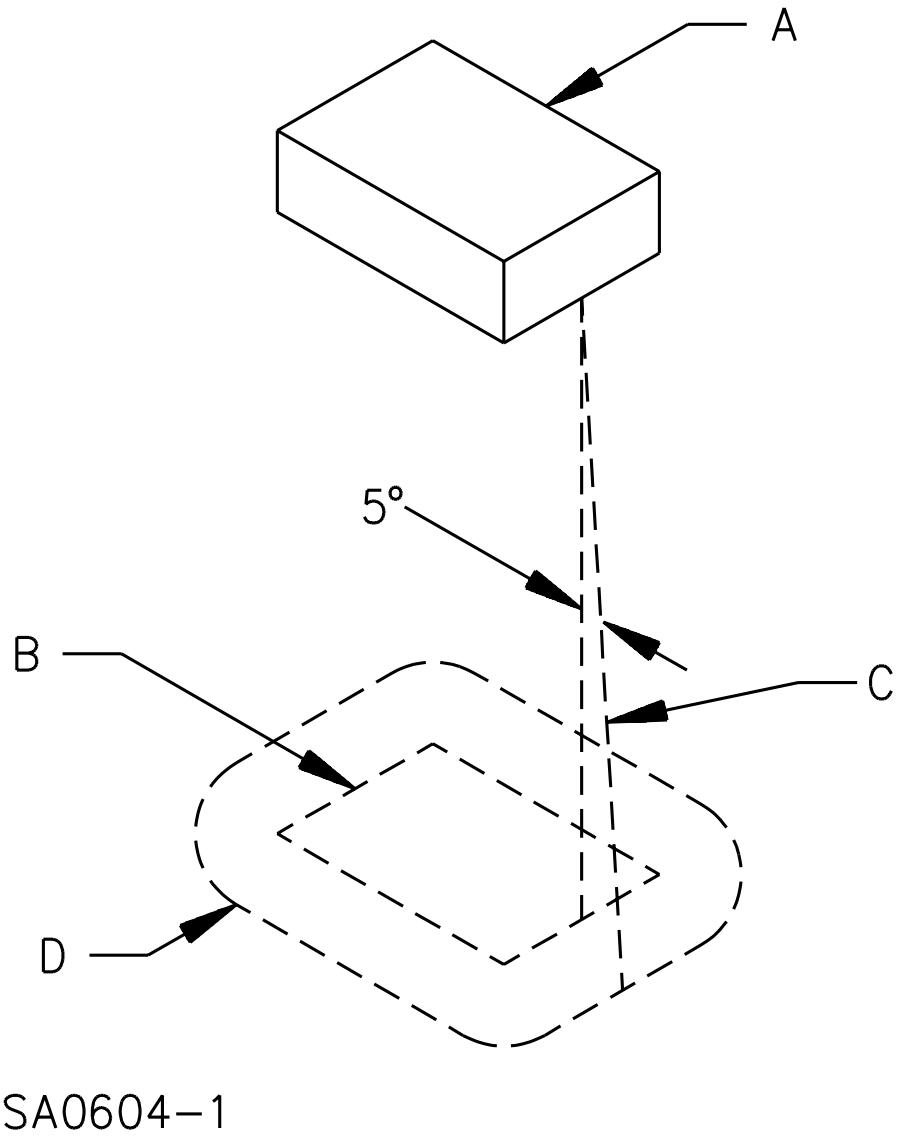
b) Under wiring, unless it is neoprene- or thermoplastic-insulated.

6.5.11 The requirement in 6.5.9 will also necessitate that a switch, relay, solenoid, or the similar part be individually and completely enclosed unless there is no opening in the bottom of the appliance enclosure, or it can be shown that malfunction of the component would not result in a risk of fire.

Exception: Terminals of a switch, relay, solenoid, or the like are not required to be individually and completely enclosed.

6.5.12 The barrier specified in 6.5.10 shall be horizontal, shall be located as indicated in Figure 6.3, and shall have an area no less than that described in Figure 6.3. An opening such as for drainage or ventilation, is permitted in the barrier if such an opening would not permit molten metal, burning insulation, or flaming particles to fall on combustible material.

Figure 6.3
Location and extent of barrier



A – Region to be shielded by barrier. This will consist of the entire component if it is not otherwise shielded, and will consist of the unshielded portion of a component which is partially shielded by the component enclosure or equivalent.

B – Projection of outline of component on horizontal plane.

C – Inclined line which traces out minimum area of barrier. When moving, the line is always:

1) Tangent to the component,

2) 5 degrees from the vertical, and

3) Oriented so that the area traced out on a horizontal plane is maximum.

D – Location (horizontal) and minimum area for barrier. The area is that included inside the line of intersection traced out by the inclined line C and the horizontal plane of the barrier.

6.6 Doors and covers

6.6.1 The door or cover of an enclosure shall be provided with means for holding it in the closed position.

6.6.2 The door or cover of an enclosure shall be hinged (or similarly attached) if it gives access to any overload protective device, the functioning of which requires renewal, or if it is necessary to open the cover in connection with the operation of the protective device. Such a door or cover shall be provided with a latch or similar device and shall be tight-fitting or shall overlap the surface of the enclosure around the opening.

7 Reduction of Risk of Injury to Persons

7.1 General

7.1.1 Materials that are relied upon to reduce the risk of injury to persons shall have such properties as to meet the demand of intended loading conditions.

7.1.2 Asbestos shall not be used.

7.1.3 A moving part that can result in a risk of injury to persons shall be enclosed or provided with other means to reduce unintentional contact.

7.1.4 With respect to the requirement specified in 7.1.3, the construction and intended use of the appliance are to be considered in investigating a guard or enclosure. Among the factors to be evaluated in evaluating the acceptability of an exposed moving part are:

a) The degree of exposure;

b) The sharpness of the moving part; and

c) The possibility of fingers, arms, hair, or clothing being drawn into the moving part (such as at points where gears mesh, where belts travel onto a pulley, or where moving parts close in a pinching or shearing action).

7.1.5 An appliance, or any item furnished with an appliance, shall have no sharp edge, burr, point, or spike inside or outside the appliance that results in injury to persons during intended use and maintenance.

7.1.6 On an appliance adjustable for height, means shall be provided for holding the upper parts securely in position. Means shall also be provided to prevent the upper part from descending rapidly if the securing means loosens or fails to operate as intended.

7.1.7 A hand-supported hair dryer shall have each air intake opening provided with a screen or equivalent means so that there are no openings larger than 0.004 square inch (0.03 cm^2).

7.2 Appliances with reservoirs

7.2.1 An appliance in which liquid reaches a temperature greater than 46°C (114.8°F) shall comply with the requirements specified in 7.2.2 – 7.2.4, 29.1 – 29.3, and 30.2.

Exception No. 1: An electrode-type appliance is not required to comply with these requirements. For requirements for an electrode-type appliance, see Sections 67 – 73.

Exception No. 2: A wax depilatory appliance is not required to comply with the requirements specified in 7.2.3, 7.2.4, and 29.1 – 29.3.

7.2.2 The construction of the appliance shall reduce the risk of injury to persons under conditions of intended use. Openings through which liquid can be emitted shall not be provided unless such openings are needed to perform an operating function.

7.2.3 An appliance with a vessel or container with a capacity of more than 32 fluid ounces (946 mL) shall be provided with a fully inserting or a lock-on lid.

7.2.4 If any part of an appliance requires assembly (for example, engagement of a twist-lock part), then improper assembly that results in a risk of injury to persons shall be clearly visible to the user.

7.3 Wax depilatory appliances

7.3.1 The maximum temperature of the wax, measured as described in 37.2.1 – 37.2.3, shall not exceed 75°C (167°F).

7.3.2 The maximum temperature rise of surfaces that may be contacted by the user shall be as specified in Table 37.2.

7.3.3 When there are multiple heat settings (for example, a setting for maintaining molten wax at the intended temperature for application to all of the skin and a higher heat setting for quick melting of solid wax), the appliance shall comply with all of the following:

a) If the wax is capable of being heated above 75°C (167°F) for quick melting, the reservoir in which the wax is so heated shall be provided with a nonremovable, self-closing lid or cover.

b) A visible overheat condition indicator shall be provided. Such an indicator shall indicate when the wax temperature exceeds 75°C. This indicator shall be separate and independent of any other temperature indicator (for example, an indicator light whose functioning depends upon the setting of an adjustable thermostat) which may be provided. See 37.2.3, 63.7(l)(12), and 65.8(e).

c) A marking (such as a number or symbol) shall be provided adjacent to each heat selector position. A permanent marking shall be provided on the appliance in accordance with 61.8.1(b), and the Use and Care Instructions shall warn the user against applying wax that has been heated at a setting higher than the intended setting [see 63.7(l)(12)].

d) A part of a temperature control that is user-operated (an adjustment knob or similar part) shall be constructed so that deliberate and positive action by the operator is required to select a heat setting or to change from one heat setting to another. A construction that requires two separate and distinct motions by the user (such as push and turn) is an example of a control that complies with this requirement.

7.3.4 With reference to 7.3.3(a), a nonremovable cover is one which requires special tools (tools not available to other than service personnel) for removal. A self-closing cover is a cover that returns to its fully closed position without any action on the part of the user other than releasing it from any opened position while the appliance is supported by a flat, horizontal surface.

7.3.5 In accordance with 39.8.5 and 65.8, if the malfunction of a temperature-regulating control increases the application temperature of the wax above 75°C (167°F), visible means, such as an indicator light, shall be provided to inform the user of an overheat condition.

Exception: A visible overheat condition indicator is not required if a thermal cutoff or a trip-free manual-reset thermostat operates upon short-circuiting of the temperature-regulating control. The temperatures attained by the wax, and surfaces of the appliance that are handled or contacted by the user during intended use, at the time the thermal cutoff or thermostat opens shall not present a risk of burn as determined by an appropriate investigation. The investigation shall include consideration of the length of time that temperatures remain above the specified limits, the thermal inertia of the materials involved, and similar factors.

8 Mechanical Assembly

8.1 An appliance that involves a motor or other vibrating part shall be assembled such that the appliance will not be affected adversely by the vibration. Brush caps shall be tightly threaded or otherwise constructed to prevent loosening.

8.2 A switch (other than a through-cord switch), lampholder, receptacle, motor-attachment plug, or similar component shall be mounted securely and shall be prevented from turning.

Exception No. 1: Turn-prevention means for a switch are not required, when all the following conditions are met:

a) The switch is of the plunger or other type that does not tend to rotate when operated (a toggle switch is subject to forces that tend to rotate the switch during intended operation of the switch);

b) The means of mounting the switch is such that the operation of the switch will not result in the switch becoming loosened;

c) The spacings are not reduced below the minimum required values, if the switch does rotate; and

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

Exception No. 2: A lampholder in which the lamp cannot be replaced (such as a neon pilot or indicator light in which the lamp is sealed in by a nonremovable jewel) is not required to be prevented from turning if the rotation cannot reduce spacings below the minimum required values.

8.3 Friction alone shall not be relied on for turn-prevention as required in 8.2. A lock-washer, applied as intended, is a reliable means of turn-prevention of a device with a single-hole mounting means.

8.4 A positive means shall be provided to prevent parts of an appliance from turning with respect to each other if such turning would result in reduction of spacings, twisting of wires, and the like.

Exception: If such parts depend upon 3/8 inch (9.5 mm) or larger pipe threads, no additional means to prevent turning need be provided.

8.5 A fastener that secures the insulating tip of a curling iron, a heated brush, or a similar appliance shall be constructed, fastened, or located so as to prevent the fastener from becoming loosened if such loosening can result in a risk of fire or electric shock.

8.6 Compliance with the requirement specified in 8.5 may be accomplished by use of:

a) Staked and upset screws,

b) Screws with properly applied lock washers,

c) Press fitting of the insulating tip into place, or

d) Other equivalent means.

A polymeric material relied upon to prevent the fasteners from loosening shall have the required mechanical strength, resistance to heat, and dimensional stability. All of these properties are to be considered with respect to thermal aging.

8.7 If any part of a metal spring of a hair clamp of a curling iron or a similar appliance can become loose inside the enclosure of electrical parts as a result of breakage of the spring, the construction shall be such that electrical spacings will not be reduced.

8.8 Compliance with the requirement specified in 8.7 may be accomplished by

a) Locating all parts of the spring outside the enclosure of electrical parts,

b) Using barriers,

c) Using physical restraints, or

d) Using other equivalent means.

8.9 The temperature sensor of a temperature controller, a thermostat, a thermal cutoff, or a similar device shall be secured in place.

9 Stability

9.1 A floor- or counter-supported appliance shall be constructed such that it will not be overturned when tested in accordance with 30.1.

Exception: An appliance whose overturning during intended use will not present a risk of burns or injury to persons need not be tested.

9.2 With regard to 9.1, a hand-supported hair dryer provided with a stand for conversion into a counter-supported hair dryer is to be evaluated as a hand-supported appliance and is not to be subjected to the stability test.

9.3 A wax depilatory appliance shall be tested and the results shall be evaluated as described in 30.2, except that the wax may be in any combination of solid and liquid states anticipated during the intended operation of the appliance. Any movable parts or covers are to be in the positions that result in the most adverse conditions of use.

Exception: The test need not be conducted on a construction for which there is no possibility of molten wax spilling from its container under any condition of use, such as constructions in which the wax material is contained within completely enclosed wax applicators.

10 Hanging and Mounting Means

10.1 A wall-hung or a wall-mounted appliance shall withstand a force as described in 51.1 without evidence of damage to the mounting surface, to the hanging means, to the mounting means, or to the appliance that results in the risk of electric shock, fire, or injury to persons.

10.2 A cord-connected appliance that is provided with keyhole slots, notches, hanger holes, or similar feature, for hanging the appliance on a wall, shall be:

a) Provided with the necessary hardware for hanging the appliance in accordance with the installation instructions and

b) Constructed in such a manner that the hanging means (such as screws) shall not be accessible without removing the appliance from the supporting means.

10.3 When determining compliance with 10.2, any part of the enclosure or barriers that can be removed without the use of tools to gain access to the hanging means is to be removed.

10.4 A keyhole slot, notch, or hanger hole shall be located so that the supporting screws or similar hardware cannot damage any electrical insulation or reduce spacings to current-carrying parts of the appliance.

10.5 A permanently installed wall-mounted appliance shall be provided with the necessary hardware for mounting in accordance with the installation instructions.

Exception: Small parts commonly available for the mounting of the appliance need not be provided if the installation instructions refer to such parts as specified in 64.4.

11 Supply Connections

11.1 Permanently-connected appliances

11.1.1 An appliance intended for permanent connection to a power supply, either by being fastened in place, located in a dedicated space, or both, shall have provision for connection of one of the wiring systems that is acceptable for the appliance.

Exception: If an appliance is not intended for permanent connection to a power supply, but is intended to be either fastened in place, located in a dedicated space, or both, it may be provided with a short length of flexible cord in accordance with 11.3.1.1 – 11.3.1.3 and 11.3.1.6 and with an attachment plug for supply connection. The investigation of such a feature will include consideration of the utility of the appliance and the reasons for having it detachable from its supply source by means of the attachment plug.

11.1.2 The location of a terminal box or compartment in which a power supply connection to a permanently-connected appliance is to be made shall be such that the connection may be readily inspected after the appliance is installed as intended.

11.1.3 A terminal compartment intended for the connection of a supply raceway shall be attached to the appliance so as to be prevented from turning.

11.2 Wiring terminals

11.2.1 An appliance intended for permanent connection to the power supply shall be provided with wiring terminals or leads for connection of supply circuit conductors. Such wiring terminals or leads shall accommodate conductors having an ampacity of not less than 125 percent of the appliance current rating when the load is continuous (3 hours or more), and not less than the appliance current rating when the load is intermittent.

11.2.2 For the purpose of these requirements, wiring terminals are considered to be terminals to which power supply or control connections will be made in the field when the appliance is installed.

11.2.3 A wiring terminal shall be provided with a soldering lug or with a pressure terminal connector securely fastened in place (for example, firmly bolted or held by a screw).

Exception: A wire-binding screw may be used at a wiring terminal intended to accommodate a No. 10 AWG (5.3 mm^2) or smaller conductor if upturned lugs or the equivalent are provided to hold the wire in position.

11.2.4 A wiring terminal shall be prevented from turning or shifting in position by means other than friction between surfaces. This may be accomplished by two screws or rivets; by square shoulders or mortices; by a dowel pin, lug, or offset; by a connecting strap or clip fitted into an adjacent part; or by an equivalent means.

11.2.5 A wire-binding screw at a wiring terminal shall be no smaller than No. 10 (4.8 mm).

Exception: A No. 8 (4.2 mm) screw may be used at a terminal intended only for the connection of a No. 14 AWG (2.1 mm^2) conductor, and a No. 6 (3.5 mm) screw may be used for the connection of a No. 16 AWG (1.3 mm^2) or No. 18 AWG (0.82 mm^2) control-circuit conductor.

11.2.6 A terminal plate tapped for a wire-binding screw shall be of metal not less than 0.050 inch (1.27 mm) thick. There shall be two or more full threads in the metal, which may be extruded if necessary to provide the threads.

Exception: A plate less than 0.050 inch thick, but not less than 0.030 inch (0.762 mm) thick, is acceptable if the tapped threads are determined to have equivalent mechanical strength.

11.2.7 Upturned lugs or a cupped washer shall be capable of retaining a conductor of the size specified in 11.2.1, but not smaller than No. 14 AWG (2.1 mm^2), under the head of the screw or the washer.

11.2.8 A wire-binding screw shall thread into metal.

11.2.9 An appliance intended for connection to a grounded power supply conductor and using a:

a) Lampholder or element holder of the Edison screw shell type,

b) Single pole switch, or

c) Single pole automatic control

shall have one terminal or lead intended for connection of the grounded conductor of the supply circuit. The terminal or lead intended for grounded connection shall be the one that is connected to the screw shell of a lampholder or element holder and that has no connection to a single pole switch or single pole automatic control.

Exception: With regard to connection of a single pole automatic control, the requirements specified in 23.1 shall apply.

11.2.10 A terminal intended for the connection of a grounded circuit conductor shall be made of, or plated with, a metal substantially white in color and shall be readily distinguishable from the other terminals. If not of such metal, the identification of that terminal shall be clearly shown in some other manner, such as on an attached wiring diagram. A lead intended for the connection of a grounded circuit conductor shall be finished to show a white or gray color and shall be readily distinguishable from the other leads.

11.2.11 The free length of a lead inside an outlet box or wiring compartment shall be 6 inches (152.4 mm) or more if the lead is intended for field connection to an external circuit.

Exception: A lead may be less than 6 inches long if it is evident that the use of a longer lead will result in a risk of fire, electric shock, or injury to persons.

11.2.12 The surface of an insulated lead intended solely for the connection of an equipment-grounding conductor shall be green, with or without one or more yellow stripes, and no other lead shall be so identified.

11.2.13 A wire-binding screw intended for the connection of an equipment grounding conductor shall have a green colored head that is hexagonal shaped, slotted, or both. A pressure wire connector shall be plainly identified as such by being marked ″G,″ ″GR,″ ″GND,″ ″Grounding,″ or the like or by a marking on the wiring diagram provided on the appliance. The wire-binding screw or pressure wire connector shall be located so that it is unlikely to be removed during servicing of the appliance.

11.2.14 A terminal solely for connection of an equipment grounding conductor shall be capable of securing a conductor of the correct size for that purpose.

11.3 Cord-connected appliances

11.3.1 Cords and plugs

11.3.1.1 An appliance shall be provided with a length of flexible cord in accordance with Table 11.1 and an attachment plug for connection to the supply circuit. A coiled cord shall not be used with a floor- or counter-supported appliance where such use would present a risk of burn, fire, electric shock, or injury to persons (for example, the appliance being pulled off a table by the force of the cord). The cord length is measured from the point of cord entry into the enclosure, or into the wiring device at the appliance end of the cord, to the face of the attachment plug. The length for a coiled cord is to be measured with the cord in an uncoiled position.

Exception: When a power supply cord contains a right-angle attachment plug, the cord length shall be measured from the point of cord entry into the enclosure, or into the wiring device at the appliance end of the cord, to the edge of the line blades or grounding pin nearest the point of cord entry into the attachment plug as shown in Figure 11.1.

11.3.1.1 revised August 30, 2002

Table 11.1
Cord lengths for specific conditions

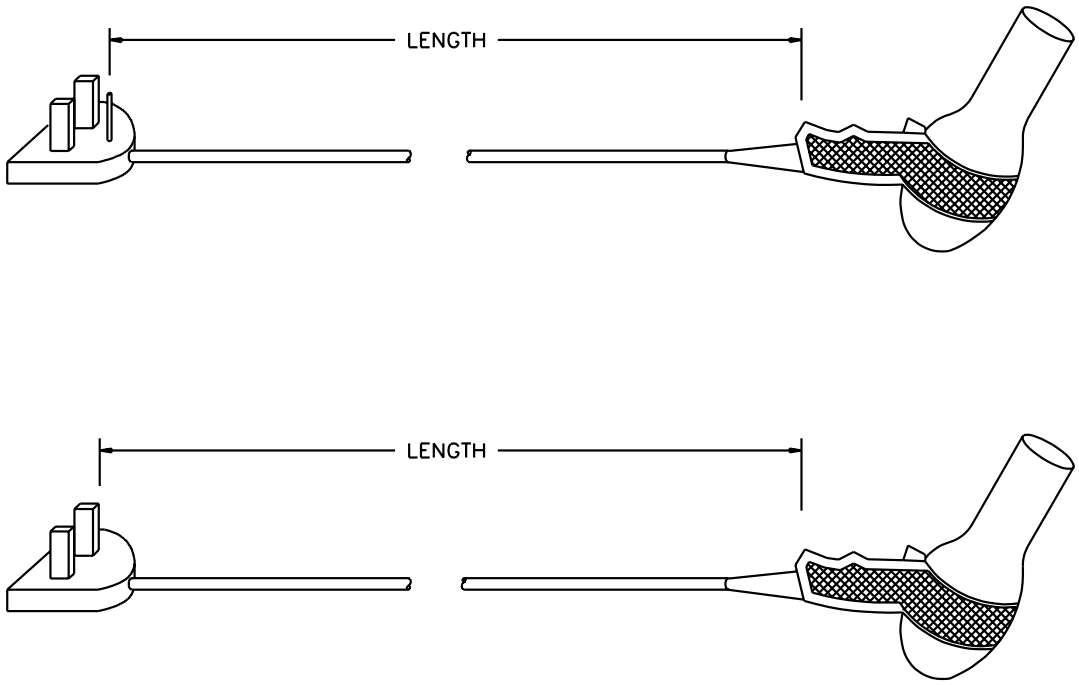
Type of appliance	Cord length			
	Minimum,		Maximum,	
	feet	(m)	feet	(m)
Appliance supported by hand or by table or counter top	5	1.52	9	2.74
Wall-hung appliances with attached appliance supported by hand	5[a]	1.52	9[a]	2.74
	2[b]	0.61	3[b]	0.91
Appliance usually supported by head, shoulder, or back	6	1.83	12	3.66
Any appliance having a jacketed cord	See note[c]		Not specified	

[a] Between wall unit and hand unit.

[b] Between wall unit and receptacle.

[c] As specified elsewhere in this table or in 11.3.1.1.

Figure 11.1
Power supply cord length measurement for right angle attachment plugs



11.3.1.2 The flexible cord:

a) May be permanently attached to the appliance or

b) For other than a hand-supported appliance, may be in the form of a detachable power supply cord with means for connection to the appliance.

Examples of the means for connection are an appliance plug, a flatiron plug, or a cord connector cooperating with pin or blade terminals on the appliance.

11.3.1.3 The ampacity of the cord and of the plug shall not be less than the current rating of the appliance. The cord and the plug voltage rating shall be at least equal to the rated voltage of the appliance.

11.3.1.4 With respect to 11.3.1.3, the voltage rating of a dual voltage appliance is deemed to be that to which the appliance is set when it is shipped from the factory.

11.3.1.5 If a dual-voltage appliance is provided with an adapter for connection to an alternate supply source, the adapter shall comply with the applicable requirements in the Standard for Attachment Plugs and Receptacles, UL 498.

11.3.1.6 The flexible cord shall be of a type indicated in Table 11.2 or the equivalent.

Table 11.2
Required types of cord and applicable limitations on their use

Appliance on which the cord is to be used	Required cords where temperatures higher than 121°C (250°F) are attained on any surface the cord can touch	Required cords where 121°C (250°F) or lower temperatures are attained on any surface the cord can touch
Floor supported	HPN[a], HSJ, HSJO, HS, kHSO	SP-2[a], SPE-2[a], SPT-2[a], SV[a], SVE[a], SVO[a], SVOO[a], SVT[a], SVTO[a], SVTOO[a] SJ, SJE, SJO, SJOO, SJT, SJTO, SJTOO, S, SE, SO, SOO, ST, STO, STOO
Hand-supported hair dryers, heated air curling irons and brushes, and, except as noted in Note (b), counter-supported appliances	HPD, HPN, HSJ, HSJO	SP-2, SPE-2, SPT-2, SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO, SJ, SJE, SJO, SJOO, SJT, SJTO, SJTOO, SP-1[b], SPE-1[b], SPT-1[b]
Facial saunas	–	SP-1, SPE-1, SPT-1
Combs	SP-2, SPE-2 or SPT-2, HPN	SP-2, SPE-2 or SPT-2, HPN
Curling irons and brushes, manicure and pedicure sets, hair crimping and hair straightening irons, and similar hand-supported appliances	TPT[c], SPT-1, XT[d], HPD	TPT[c], SP-1, SPE-1, SPT-1, XT[d], HPD

[a] Acceptable if the following conditions are met:

1) The unit is not provided with rollers, castors, or similar parts, and

2) The point of cord entry to the unit is at least 3 feet (0.91 m) above the floor with the unit in any operating configuration.

[b] Acceptable on counter-supported appliances weighing 1/2 pound (0.23 kg) or less. The weight is to be determined without the power supply cord.

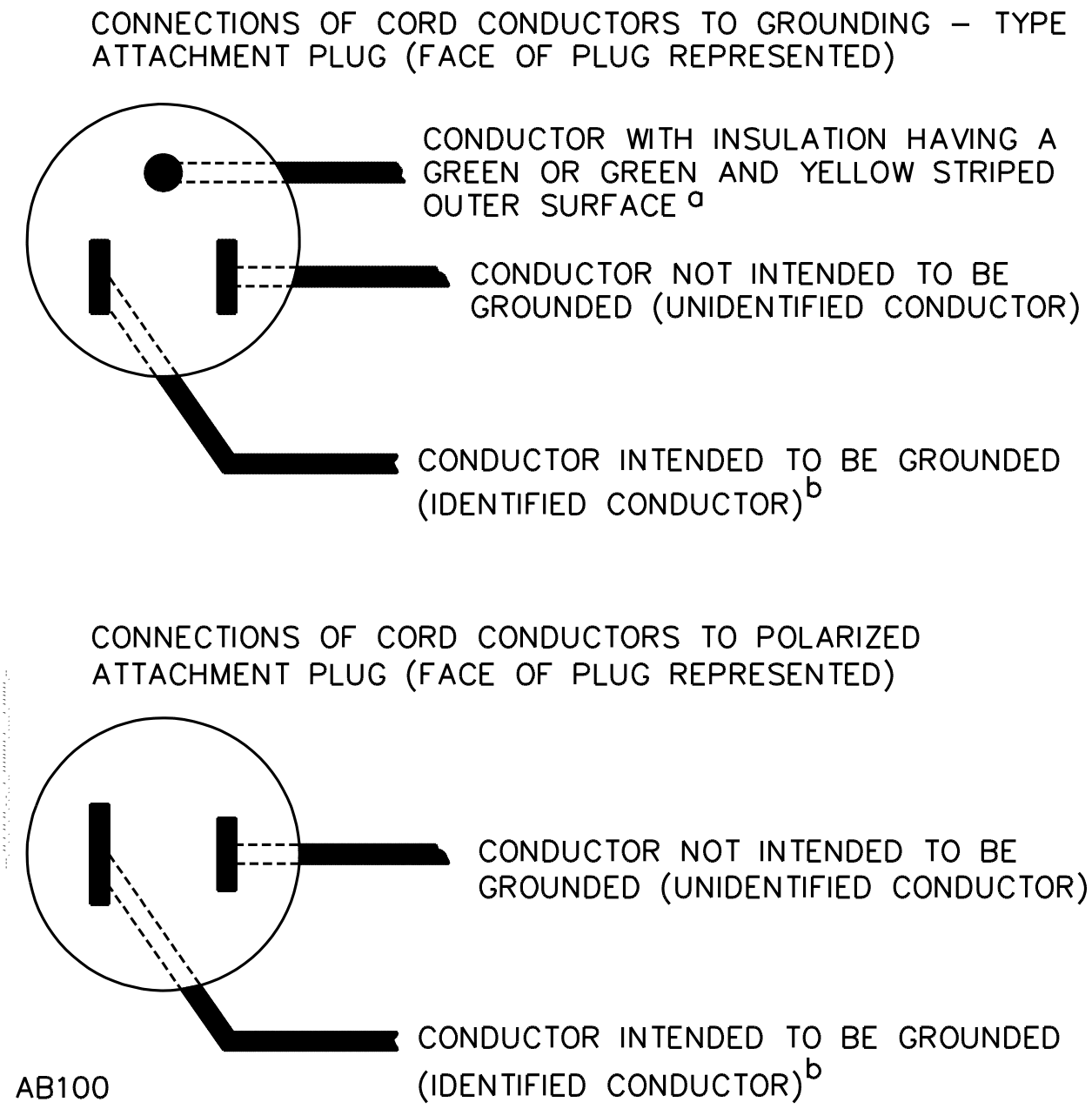
[c] Acceptable for use with appliances rated 50 watts or less and weighing 1/2 pound (0.23 kg) or less. The weight is to be determined without the power supply cord.

[d] Minimum No. 20 AWG (0.52 mm^2) parallel 2-conductor construction required.

11.3.1.7 The attachment plug of a cord-connected appliance, and the integral blades of a direct plug-in appliance, provided with a 15- or 20-ampere general-use receptacle shall be of the 3-wire grounding type. The attachment plug and the integral blades of all other cord-connected and direct plug-in appliances provided with either a line-connected, single-pole on-off switch or overcurrent protective device, or an Edison-base lampholder shall be polarized or of the grounding type.

11.3.1.8 When a 3-wire grounding-type attachment plug or a 2-wire polarized attachment plug is provided, the attachment plug connections shall comply with Figure 11.2 and the polarity identification of the flexible cord shall comply with Table 11.3.

Figure 11.2
Connection to attachment plug



[a] In the above illustration, the blade to which the green conductor is connected may have a U-shaped or a circular cross section.

[b] Signifies a conductor identified in accordance with Table 11.3.

Table 11.3
Polarity identification of flexible cords

Method of polarity identification	Required combinations	
	Wire intended to be grounded[a]	All other wires[a]
Colored braid	Solid white or gray	Solid color other than white or gray
Tracer in braid	Solid white or gray braid with no tracer in braid[b]	Solid white or gray braid with a colored tracer in braid[b]
	Colored tracer in braid of a color other than white or gray	No tracer in braid of solid color other than white or gray
Colored insulation[c]	Solid white or gray	Solid color other than white or gray
	Light blue[d]	Solid color other than light blue, white, or gray[d]
Colored separator[e]	White or gray	Color other than white or gray
Tinned conductors[f]	Tin or other white metal on all strands of the conductor	No tin or other white metal on the strands of the conductor
Surface marking[e]	One or more stripes, ridges, or grooves, or a combination of these on the exterior surface of the cord	

[a] A conductor having insulation finished to show a green color with or without one or more straight or helical unbroken yellow stripes or having a green braid with or without one or more yellow tracers is to be used only as an equipment grounding conductor. See also 25.4 for the description of an equipment grounding conductor and Figure 11.2 for the connection of conductors to attachment plugs.

[b] Only for Types C and PD cords.

[c] Only for a cord having no braid on any individual conductor.

[d] Only for a cord having a jacket that is not integral with the circuit conductor insulation.

[e] Only for Types SP-1, SP-2, SPE-1, SPE-2, SPT-1, and SPT-2 cords.

[f] Only for Types SPT-1 and SPT-2 cords.

11.3.1.9 Type SPT-2, SVT, or SVTO flexible cord may be used for connecting a pendant-type on-off switch, a temperature control, or both to a table- or floor-supported hair dryer.

11.3.2 Pin terminals

11.3.2.1 When an appliance is provided with pin terminals, the construction of the appliance shall be such that no live part will be exposed to unintentional contact both during and after the placement of the plug on the pins in the intended manner.

11.3.2.2 When an appliance is provided with pin terminals, a pin guard is required, such that:

a) A straight edge placed in any position, including across and in contact with edges of the plug opening without the plug in place, cannot be made to contact any current-carrying pin.

b) With the plug aligned with the pins and the face of the plug in a plane located perpendicular to the end or ends of the farthest projecting current-carrying pin, the probe illustrated in Figure 6.1 shall not touch any current-carrying pin while the probe is inserted through any opening with the appliance in any position.

11.3.2.3 When the pins on the appliance are of American National Standard configuration, the plug used in 11.3.2.2(b) shall consist of an appliance plug in accordance with the Standard for Wiring Devices – Dimensional Requirements, ANSI/NEMA WD6.

11.3.2.4 When the pins on the appliance are not of an American National Standard configuration, the plug used in 11.3.2.2(b) shall be the plug supplied with the appliance – 125 volts, 10 amperes, and 250 volts, 5 amperes.

11.3.2.5 When an appliance uses three or more pin terminals intended for use with a plug that covers all the pins, the terminals shall be spaced so that they will not accommodate a flatiron, appliance plug, or cord connector. These pins shall accommodate the plug required for the particular application.

11.3.2.6 A pin terminal shall be securely and rigidly mounted and shall be prevented from shifting in position by means other than friction between surfaces.

11.3.2.7 The requirement specified in 11.3.2.6 is intended primarily to provide for the maintenance of spacings as specified in 24.6, and to maintain required spacings between pin terminals. Under this requirement, consideration is also to be given to the means for locking terminals in position to maintain tightness.

11.3.2.8 For a heating appliance, the dimensions of pins and their center-to-center spacings (including the corresponding spacings of the female contacts of general use plugs that these arrangements of pins will accommodate) shall be as indicated in Table 11.4.

Table 11.4
Pins

Type and rating of plug that accommodates the pins	Pin configuration				Pin diameter,		Pin length,	
	Number	Arrangement	Spacing between centers, inch	(mm)	inch	(mm)	inch	(mm)
Appliance plug rated for 5 amperes at 250 volts and for 10 amperes at 125 volts	2	In line	1/2	12.7	5/32 ±0.005	4.0 ±0.13	9/16 – 5/8	14.3 – 15.9
Flat-iron plug rated for 5 amperes at 250 volts and for 10 amperes at 125 volts	2	In line	11/16	17.5	3/16 ±0.005	4.8 ±0.13	3/4 – 7/8	19.1 – 22.2
Jumbo appliance plug rated for 10 amperes at 250 volts and for 15 amperes at 125 volts	2	In line	1-1/16	27.0	3/16 ±0.005	4.8 ±0.13	3/4 – 7/8	19.1 – 22.2
Reversible plug (for two-heat control) rated for 10 amperes at 250 volts and for 15 amperes at 125 volts[a]	3	In line	7/8	22.2	3/16 ±0.005	4.8 ±0.13	3/4 – 7/8	19.1 – 22.2
Reversible plug (for two-or three-heat control) rated for 10 amperes at 250 volts and for 15 amperes at 125 volts[a]	3	One pin at each apex of an equilateral triangle	7/8	22.2	3/16 ±0.005	4.8 ±0.13	3/4 – 7/8	19.1 – 22.2

[a] This plug is usually made without a contact in one of the holes.

11.3.2.9 The material on which the pins are mounted, the proximity of any vapor outlet to the terminals, and the direction of the vapor spray shall be such that water shall be prevented from accumulating at the terminal.

11.4 Strain relief

11.4.1 Strain relief shall be provided such that stress on a flexible cord will not be transmitted to a terminal, splice, or internal wiring in the appliance or in a fitting (attachment plug, appliance plug, or similar component.

11.4.2 If a knot in a flexible cord serves as strain relief, the surface against which the knot bears or with which it contacts shall be free of any projection, sharp edge, burr, fin, results in abrasion of the insulation on the conductors.

11.5 Bushings

11.5.1 At a point where a flexible cord passes through an opening in a wall, barrier, or enclosing case, there shall be a bushing or the equivalent that is substantial, reliably secured in place, and that has a smooth, rounded surface against which the cord bears. The bushing or the equivalent is to protect the cord from abrasion damage; it is not intended for strain-relief or flex-relief purposes. An insulating bushing shall be provided if:

a) Type SP-1, SPE-1, SPT-1, SP-2, SPE-2, SPT-2, or other cord lighter than Type HSJ is used;

b) The wall or barrier is of metal; and

c) Construction is such that the cord might be subjected to strain or motion.

The heat- and moisture-resistant properties of the bushing material shall be that required for the particular application.

11.5.2 If the cord hole is in wood, porcelain, phenolic composition, or other nonconducting material, a smooth rounded surface is deemed equivalent to a bushing.

11.5.3 Ceramic materials and some molded compositions are acceptable for insulating bushings. A separate bushing of wood or rubber material (other than in a motor) is not. Vulcanized fiber may be used if the bushing is no less than 1/16 inch (1.6 mm) thick [with a minus tolerance of 1/64 inch (0.4 mm) for manufacturing variations] and if it is formed and secured in place so that it will not be affected adversely by conditions of ordinary moisture.

11.5.4 A separate soft rubber, neoprene, or polyvinyl chloride bushing may be used in the frame of a motor or in the enclosure of a capacitor physically attached to a motor (but not elsewhere in an appliance) when:

a) The bushing is not less than 1/16 inch (1.6 mm) thick, with a minus tolerance of 1/64 inch (0.4 mm); and

b) The bushing is located so that it will not be exposed to oil, grease, oily vapor, or other substance having a harmful effect on the bushing material.

Exception: A bushing of any of the materials specified may be used at any point in an appliance if used in conjunction with a type of cord for which an insulating bushing is not required and if the edges of the hole in which the bushing is mounted are smooth and free from any burr, fin, or similar abrading surface.

11.5.5 An insulated metal grommet may be used in place of an insulating bushing if the insulating material used is not less than 1/32 inch (0.8 mm) thick and completely fills the space between the grommet and the metal in which it is mounted.

11.6 Direct plug-in appliances

11.6.1 With regard to Figure 11.3, the maximum moment, center of gravity, dimensions, and weight of a direct plug-in appliance shall comply with the requirements specified in (a) – (d). See 11.6.2 and 11.6.3 for symbol definitions and methods of application:

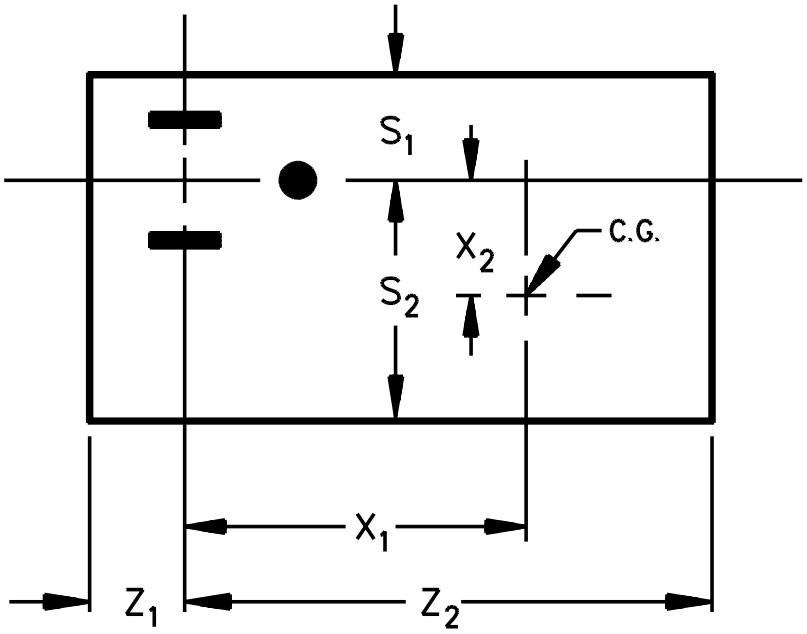
a) The quotient of WY/Z shall not exceed 48 ounces (1.36 kg).

b) The quotient of WY/S shall not exceed 48 ounces.

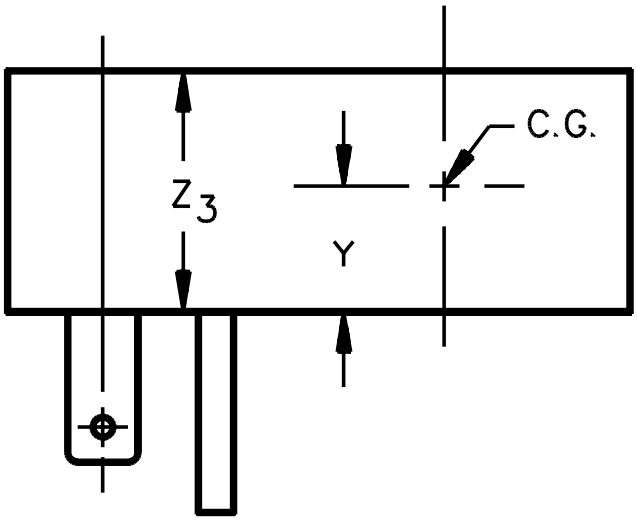
c) The product of WX shall not exceed 80 ounce-inches (0.56 N•m).

d) The weight of an appliance shall not exceed 28 ounces (0.79 kg).

Figure 11.3
Dimensions of a direct plug-in appliance



FRONT VIEW



SIDE VIEW

C.G. = Center of Gravity

CP100

11.6.2 Definitions for the symbols used in 11.6.1 are as follows:

a) W is the weight of the appliance.

b) Y is the distance illustrated in Figure 11.3.

c) Z is the shorter distance, Z_1 or Z_2, as illustrated in Figure 11.3.

d) S is the shorter distance, S_1 or S_2, as illustrated in Figure 11.3.

e) X is the longer distance, X_1 or X_2, as illustrated in Figure 11.3.

11.6.3 The moment and weight specified in 11.6.1 are to be determined as follows for:

a) An appliance with an attached cord, the cord is to be cut off at the enclosure or at the strain-relief means if the strain-relief means extends outside the enclosure.

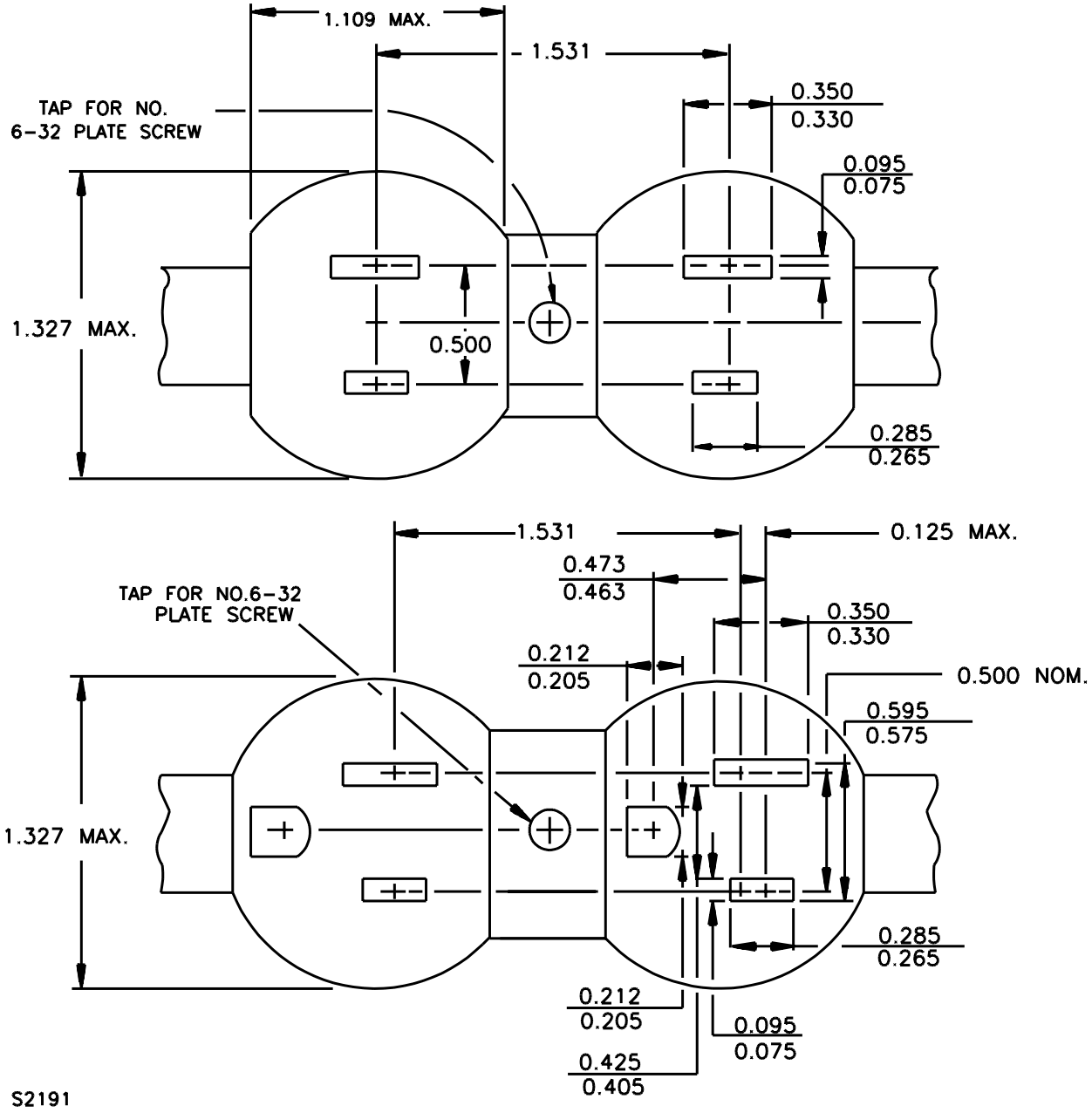
b) An appliance with a directly mounted accessory, the values are to be measured with the accessory in place.

c) An appliance with a mounting tab, the tab is not to be included in the measurement of linear dimensions for the purpose of determining moments.

11.6.4 When inserted in a parallel-blade duplex receptacle, any part of an appliance, including a mounting tab, shall not interfere with full insertion of an attachment plug into the adjacent receptacle as illustrated in Figure 11.4.

Exception: An appliance that renders the adjacent receptacle completely unusable is acceptable.

Figure 11.4
Parallel receptacle duplex



11.6.5 An appliance shall not be provided with a mounting tab unless all the following conditions are met:

a) The appliance is of a type such that semipermanent mounting will not introduce a risk of fire or electric shock;

b) The appliance is intended for use on a 15-ampere, 125-volt receptacle;

c) A screw is provided and constructed so as to secure the mounting tab of the appliance to a parallel-blade duplex receptacle that has a center screw, as shown in Figure 11.4;

d) For an appliance without a grounding pin, the mounting tab is constructed so that the appliance may be mounted to both grounding and nongrounding receptacles; and

e) A marking as specified in 61.7.1 is provided.

11.6.6 The enclosure of a direct plug-in appliance shall be capable of being gripped for removal from the receptacle to which it is connected, and the perimeter of the face section from which the blades project shall be no less than 5/16 inch (7.9 mm) from any point on either blade.

Exception: For tab-mounted appliances intended for use with fixed systems, the perimeter of the face section shall not be less than 1/4 inch (6.4 mm) from any point on either blade.

12 Live Parts

12.1 A current-carrying part shall be of silver, copper, a copper alloy, or equivalent material.

12.2 Plated iron or steel may be used for a current-carrying part:

a) Whose temperature during intended operation is more than 100°C (212°F);

b) Within a motor or associated governor; or

c) If provided in a component in accordance with 2.1; but unplated iron or steel shall not be used.

Exception: Stainless steel and other corrosion-resistant alloys may be used for current-carrying parts regardless of temperature.

12.3 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 motion results in a reduction of spacings below the minimum required values.

12.4 Friction between surfaces shall not be used as a means to prevent shifting or turning of an uninsulated live part, but a lock washer applied as intended is acceptable.

13 Reservoirs

13.1 If a reservoir is part of an appliance, a live part shall be located or protected so that it will not be subject to dripping if the reservoir does not perform as intended.

Exception: The requirement need not apply if the reservoir is resistant to corrosion from the liquid intended for use in it, and the reservoir does not develop cracks as a result of aging.

14 Internal Wiring

14.1 The wiring and connections between parts of an appliance shall be protected or enclosed.

Exception: A length of flexible cord may be used for external connections between parts of the appliance if flexibility is essential.

14.2 A wireway shall be smooth and entirely free from sharp edges, burrs, fins, moving part similar abrading surfaces that might damage the insulation on the conductors.

14.3 A hole in a sheet metal wall through which insulated wires pass shall be provided with a smooth rounded bushing or shall have a smooth, well-rounded surface upon which the wires bear.

14.4 A separate foot switch provided with an appliance shall be connected to the appliance by flexible cord no lighter than Type SJ.

14.5 Insulated internal wiring (including a grounding conductor) shall consist of a type or types of wire that are acceptable for the application with regard to:

a) The temperature and voltage to which the wiring is likely to be subjected;

b) Exposure to oil, grease, or other substances likely to have a harmful effect on the insulation;

c) Exposure to moisture; and

d) Other conditions of service to which it is likely to be subjected.

Exception: Insulated internal wiring evaluated as an uninsulated live part is not required to comply with the criteria specified in (a) – (d).

14.6 A splice and connection shall be mechanically secure and shall provide effective electrical contact.

14.7 Aluminum conductors, insulated or uninsulated, used as internal wiring, such as for interconnection between current-carrying parts or as motor windings, shall be terminated at each end by a method acceptable for the combination of metals involved at the connection point.

14.8 If a wire-binding screw construction or a pressure wire connector is used as a terminating device for aluminum, it shall be required for use with aluminum under the conditions involved (for example, temperature, heat cycling, vibration).

14.9 A soldered connection shall be made mechanically secure before being soldered if breaking or loosening of the connection results in a risk of fire, electric shock, or injury to persons.

14.10 A wire-binding screw or nut shall be provided with a lock-washer if loosening by vibration permits shifting of parts thereby reducing spacings, or otherwise results in a risk of fire, electric shock, or injury to persons. The lock-washer shall be located under the head of a wire-binding screw or under a wire-binding nut.

14.11 An open-end spade lug shall not be used unless additional means (such as upturned ends on the tangs of the lug) are provided to hold the lug in place if the wire-binding screw or nut becomes slightly loosened.

14.12 The means of connecting stranded internal wiring to a wire-binding screw shall be such that loose strands of wire are prevented from contacting other live parts not always of the same polarity as the wire and from contacting dead-metal parts. This can be accomplished by using a pressure terminal connector, a soldering lug, a crimped eyelet, or by soldering all strands of the wire together or the equivalent.

14.13 A splice shall be provided with insulation equivalent to that of the wires involved if spacing between the splice and other metal parts is not permanently maintained.

14.14 Insulation consisting of two layers of friction tape, two layers of thermoplastic tape, or one layer of friction tape on top of one layer of rubber tape is acceptable on a splice. In determining whether splice insulation consisting of coated fabric, thermoplastic, or other type of tubing is acceptable, consideration is to be given to such factors as dielectric properties, heat- and moisture-resistant characteristics, and similar criteria. Thermoplastic tape wrapped over a sharp edge shall not be used.

15 Heating Element

15.1 A heating element shall be supported in a reliable manner and shall be protected against mechanical damage and contact with outside objects.

15.2 In determining whether a heating element is reliably supported, consideration is to be given to sagging, loosening, and other adverse conditions resulting from continuous heating.

15.3 An appliance in which the heating element is designed for operation only in an air stream shall be wired or controlled so that the element is capable of operation only when under the cooling effect of the air stream.

16 Electrical Insulation

16.1 An insulating washer, bushing, or similar part that is an integral part of an appliance, and a base or support for the mounting of a current-carrying part, shall be of a moisture-resistant material that will not be adversely affected by the temperatures to which it will be subjected under conditions of intended use. Molded parts shall be constructed so that they will have strength and rigidity to withstand the stresses of intended service.

16.2 Insulating material is to be evaluated with respect to its acceptability for the particular application. Materials such as mica, some molded compounds, and certain refractory materials are usually acceptable for use as the sole support of live parts. Other materials that shall not be used for general use, such as magnesium oxide, may be used if used in conjunction with other insulating materials, or if so located and protected that the risk of mechanical damage and the absorption of moisture are reduced. When it is necessary to investigate a material to determine its acceptability, consideration is to be given to its mechanical strength, insulation resistance, heat-resistant qualities, the degree to which it is enclosed or protected, and any other features having a bearing on the risk of fire, electric shock, or injury to persons involved in conjunction with conditions of service. All these factors are to be considered with respect to thermal aging. When a polymeric enclosure also serves as an insulating material, or as the direct or indirect support for any live part, the polymeric material shall comply with the requirements specified in 6.2.1.

16.3 In the mounting or supporting of a small fragile insulating part, a screw or other fastening is not to be so tight as to result in cracking or breaking with expansion and contraction. Such a part shall be slightly loose.

16.4 A small molded part, such as a brush cap, shall be constructed so that it will have the strength and rigidity to withstand stresses during intended use.

16.5 Insulating material on which the opposite polarity fixed contacts of a hand-held hair dryer power “on-off” slide switch are mounted shall have a comparative tracking index (CTI) rating of 2 or better, and a flammability rating of V-1 or better.

Added 16.5 effective July 1, 2007

17 Thermal Insulation

17.1 Combustible thermal and electrically conductive insulation shall not contact an uninsulated live part.

17.2 Mineral wool thermal insulation that contains conductive impurities in the form of slag shall not come into contact with any uninsulated live part.

17.2 revised August 30, 2002

17.3 Thermal insulation shall be rated for the temperature to which it is exposed when tested under the conditions described in 37.1.1.

18 Overcurrent Protection

18.1 If overcurrent conditions are likely to occur, the appliance shall be provided with a circuit breaker or fuse.

18.2 Overcurrent protection at not more than 20 amperes shall be provided by means of a circuit breaker or fuse in the appliance for each general use receptacle circuit and each lampholder circuit in the appliance, unless the appliance would be correctly connected to a branch circuit rated at 20 amperes or less.

18.3 The overcurrent protection specified in 18.2 shall be of a type rated for branch circuit protection.

18.4 A fuseholder or circuit breaker provided as a part of an appliance shall be of a type rated for the particular application and shall not be accessible from outside the appliance without opening a door or cover. A fuseholder for a plug fuse shall be constructed and installed so that an uninsulated live part other than the screw shell will not be exposed to contact by persons removing or replacing a fuse.

Exception: The operating handle of a circuit breaker may project outside the enclosure.

18.5 For other than a hand-supported appliance, if the handle of a circuit breaker is operated vertically rather than rotationally or horizontally, the up position of the handle shall be the on position.

19 Thermal Cutoffs (Fusible Links)

19.1 If an appliance is provided with a thermal cutoff, the cutoff shall open the circuit in the intended manner without causing the short circuiting of live parts and without causing live parts to become grounded to the enclosure. This determination is to be made in accordance with the test requirements specified in the Test of Thermal Cutoffs (Fusible Links), Section 47.

20 Immersion-Detection Circuit-Interrupters (IDCIs)

20.1 If a hair dryer is provided with a resettable IDCI, the IDCI shall be provided with a supervisory circuit that tests the ability of the IDCI to interrupt all power to the hair dryer. The supervisory circuit shall test the continuity of the sensor conductor in an interconnecting cord between the hair dryer and the IDCI and operation of the IDCI. This will usually necessitate that the test switch be in the hair dryer enclosure of a hand-supported hair dryer and in the hand-held portion of a wall-hung or wall-mounted hair dryer.

Exception: A user-resettable IDCI may be provided with a reset feature not providing a test function when:

a) The IDCI complies with the Standard for Immersion-Detection Circuit-Interrupters, UL 1664, applicable to resettable IDCIs not provided with a supervisory circuit;

b) The instructions provided with the appliance alert the user to the reset feature and how and when to use it; and

c) The instructions provided with the appliance alert the user to not reset and reuse the appliance should the protective device trip as a result of immersion.

20.2 With regard to 20.1, a tool shall not be used to operate the supervisory circuit.

20.3 The results of the test required in 20.1 shall be indicated by means of an audible, visible, or audible and visible signal.

20.4 A resettable IDCI shall be trip-free. That is, the automatic tripping shall be independent of the manipulation or position of the reset button, handle, or lever of the IDCI.

20.5 For the purpose of applying the electrical spacing requirements specified in 24.6, the sensor conductor within the hair dryer shall be deemed an uninsulated live part of opposite polarity in relationship to all other live parts and to accessible dead-metal parts.

20.6 The interconnecting cord between an IDCI and the appliance enclosure shall be at least the equivalent of Type SPT-2 flexible cord.

Exception: The size of the conductor used as the sensor conductor may be smaller than No. 18 AWG (0.82 mm^2), but no smaller than No. 24 AWG (0.21 mm^2).

20.7 A conductive coating provided as the sensor for an IDCI shall be free of wrinkles, pits, cracks, peeling, and similar defects. The coating shall be applied in a consistently uniform width and thickness.

20.8 A sensor that is in the form of a conductive coating shall comply with the Conductive Coating Test, Section 35.

20.9 The material, construction, and location of a sensor shall be such that the intended functioning of the IDCI will not be adversely affected by corrosion, exposure to abnormal operating conditions, and similar criteria as determined in accordance with the Immersion-Detection Circuit-Interrupter (IDCI) Trip Time Measurement Test, Section 33.

20.10 A metal sensor shall:

a) Comply with Internal Wiring, Section 14, and

b) Not be fabricated of iron or steel.

Exception: Stainless steel or other corrosion resistant alloys may be used.

21 Lampholders and Receptacles

21.1 A female screw shell used as a holder for a heating element shall be of copper or of copper alloy and shall be plated with nickel or an equivalent oxidation-resistant metal.

21.2 The circuit conductor of a power supply cord that is intended to be grounded shall have the following items connected to it:

a) The screw shell of an Edison-base lampholder and

b) The terminal or lead of a receptacle intended to be grounded.

Table 11.3 identifies the supply cord conductor intended to be grounded.

21.3 An Edison-base lampholder shall not be used in an appliance rated over 150 volts.

Exception: An Edison-base lampholder may be used if the construction is such that live parts of the lampholder and the lamp will not be exposed to contact by persons when the screw shell of the lamp is in contact with live parts of the lampholder or if used on a three-wire Edison system.

21.4 In determining compliance with the Exception to 21.3, the probe shown in Figure 6.1 shall be used as described in 6.5.3.

21.5 An Edison-base lampholder in an appliance rated 150 volts or less shall be constructed or installed so that an uninsulated live part other than the screw shell will not be exposed to contact by a person removing or replacing a lamp during intended service.

Exception: This requirement is not applicable to an appliance:

a) For which it is necessary to dismantle the appliance or remove a cover plate or other part by means of a tool to remove or replace a lamp or

b) That is permanently and legibly marked to indicate that such relamping is to be done with the appliance disconnected from the supply source.

21.6 A 15- or 20-ampere attachment plug receptacle intended for general use in an appliance shall be of the grounding type. The grounding contact of the receptacle shall be electrically connected to dead metal that will be grounded when the appliance is in use.

21.7 The face of a receptacle that is less than 5/8 inch (15.9 mm) wide or 7/8 inch (22.2 mm) long shall project a minimum of 0.015 inch (0.38 mm) and a maximum of 3/16 inch (4.8 mm) from the part of the receptacle-mounting surface that is within a rectangle 5/8 inch wide and 7/8 inch long, the rectangle being symmetrically located about the receptacle contacts.

Exception: If the mounting surface for the receptacle is electrically conductive, the face of the receptacle shall project a minimum of 3/32 inch (2.4 mm).

21.8 An appliance provided with one or more general use receptacles shall not be equipped with a flexible cord not smaller than No. 16 AWG (1.3 mm^2).

21.9 When the branch circuit over current protection will be inadequate for any general use receptacle or receptacles provided as part of an appliance, over current protection for the receptacle or receptacles shall be provided as part of the appliance as follows:

a) Not more than 15 amperes for a single receptacle, and

b) Not more than 20 amperes for two or more receptacles (including a single duplex receptacle).

22 Switches

22.1 General

22.1.1 An appliance having any driven moving part, which by function could cause entrapment of hair, body parts, clothing or the like, shall be provided with a main on-off switch. Appliances in this group include, but are not limited to, hair dryers, hair untanglers, and the like.

22.1.2 A switch, as required in 22.1.1, shall be located so that it can be operated by the user to turn off the appliance.

22.1.3 A switch shall be acceptable for the particular application and shall have a current and voltage rating no less than that of the circuit (load) it controls.

22.1.4 A manually operated, line-connected, single-pole switch for appliance on-off operation shall not be connected to the conductor of the power supply cord or circuit intended to be grounded. Table 11.3 specifies the identification of the power supply cord conductor intended to be grounded.

22.1.5 A switch that is subjected to a temperature of more than 65°C (149°F) shall be evaluated with respect to the temperature limitations of the materials used.

22.1.6 A switch shall be located or protected so that it will not be subjected to mechanical damage during use.

22.1.7 A switch, as required in 22.1.1, shall have a plainly marked ″off″ position. The use of a symbol alone, such as the symbol ″O,″ shall not be used to denote the off position. The switch position marking need not be an integral part of the switch itself.

Exception: An appliance that is provided with a momentary contact on-off switch that automatically returns to the off position when the actuator is released is not required to have a marked ″off″ position.

22.1.8 A hand-supported hair-drying appliance is not intended to be immersible and shall not be so marked.

22.1.9 A maintained contact switch for a hand-supported hair dryer shall be subjected to a 6,000-cycle switch endurance test. A momentary contact switch that is likely to be operated several times during each use of a hand-supported hair dryer, such as the on-off switch, shall be subjected to a 30,000-cycle switch endurance test. A momentary-contact switch that is not likely to be operated several times during each use of a hand-supported hair dryer, such as a switch used to provide low-velocity, cool air for setting a curl (a ″cool shot″ switch), shall be subjected to 6,000 cycles of the switch endurance test. The tests, when required, are to be conducted in accordance with the Standard for Special-Use Switches, UL 1054.

22.2 Dual-voltage selector

22.2.1 The construction of the supply circuit voltage selector shall be such that the supply circuit voltage setting cannot be changed without the use of a tool (a coin, screwdriver, or the like is considered to be a tool for the purpose of this requirement).

22.2.2 If the appliance is constructed so that the supply circuit voltage selector setting can be changed, the action of changing the voltage selector setting shall also change the supply circuit voltage indication.

22.2.3 An appliance that can be set to different rated supply circuit voltages shall be provided with the statement required in 63.7(k)(12).

23 Automatic Controls

23.1 The operation of an automatic control device in an appliance shall disconnect the element or elements it controls from all ungrounded conductors of the supply circuit.

Exception: Disconnection from all ungrounded conductors of the supply circuit is not required if there is no uninsulated live part exposed to unintentional contact when the switch is open, or if the fact that such part is live is definitely apparent.

23.2 Breakdown of a temperature control in a hand-supported hair dryer shall not result in a risk of fire, electric shock, or injury to persons as determined in accordance with 39.3.3.4 and 39.3.4.3. A limit control that operates to interrupt all heater and motor circuits and end the test shall comply with the requirements specified in Thermal Cutoffs (Fusible Links), Section 19.

23.2 revised June 16, 2004

23.3 A temperature control installed in a hand-supported hair dryer shall operate at not more than 8.3°C (15°F) above or below its rated operating temperature. Compliance is determined by subjecting the control, a sub-assembly including the control, or the complete appliance to the appropriate temperatures in an air oven.

23.4 In a wax depilatory appliance, an automatic-reset temperature control shall be a calibrated control endurance tested for at least 6,000 cycles of operation and shall comply with all other requirements applicable to limit controls in the Standard for Limit Controls, UL 353, or the requirements applicable to temperature-limiting controls in the Standard for Temperature-Indicating and -Regulating Equipment, UL 873. The calibration requirements shall be as specified for water-heater limit controls in UL 353 or water-heater temperature-limiting controls in UL 873.

23.5 The overload and endurance tests of a temperature controller consisting of a temperature sensor and the associated control circuit for an appliance having a preheat cycle shall be conducted in the appliance, or under conditions representative of those in the appliance, as described in the Test of Automatic Controls, Section 46.

23.6 A temperature controller that controls the duration of a preheat cycle by a timing circuit or by an equivalent means without using a temperature sensor is considered to be a temperature-regulating control and shall comply with the overload and endurance requirements specified in the Test of Automatic Controls, Section 46.

24 Spacings

24.1 All uninsulated live parts connected to different circuits – line voltage, low voltage (Class 2), or limited energy primary – and separated electrically by insulation or impedance shall be spaced from one another as though they were parts of opposite polarity and shall be judged on the basis of the highest voltage involved.

24.2 The spacing between uninsulated live parts of opposite polarity and between such parts and dead metal that may be grounded in service is not specified for parts of circuits that are classified as low-voltage (Class 2) circuits.

24.3 The spacing between uninsulated live parts within a limited energy primary circuit is not specified if the:

a) Location and relative arrangement of the parts are such that permanent separation is provided and

b) Limited-energy circuit meets the abnormal test requirements specified in 39.5.1 – 39.5.4.

24.4 The spacing between uninsulated live parts of a limited-energy primary circuit and dead metal that may be contacted by persons, or that may become grounded in service, is as specified in 24.6.

24.5 With respect to 24.4, an entire component shall be evaluated as live part if any dead metal of the component is isolated from a live part by an insulation system or by a spacing that is inadequate for the line voltage involved.

24.6 There shall be a spacing of not less than 1/16 inch (1.6 mm) between uninsulated line voltage parts of opposite polarity, and between an uninsulated line-voltage part and a dead-metal part that might be exposed to contact by persons during operation of the appliance or that might be grounded. If an uninsulated live part is not rigidly supported, or if a movable dead-metal part is in close proximity to an uninsulated live part, the construction shall be such that this minimum spacing will be maintained under all operating conditions.

Exception: At closed-in points only, such as the screw and washer construction of an insulated terminal mounted in metal, a spacing of no less than 3/64 inch (1.2 mm) may be used. Within a thermostat, other than at contacts, the spacing between uninsulated live parts on opposite sides of the contacts shall not be less than 1/32 inch (0.8 mm) through air and 3/64 inch over surface of insulating material, and the construction shall be such that the spacings will be permanently maintained.

24.7 An insulating lining or barrier of fiber or similar material shall be so located or of such material that it will not be affected adversely by arcing. If the lining or barrier is used instead of an air spacing, the material shall not be less than 1/32 inch (0.8 mm) thick.

Exception No. 1: The insulating material may be 1/64 inch (0.4 mm) thick if a fiber liner or barrier is used in conjunction with an air spacing not less than 50 percent of that required for air alone.

Exception No. 2: Insulating material having a thickness less than that specified may be used if, upon investigation, it has been determined to be acceptable for the particular application.

25 Grounding

25.1 All permanently connected appliances shall have provision for the grounding of all exposed metal parts that are likely to become energized.

Exception: An appliance provided with a double-insulation system, shall be constructed in accordance with the Standard for Double Insulation Systems for Use in Electrical Equipment, UL 1097, and is not required to be grounded.

25.2 An appliance marked as double insulated shall not be provided with a means for grounding.

25.3 If a grounding means is provided on the appliance, whether required or not, all exposed dead-metal parts and all dead-metal parts within the enclosure that are exposed to contact during any servicing operation and that are likely to become energized shall be reliably connected to the grounding means.

25.4 An equipment grounding conductor of a flexible cord shall comply with all of the following:

a) Finished to show a green color with or without one or more yellow stripes.

b) Conductively connected to:

1) All exposed dead-metal parts that are likely to become energized and

2) All dead-metal parts within the enclosure that are exposed to contact during any user servicing and that are likely to become energized.

The grounding conductor shall be connected by means of a screw or other means not likely to be removed during any servicing operation not involving the power supply cord. Solder alone shall not be used for securing this conductor.

c) Connected to the fixed grounding member of an attachment plug of the grounding type.

Exception: The grounding contact member of a grounding attachment plug used on the power supply cord of a portable hand-held, hand-guided, or hand-supported appliance may be of the movable, self-restoring type on circuits operating at 150 volts or less between any conductor and ground.

26 Motors

26.1 Construction

26.1.1 A motor provided as part of an appliance shall be capable of handling the load it is intended to drive without introducing a risk of fire, electric shock, or injury to persons.

26.1.2 A motor winding shall be constructed so as to resist the absorption of moisture.

26.1.3 With reference to the requirement specified in 26.1.2, film-coated wire is not required to be additionally treated to prevent absorption of moisture. Fiber slot liners, cloth coil wrap, and similar moisture-absorptive materials shall be provided with impregnation or otherwise treated to prevent moisture absorption.

26.1.4 A brush cap, accessible from outside an enclosure of a portable appliance that prevents contact with a live part at a potential of more than 30 volts rms (42.4 volts peak) to any other part or to ground, shall be fastened in place so that removal cannot be accomplished by an ordinary tool used in the intended manner. Wrenches, pliers, and flat-blade or cross-blade screwdrivers are deemed to be ordinary tools.

26.2 Brush wear-out

26.2.1 A brush-holder assembly shall be constructed so that when a brush is worn out (no longer capable of performing its function), the brush, spring, and other parts of the assembly will be retained to the degree necessary to reduce the likelihood of:

a) Accessible dead-metal parts becoming energized and

b) Live parts becoming accessible.

26.2.2 With reference to the requirement in 26.2.1, the parts of a brush holder assembly are considered to be acceptably retained if:

a) The motor is enclosed, independently of the appliance enclosure, to the degree that the brush, spring, or other parts of the assembly will be contained within the motor enclosure, and no conductive parts of the motor enclosure are accessible.

b) The appliance has spacings such that parts of the brush holder assembly which can become free to move will not become live and accessible, nor bridge live parts to accessible metal parts, and the motor enclosure is not accessible; or

c) Other constructions equivalent to (a) or (b).

26.2.3 A motor control device not having a horsepower rating equivalent to the motor it controls, shall be capable of performing effectively when subjected to an overload test as specified in the Motor Control Overload Test, Section 48.

PERFORMANCE

27 General

27.1 The tests described in Sections 31 – 39 shall be conducted in that order on the same samples.

Exception: Some tests on hand-supported hair dryers will require more than one sample.

27.2 A simulated head used for temperature testing is to consist of a foamed plastic wig form, approximately 21-1/2 inches (546 mm) in circumference, closely wrapped with two layers of cheesecloth. Pieces of black (exposed and developed) cellulose acetate photographic film to represent hair-holding devices are to be attached to the top and sides.

27.3 Wherever cheesecloth is specified in connection with either a temperature test or an abnormal test, the cloth is to be bleached cheesecloth 36 inches (914 mm) wide, running 14 – 15 yards per pound mass (approximately 28 – 30 m/kg mass), and having what is known in the trade as a ″count of 32 x 28,″ which means that for any square inch there are 32 threads in one direction and 28 threads in the other direction (for any square centimeter there are 13 threads in one direction and 11 threads in the other direction).

27.4 For the purpose of these requirements, a primary temperature limiting control in an appliance that has two different temperature limiting controls is the control that is intended to operate before the second control operates. The second control, termed the backup temperature limiting control, is intended to operate in the event of malfunction of the primary control.

27.5 Wherever a hardwood surface is specified in connection with a test, the hardwood surface is to consist of a layer of tongue-and-groove oak flooring mounted on two layers of nominal 3/4 inch (19.1 mm) plywood. The oak flooring is to be nominally 3/4 inch thick [actual size 3/4 by 2-1/4 inch (19.1 by 57.2 mm)]. The assembly is to rest on a concrete floor or an equivalent nonresilient floor during the test.

28 Strength of Enclosure Test

28.1 A 5-pound (22.2-N) force shall be applied by means of the flat end of a circular steel rod that is 1/4 inch (6.4 mm) in diameter and 5 inches (127 mm) long for 1 minute to any part of the area described in 6.5.8. The rod is to be vertical, and the appliance may be oriented in any position relative to the rod before the force is applied. The results are acceptable if:

a) During the test, the rod does not contact an uninsulated live part; and

b) After the test, the construction is in compliance with 6.5.3, 6.5.4, and 24.6.

28.2 With reference to 28.1, the test is to be conducted on a guard such as a screen, which is located under an opening in an enclosure, through the opening in the enclosure only if the following conditions are met:

a) The guard is:

1) Metal or other electrically conductive material,

2) Accessible to user contact as determined in accordance with 6.5.4, and

3) Accessible to the rod; or

b) The guard is:

1) Electrically nonconductive material,

2) Accessible to user contact as determined in accordance with 6.5.4,

3) Accessible to the rod, and

4) Required for compliance with the accessibility requirements specified in 6.5.3.

29 Tip-Over Test

29.1 Three samples of an appliance as described in 7.2.1 shall be tested and each sample is to be tested three times. Each sample of the appliance is to be placed on a horizontal surface of laminated thermosetting counter-top-type material. The appliances are to be oriented in a position that is likely to occur during intended use, and are to contain whatever combination of separable components and liquid that results in the most adverse condition for this test.

29.2 For an appliance with a capacity of 32 fluid ounces (947 mL) or less, the sample is to be tilted to determine its critical angle of balance (the angle at which the sample will tip over due only to the force of gravity). The results are acceptable if one of the following occurs:

a) The critical angle of balance is 45 degrees or greater or

b) The lid, if provided, remains in place and the amount of liquid emitted during the first 5 seconds from the appliance during tip over is no more than 5 fluid ounces (148 mL).

Exception: An appliance having a reservoir with a capacity of 5 fluid ounces or less need not be tested.

29.3 For an appliance with a capacity of greater than 32 fluid ounces (947 mL), the sample is to be tipped over. The results are acceptable if the lid remains in place.

30 Stability Test

30.1 In accordance with 9.1, an appliance shall be placed on a supporting surface that is inclined at a 10-degree angle from the horizontal. The appliance is to be turned to the position most likely to cause tipping. Any adjustable or movable part that will affect the location of the center of gravity of the appliance is to be placed in the position most likely to contribute to tipping. If the appliance is on castors, blocks are to be placed in front of them to prevent the appliance from moving down the incline. The results are acceptable if the appliance remains stable on the tilted surface.

30.2 An appliance of the type specified in 7.2.1 shall be placed on a plane inclined at an angle of 15 degrees to the horizontal. The appliance shall be positioned and loaded with whatever combination of separable components (strainers, cups, and similar parts) and liquid that results in the maximum tendency to overturn under conditions of intended use. The appliance shall be prevented from sliding on the inclined surface. The result is acceptable if the appliance does not overturn as a result of this test.

31 Leakage Current Test

31.1 The leakage current of a cord-connected portable, stationary, or fixed appliance, when tested in accordance with 31.3 – 31.7, shall be no more than:

a) 0.5 milliampere for an ungrounded (two wire) portable, stationary, or fixed appliance;

b) 0.5 milliampere for a grounded (three wire) portable appliance; and

c) 0.75 milliampere for a grounded (three wire) stationary or fixed appliance.

31.2 Leakage current refers to all currents, including capacitively-coupled currents that may be conveyed between exposed conductive surfaces of an appliance and ground or other exposed conductive surfaces of an appliance.

31.3 All exposed conductive surfaces are to be tested for leakage current. The leakage currents from these surfaces are to be measured to the grounded supply conductor individually as well as collectively where simultaneously accessible. Parts are considered to be exposed surfaces unless guarded by an enclosure that reduces the risk of electric shock as defined in 6.5.1 – 6.5.6. Surfaces are considered to be simultaneously accessible when they can be readily contacted by one or both hands of a person at the same time. These measurements do not apply to terminals operating at voltages considered not to present a risk of electric shock.

31.4 If a conductive surface other than metal is used for the enclosure or part of the enclosure, the leakage current is to be measured using a metal foil having an area of 10 by 20 centimeters in contact with the surface. Where the surface is less than 10 by 20 centimeters, the metal foil is to be the same size as the surface. The metal foil is not to remain in place long enough to affect the temperature of the appliance.

31.5 The measurement circuit for leakage current is to be as shown in Figure 31.1. The measurement instrument is described in (a) – (d). The meter used for a measurement need only indicate the same numerical value for a particular measurement as would the defined instrument. The meter used need not have all the attributes of the defined instrument.

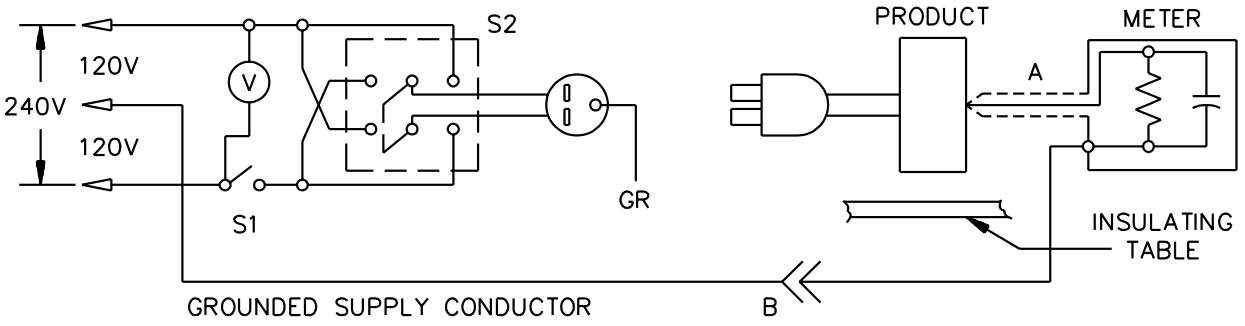
a) The meter is to have an input impedance of a 1,500-ohm resistor shunted by a capacitance of 0.15 microfarads.

b) The meter is to indicate 1.11 times the average of the full wave rectified composite waveform of the voltage across the resistor or current through the resistor.

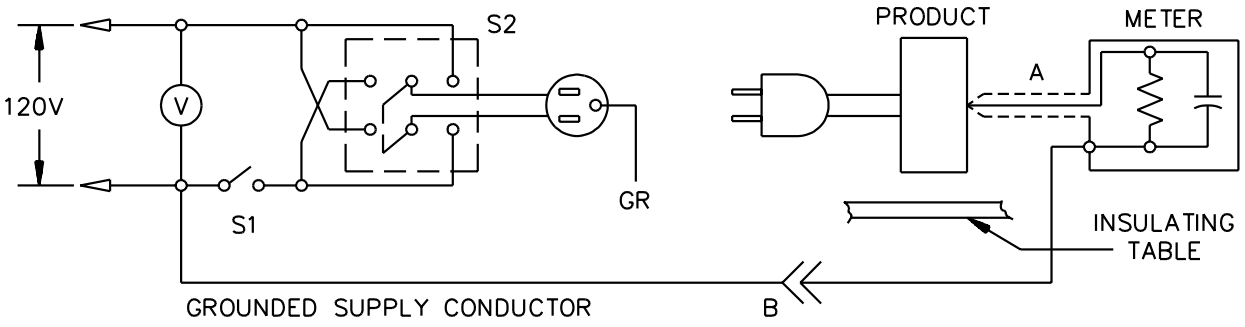
c) Over a frequency range of 0 – 100 kilohertz the measurement circuitry is to have a frequency response (ratio of indicated-to-actual value of current) equal to the ratio of the impedance of a 1,500-ohm resistor shunted by a 0.15-microfarad capacitor to 1,500 ohms. At an indication of 0.5 or 0.75 milliampere, the measurement is to have an error of no more than 5 percent.

d) Unless the meter is being used to measure leakage from one part of an appliance to another, the meter is to be connected between an accessible part and the grounded supply conductor.

Figure 31.1
Leakage current measurement circuits



LC200



LC100

A – Probe with shielded lead.

B – Separated and used as a clip when measuring currents from one part of the device to another.

31.6 A sample of the appliance is to be tested for leakage current starting with the as-received condition, but with its grounding conductor, if any, open at the attachment plug (open at receptacle as shown in Figure 31.1). The as-received condition is without prior energization, other than that which may have occurred as part of the production-line testing. The supply voltage is to be adjusted to 120 or 240 volts depending on the rating. Thermostats are to be closed. The test sequence, with reference to the measuring circuit (Figure 31.1) is to be as follows:

a) With switch S1 open, the appliance is to be connected to the measuring circuit. Leakage current is to be measured using both positions of switch S2, and with the appliance switching devices in all their operating positions.

b) Switch S1 is then to be closed, energizing the appliance, and within 5 seconds, the leakage current is to be measured using both positions of switch S2, and with the appliance operated at the maximum heat setting of controls.

c) Leakage current is to be monitored until thermal stabilization under the maximum heat conditions. Both positions of switch S2 are to be used. The equivalent of thermal stabilization is considered to be obtained as in the normal temperature test. If any temperature-regulating thermostat does not cycle at the maximum setting, the setting is to be lowered until the thermostat does cycle before the final measurements at thermal stabilization are taken. Measurements are to be made with the thermostat, if any, open and closed. Upon evidence of stabilizing readings, monitoring periods may be increased.

d) If the appliance uses a single pole switch or a thermostat with an off position, monitoring of leakage current is to continue until the leakage current stabilizes or decreases after the appliance is turned off. Both positions of switch S2 are to be used.

31.7 Normally a sample will be carried through the complete leakage current test program as described in 31.6, without interruption for other tests. With the concurrence of those concerned, the leakage current tests may be interrupted for the purpose of conducting other nondestructive tests.

32 Leakage Current Test Following Humidity Conditioning

32.1 A cord-connected appliance shall comply with the requirements for leakage current specified in 31.1 following exposure for 48 hours to air having a relative humidity of 88 ±2 percent at a temperature of 32 ±2°C (89.6 ±3.6°F).

32.2 To determine compliance with the requirement specified in 32.1, a sample of the appliance that has been preheated to a temperature just above 34°C (93.2°F) is to be contained in a chamber under the time, humidity, and temperature conditions specified. Following the conditioning, while still in the chamber, the sample is to be tested unenergized as described in 31.6(a). The sample, either in or immediately after removal from the chamber, is to be energized and tested as described in 31.6(b) and (c). The test is to be discontinued when the leakage current stabilizes or decreases.

33 Immersion-Detection Circuit-Interrupter (IDCI) Trip Time Measurement Test

33.1 As-received hair dryers

33.1.1 Samples of hair dryers that are provided with an IDCI shall be subjected to the tests described in 33.1.2 – 33.1.7. The results are acceptable if the IDCI trips, causing the flow of current to ground to cease within the time interval, T, when the current to ground, I, is within the range of 6 – 264 milliamperes, in accordance with the relationship:

$$T = \left[\frac{20}{I}\right]^{1.43}$$

in which:

T is the interval in seconds and

I is the current to ground in milliamperes rms.

33.1.2 Three samples are to be tested individually while connected to their rated source of supply as described in 37.1.13, and then connected to a voltage equal to 85 percent of the rated voltage. The tests are to be conducted with the hair dryer samples in various configurations (including the orientation that results in the most unfavorable condition of use) with the:

a) Hair dryer switch in the off position,

b) Hair dryer switch in the on position,

c) Heat/speed switches in the most disadvantageous settings, and

d) Appliance plug inserted in one position into the supply circuit receptacle and then with the polarity reversed.

Exception: Testing at 85 percent of rated voltage is not required if the investigation of the IDCI indicated it will function as intended at 85 percent of rated voltage.

33.1.3 Each sample is to be placed at the bottom of an empty, isolated, conductive metal tub of a convenient size. The tub is to be equipped such that it can be filled from beneath at a rate of no greater than 5 inches (127 mm) of water per hour. The tub is to be connected to earth ground through a noninductive 500-ohm resistor. As the tub is filled, the leakage current is to be continually measured and a trace of the current flow as a function of time is to be obtained. The water flow is to be stopped when the leakage current reaches 6 milliamperes or the IDCI functions, whichever occurs first. One minute after the IDCI has tripped and without changing any of the test conditions, a user-resettable IDCI is to be reset and the current value and tripping time measurements are to be repeated. The results are acceptable if in each immersion the IDCI trips at a current:

a) Less than 6 milliamperes or

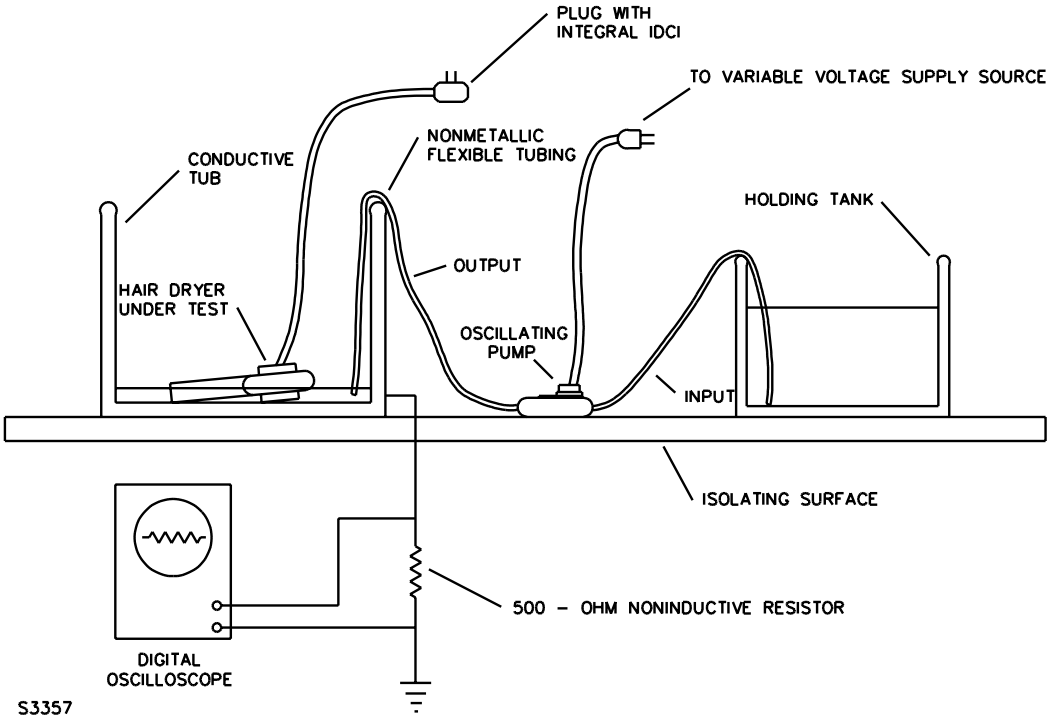
b) Greater than 6 milliamperes in a period of time to comply with the time and current relationship specified in 33.1.1. The period of time is to be measured from the moment the current flow exceeds 6 milliamperes to the moment the current ceases to flow. When the IDCI trips, the flow of current to ground is to cease.

33.1.4 The isolated tub described in 33.1.3 is to be filled with 12 inches (305 mm) of water. Three samples are to be dropped into the water such that different surfaces of the samples strike the water first. The leakage current is to be continuously measured and a trace of the current flow as a function of time is to be obtained.

33.1.5 The tests described in 33.1.2 – 33.1.4 are to be conducted two separate times using water with a resistivity of 200 ohm-cm and 20,000 ohm-cm as described in 33.1.7.

33.1.6 A typical test arrangement for the test described in 33.1.3 is shown in Figure 33.1. In the arrangement, the pump is connected to a source of supply of variable voltage so that the water flow rate may be regulated. The tubing that connects the holding tank to the pump and the pump to the conductive tank is nonmetallic flexible tubing (such as aquarium air hose) and is of such length that it extends to the bottom of the conductive tub so that the water fills the tub from below.

Figure 33.1
IDCI trip test arrangement



33.1.7 The water resistivities specified in 33.1.5 are to be obtained by the addition of sodium chloride (common table salt) to distilled water or tap water. The water temperature is to be 20 – 40°C (68 – 104°F).

33.2 Conditioned hair dryers

33.2.1 The requirements specified in 33.1.2 – 33.1.7 are to be applied to samples of a hair dryer provided with an IDCI that have been subjected to one of the following tests (each test is to be conducted):

a) Drape test, 39.2.1 – 39.2.3;

b) Restricted air inlet test, 39.3.3.1 – 39.3.3.4;

c) Restricted air outlet test, 39.3.4.1 – 39.3.4.3;

d) Floor drop test, 39.3.5.1 and 39.3.5.2;

e) Motor slowdown test, 39.3.7.1 and 39.3.7.13; and

f) Short circuit and stall tests, 39.5.1 – 39.5.4.

33.2.1 revised June 16, 2004

33.2.2 The tests on the conditioned samples are to be conducted using the on-off switch position, the heat-speed selector switch(es) position(s), the supply circuit voltage and polarity, the water resistivity, and the like as specified in 33.1.2 and 33.1.5, that resulted in the highest leakage current and longest IDCI trip time determined in accordance with 33.1.3. The results are acceptable if the IDCI trips at a current:

a) Less than 6 milliamperes or

b) Greater than 6 milliamperes in a period of time to comply with the time and current relationship specified in 33.1.1. The period of time is to be measured from the moment the current flow exceeds 6 milliamperes to the moment the current ceases to flow. When the IDCI trips, the flow of current to ground is to cease.

34 Dew Point Humidity Test

34.1 Three samples of a hair dryer provided with an IDCI are to be conditioned in a chamber at a temperature of 5 ±2°C (41 ±3.6°F) for at least 4 hours and then transferred to a humidity chamber having a relative humidity of 86 ±2 percent at a temperature of 32 ±2°C (89.6 ±3.6°F). The transfer time is not to exceed 1 minute. The samples are to be energized by the insertion of their attachment plugs into receptacles of the voltage specified in 37.1.13. The on-off switch of the hair dryer is to be in the off position. The samples are to remain in the humidity chamber for 15 minutes. The results are acceptable if the IDCIs do not trip while in the chamber.

35 Conductive Coating Test

35.1 General

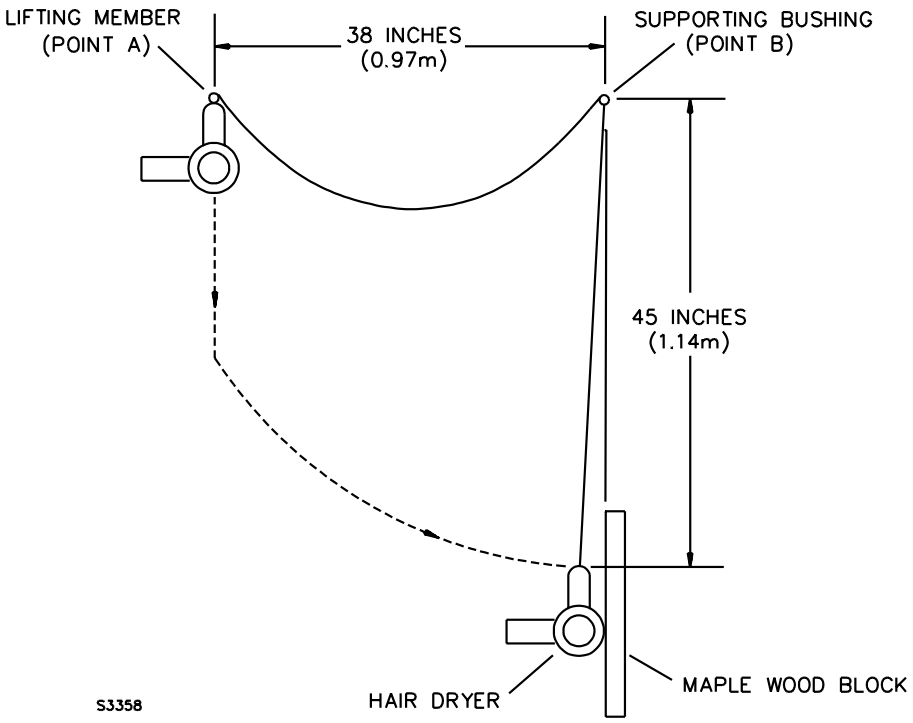
35.1.1 A hair dryer that is provided with a conductive coating for use as an IDCI sensor shall be conditioned as described in 35.2.1 – 35.5.1 and then subjected to the mechanical endurance test described in 35.1.2. Five separate samples are to be used for each conditioning. The resistance from at least three points on the interior of the enclosures (typically a point near the exhaust opening, a point near the intake opening, and a point that is the longest distance away from the point of connection of the sensor wire) to the sensor wire termination is to be determined before the conditioning begins, after conditioning, and then again after the mechanical endurance test.

35.1.2 After conditioning, all samples are to be subjected to 150 cycles of mechanical endurance or the number of cycles less than 150 that results in the hair dryer becoming inoperable due to breakage of an electrical connection or component or a mechanical breakdown. Detachment of the exhaust grille or intake grille, or similar failure of mechanical parts that do not result in the hair dryer becoming inoperable shall not be considered to be the end of the test. It is usually necessary to examine and energize the samples after each impact to determine if the hair dryer has become inoperable. The samples are to be attached to a 45-inch (1.14-m) long cord positioned 38 inches (0.97 m) from the vertical plane of a Maplewood block as shown in Figure 35.1, with points A and B in the same horizontal plane. The samples are to be allowed initially to drop and then to swing in an arc onto the vertical surface of the maple block. The resistance of each sample is to be determined again between the same points previously used and compared to the first three values of resistance. The results are acceptable if:

a) The resistance of the samples does not increase to a value in excess of 50 percent of that determined to be the maximum value that will cause the IDCI to trip (The maximum resistance resulting in the threshold trip current flow for the IDCI is usually determined in a separate investigation of IDCIs) and

b) There is no visible cracking, flaking, peeling, wrinkling, blistering, or similar deterioration of the conductive coating.

Figure 35.1
Mechanical endurance test arrangement



35.2 Thermal cycling

35.2.1 Five samples are to be conditioned for:

a) One hour at 18.0 – 20.0°C (32.4 – 36.0°F) higher than the maximum measured normal-use temperature of the coating determined in accordance with 37.7.1 and 37.7.2, but no less than 85°C (185°F) in any case, followed by

b) One hour at 23.0 ±2.0°C (73.4 ±3.6°F) and a relative humidity of 50 ±5 percent, followed by

c) One hour at minus 29.0 ±2.0°C (minus 20.2 ±3.6°F), followed by

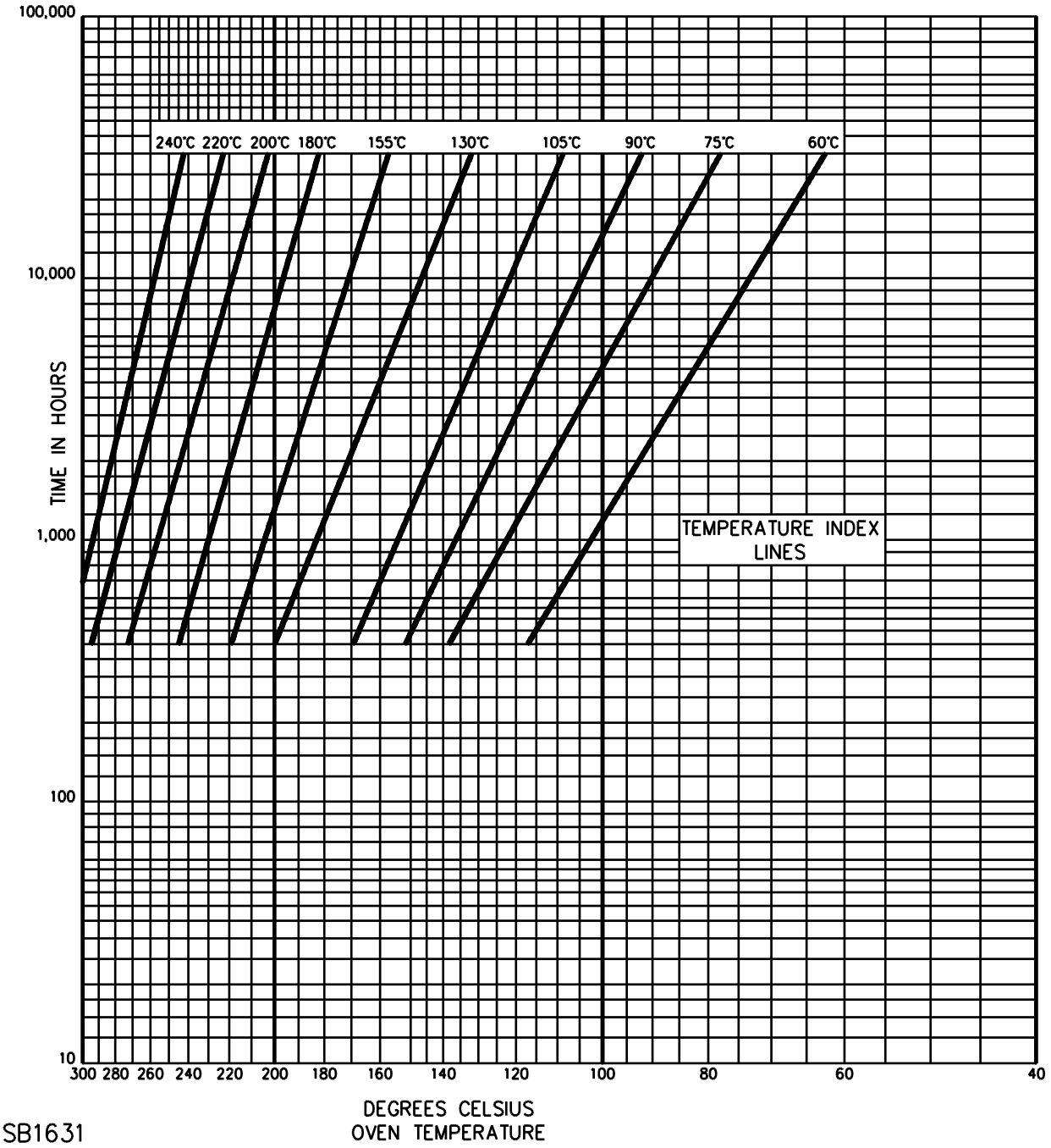
d) One hour at 23.0 ±2.0°C (73.4 ±3.6°F) and a relative humidity of 50 ±5 percent, followed by

e) The steps outlined in (a) – (d) repeated two more times.

35.3 Limited thermal aging

35.3.1 Five samples are to be conditioned for 300 hours at the oven temperature determined from the respective temperature index line in Figure 35.2, in which the temperature index T is the measured normal operating temperature of the coating determined in accordance with 37.7.1 and 37.7.2, but no less than 60°C (140°F). If agreeable to all concerned, a longer time at a correspondingly lower temperature may be used as determined in accordance with Figure 35.2. After the conditioning, the samples are to be brought to and tested at a room ambient temperature of 23.0 ±2.0°C (73.4 ±3.6°F).

Figure 35.2
Conditioning time versus oven temperature for temperature index of conductive coatings



35.4 Short term aging

35.4.1 Five samples are to be conditioned for 56 days at 18.0 – 20.0°C (32.4 – 36.0°F) higher than the maximum measured normal use temperature of the coating determined in accordance with 37.7.1 and 37.7.2, but no less than 85°C (185°F) in any case.

35.5 Humidity conditioning

35.5.1 Five samples are to be conditioned for 56 days at 35.0 ±2.0°C (95.0 ±3.6°F) and a relative humidity of 90 ±5 percent.

36 Power Input Test

36.1 The power input to an appliance marked with a rating of 50 watts or less shall be within the inclusive range of 75– 110 percent of that rating. If the marked rating is greater than 50 watts, the power input shall be within the inclusive range of 90 – 110 percent of that rating.

36.2 With respect to 36.1, the wattage of an appliance marked with its electrical rating only in amperes and volts will be assumed to be the product of those two values.

36.3 The power input to the appliance is to be measured with the appliance at operating temperature under full-load conditions, and while connected to a circuit of a voltage in accordance with 37.1.13. Control switches or the equivalent, if provided, are to be set to give the maximum power input. For an appliance having a preheat cycle of operation as defined in 3.23, the maximum input value measured during the preheat cycle, with the appliance at room temperature at the beginning of the measurement, is to be used to determine compliance with the requirement specified in 36.1.

Exception: The power input of an appliance that uses a positive temperature coefficient (PTC) heating element shall be measured 1 minute after it has become energized.

37 Normal Temperature Test

37.1 All appliances

37.1.1 An appliance tested under the conditions described in this test shall not attain temperature rises at any time during the test greater than those indicated in Table 37.1.

Exception: An initial peak temperature transient or the peak temperatures measured during preheat cycles not exceeding the temperature rise values specified in Table 37.1 by more than 20 percent are acceptable. If temperature excursions exceed the temperature rise values in Table 37.1 by more than 20 percent, the equivalent continuous normal use temperature is to be determined as described in 37.1.22. The equivalent continuous normal use temperature rises shall not exceed the values specified in Table 37.1.

37.1.1 revised August 30, 2002

Table 37.1
Maximum temperature rises

Materials and component parts	°C	(°F)
A. MOTORS		
1. Class 105 insulation systems on coil windings of DC and universal motors		
a. In open motors:		
Thermocouple method	65[a]	117[a]
Resistance method	75[a]	135[a]
b. In totally enclosed motors:		
Thermocouple method	70[a]	126[a]
Resistance method	80[a]	144[a]
2. Class 105 insulation systems on coil windings of AC motors having a frame diameter[b] of 7 inches (178 mm) of less (not including universal motors)		
a. In open motors (thermocouple or resistance method)	75[a]	135[a]
b. In totally enclosed motors (thermocouple or resistance method)	80[a]	144[a]
3. Class 130 insulation systems on coil windings for DC and universal motors:		
a. In open motors:		
Thermocouple method	85[a]	153[a]
Resistance method	95[a]	171[a]
b. In totally enclosed motors:		
Thermocouple method	90[a]	162[a]
Resistance method	100[a]	180[a]
4. Class 130 insulation systems on coil windings of AC motors having a frame diameter[b] of 7 inches (178 mm) of less (not including universal motors)		
a. In open motors (thermocouple or resistance method)	95	171
b. In totally enclosed motors (thermocouple or resistance method)	100	180
B. COMPONENTS		
1. Class 130 insulation systems except as indicated in subitems 3 and 4 of item A and subitem 2 of item B:		
a. Thermocouple method	85	153
b. Resistance method	95	171
2. Class 130 insulation systems on vibrator coils (thermocouple or resistance method)	95	171
3. Class 105 insulation systems on windings of relays, solenoids, or transformers	65[c]	117[c]
4. Class 105 insulation systems on vibrator coils (thermocouple or resistance method)	75[a]	135[a]
5. Sealing compounds	d	d
6. Capacitors		
a. Electrolytic	40[e]	72[e]
b. Other types	65[f]	117[f]
7. Phenolic composition (other than in a flatiron or appliance plug) used as electrical insulation or as a part whose breakdown would result in a condition risk	125[g]	225[g]
8. Flatiron or appliance plugs	175	315
9. Black cellulose acetate photographic film (see 27.2)	85	153
C. CONDUCTORS		

Table 37.1 Continued on Next Page

Table 37.1 Continued

Materials and component parts	°C	(°F)
1. Rubber- or thermoplastic-insulated wires and cords	35[g]	63[g]
2. Type HPN flexible cord	65	117
3. Copper or copper-base alloy conductors:		
a. Tinned or bare having:		
1. Diameter or thickness less than 0.015 inch (0.38)	125	225
2. A diameter of thickness 0.015 inch or more	175	315
b. Plated with nickel, silver, gold, or a combination of these metals	225	405
D. ELECTRICAL INSULATION – GENERAL		
1. Varnished cloth insulation	60	108
2. Fiber used as electrical insulation	65	117
3. Phenolic composition (other than in a flatiron or appliance plug used as electrical insulation or as a part)	125[g]	225[g]
4. Glass fiber sleeving:		
a. Unimpregnated	225[h,i]	405[h,i]
b. Coated	25°C less than its temperature rating[h,i]	
E. GENERAL		
1. Wood or other combustible material	65	117
2. Water in reservoir or electrode type appliances[j]	29[k]	53[k]
3. Points on surface supporting a cord-connected appliance	125	225
4. Points on surface supporting a permanently-connected appliance	65	117
5. For a direct plug-in appliance, points on surface of receptacle and on surrounding wall surfaces	65	117

[a] See 37.1.3, 37.1.5, and 37.1.11.

[b] This is the diameter measured in the plane of the lamination of the circle circumscribing the stator frame, excluding lugs, boxes, and the like, used solely for motor mounting, assembly, or connection.

[c] The maximum rise is 85°C (153°F) by the resistance method.

[d] Except in the case of a thermosetting material, the maximum sealing compound temperature, when corrected to a 25°C (77°F) ambient temperature, is 15°C (27°F) less than the softening point of the compound as determined in the Standard Test Methods for Softening Point of Resins Derived from Naval Stores by Ring-and-Ball Apparatus, ASTM E28.

[e] For an electrolytic capacitor that is physically integral with or attached to a motor, the temperature rise on insulating material integral with the capacitor enclosure shall not exceed 65°C (117°F).

[f] A capacitor that operates at a temperature rise of more than 65°C (117°F) may be evaluated on the basis of its marked temperature limit.

[g] The limitations on phenolic composition and on rubber and thermoplastic insulation do not apply to compounds that have been investigated and found to have special heat-resistant properties.

[h] A higher temperature rise is acceptable when the appliance complies with the Extended Operation Test, Section 52.

[i] This requirement does not apply to sleeving installed where it is not folded nor subjected to compression or sharp bends.

[j] This requirement does not apply to an appliance complying with 72.2. See Table 37.3 for flow chart of acceptance criteria for an appliance in which the water temperature rise exceeds 29°C (53°F).

[k] See 37.1.20.

37.1.2 A temperature control that under intended operating conditions is relied upon to maintain temperatures within the limits specified in Tables 37.1 and 37.2, shall comply with the requirements in 46.2.1 for a combination temperature-limiting and temperature-regulating control.

Table 37.2
Maximum temperature rise of surfaces of a hand-supported hair dryer that may be contacted by the user

Surface function and material[a]	°C	(°F)
1. A part of the appliance that is intended to be grasped for lifting, carrying, or holding the appliance		
a) Metal	30	54
b) Porcelain or vitreous material	40	72
c) Molded material, rubber, or wood	50	90
2. A handle or knob that is contacted but does not involve lifting, carrying, or holding the appliance, and any other surface normally subjected to contact during operation or user maintenance		
a) Metal	35	63
b) Porcelain or vitreous material	45	81
c) Molded material, rubber, or wood	60	108
3. A surface other than a heating surface whose function is known to be hot due to its proximity to the heating function surface, and the enclosure surface of a hair dryer spaced more than 1/2 inch (12.7 mm) from the outermost perimeter of the heated air outlet		
a) Metal	45	81
b) Other than metal	70	126

[a] A handle, knob, or the like made of a material other than metal, that is placed or clad with metal having a thickness of 0.005 inch (0.127 mm) or less, is to be evaluated as a nonmetallic part.

Table 37.3
Acceptability criteria for water reservoirs or boiling chambers of electrode-type appliances

Does appliance have water temperature of < or > 29°C (53°F) Rise?					
If > 29°C					If < 29°C (53°F)
Is capacity ≥ or < 8 ounces (23.7 mL)?					**Acceptable**
If ≥ 8 ounces (23.7 mL)			If < 8 ounces (23.7 mL)		
Is marking in accordance with Exception to 72.2 ?	Is ≤ or > 2 ounces (5.9 mL) spilled during Spillage Test (see Exception to 72.2)?		Is ≤ or > 2 ounces (5.9 mL) spilled during Spillage Test (see Exception to 72.2)?		
Acceptable	Is ≤ 2 ounces (5.9 mL) spilled?	Is > 2 ounces (5.9 mL) spilled?	Is ≤ 2 ounces (5.9 mL) spilled?	Is > 2 ounces (5.9 mL) spilled?	
	Acceptable	**Unacceptable**	**Acceptable**	**Unacceptable**	

37.1.3 At coils, the preferred method of measuring temperatures is the thermocouple method; temperature measurements by either the thermocouple or change-of-resistance method may be used. When temperatures of a coil or winding are measured by means of thermocouples, they are to be mounted on the outside of the coil wrap. If the coil is inaccessible for mounting thermocouples (for example, a coil immersed in sealing compound) or if the coil wrap includes thermal insulation such as more than 1/32 inch (0.8 mm) of cotton, paper, rayon, or similar insulation, the change of resistance method is to be used. For the thermocouple-measured temperature of a coil of an alternating-current motor (other than a universal motor) having a frame diameter of 7 inches (178 mm) or less (Table 37.1, item A, subitems 2 and 4), the thermocouple is to be mounted on the integrally applied insulation of the conductor.

37.1.4 In using the resistance method, the windings are to be at room temperature at the start of the test. The temperature rise of a winding is to be calculated from the formula:

$$t = \frac{R}{r}(k + t_1) - (k + t_2)$$

in which:

t is the temperature rise, in °C;

R is the resistance of the coil at the end of the test, in ohms;

r is the resistance of the coil at the beginning of the test, in ohms;

k is 234.5 for copper, 225.0 for electrical conductor grade (EC) aluminum, and k for other grades shall be determined;

t_1 is the room temperature at the beginning of the test, in °C; and

t_2 is the room temperature at the end of the test, in °C.

37.1.5 At a point on the surface of a coil where the temperature is affected by an external source of heat, the temperature rise measured by means of a thermocouple may be higher than the maximum indicated in Table 37.1 by the following amount:

Reference in Table 37.1	Temperature rise, °C	(°F)
Subitem 2(a) of item A; subitem 4 of item B	5	9
Subitem 4(a) of item A; subitem 2 of item B	10	18
Subitem 3 of item B	15	27

37.1.6 With respect to 37.1.5, if the coil wrap is not caused to exceed its temperature limitation by radiation from an external source, the temperature of the coil may be measured by means of a thermocouple on the integral insulation of the coil conductors.

37.1.7 All values for temperature rises in Tables 37.1 and 37.2 are based on an assumed ambient temperature of 25°C (77°F); however, tests may be conducted at an ambient temperature within the range of 20 – 30°C (68 – 86°F).

37.1.7 revised August 30, 2002

37.1.8 If the retention of the insulation of a heater cord depends upon a fabric braid, the braid shall not be removed nor subjected to a temperature rise of more than 65°C (117°F) unless other means are provided to hold the insulation in place. The jacket of Type HSJ or HSJO cord shall not be subjected to a temperature rise of more than 35°C (63°F) if the protection afforded by the jacket is required.

37.1.9 Certain special treatments, such as the use of an impregnant, have been determined to be acceptable for retaining the insulation around the conductors of a heater cord at elevated temperatures.

37.1.10 Thermocouples used to measure temperatures obtained by the thermocouple method are to consist of wires not larger than No. 24 AWG (0.221 mm^2). The temperature is considered to be stabilized when three successive readings, taken at intervals of 10 percent of the previously elapsed duration of the test but not less than 5 minutes indicate no change.

37.1.11 When thermocouples are used in the determination of temperatures in connection with heating of electrical equipment, it is common practice to use thermocouples consisting of No. 30 AWG (0.05 mm^2) iron and constantan wires and a temperature-indicating instrument. Thermocouples consisting of No. 30 AWG iron and constantan wires and a potentiometer-type temperature-indicating instrument are to be used whenever referee temperature measurements by thermocouples are required.

37.1.12 To determine whether an appliance complies with the requirement in 37.1.1, it is to be operated as follows. If the voltage rating of the appliance is within the range of 110 – 120 volts (inclusive), the test voltage is to be 120 volts. If the voltage rating of the appliance is within the range of 220 – 240 volts (inclusive), the test voltage is to be 240 volts. For an appliance having a voltage rating other than those previously specified, the test voltage is to be the marked voltage rating. Unless a particular voltage or other test condition is specified, the test voltage is to be increased, if necessary, to cause the wattage input to the appliance to be equal to its marked wattage rating.

37.1.12 revised August 30, 2002

37.1.13 If an appliance uses a motor in addition to a heating element, the voltage applied to an integrally connected motor is to be 120 volts for an appliance rated at 110 – 120 volts, 240 volts for an appliance rated at 220 – 240 volts, or the rated voltage of the appliance for other cases. A motor supplied from a separate circuit is to be operated at a voltage (depending upon the motor rating) as specified for an integrally connected motor.

37.1.14 During the test, each general use receptacle, or a general use receptacle intended for a limited current load, shall be loaded with a 15-ampere resistive load or with a lesser load if marked in accordance with 61.1.6.

Exception: Each outlet of a duplex receptacle shall be loaded with a 10-ampere load.

37.1.15 The appliance is to be mounted or supported as in service and tested under conditions approximating those of intended operation. If a timer switch or the equivalent is provided as part of the appliance, an appropriate cycle of operation shall be used.

Exception: For requirements regarding hand-supported hair dryers, see 37.5.1.

37.1.16 A manually resettable thermal device or a thermal cutoff shall not operate during the normal temperature test.

37.1.17 In a hand-supported hair dryer, the motor circuit shall not become de-energized during the normal temperature test.

37.1.18 A means for adjusting the operating temperature is to be set to give maximum heating.

37.1.19 An electrical heating element intended for application to the hair is to be loaded with a moistened cloth and then operated until the moisture has been evaporated and the heating surface of the unit has attained a temperature of 204°C (400°F). Following a 2 minute period with the unit disconnected, during which it is to be reloaded with another moistened cloth, the heating and evaporating operation is to be conducted a second time. The complete cycle is then to be repeated again. Temperatures are to be measured throughout the test.

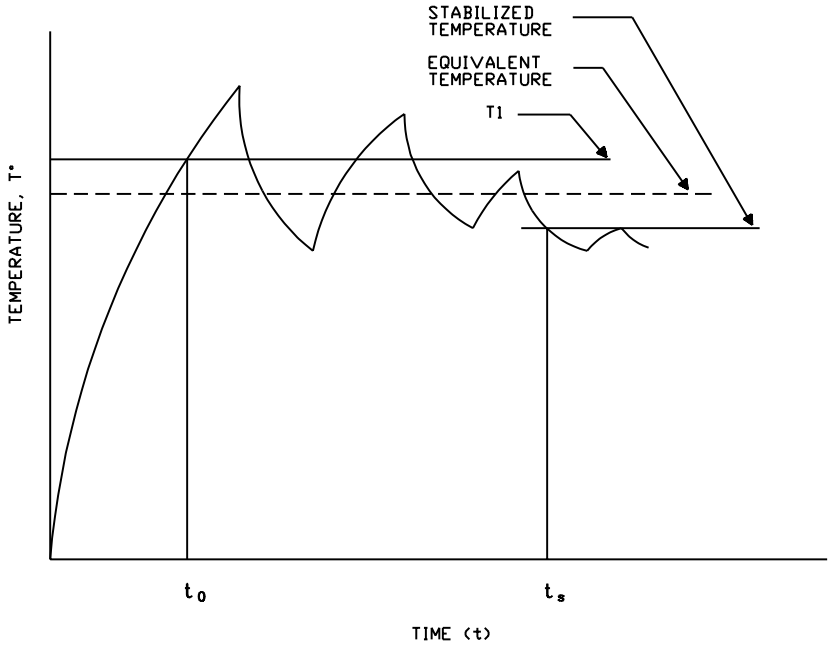
37.1.20 An appliance having a reservoir for heating water shall have the water temperature measured by means of a thermocouple floated approximately 3/16 inch (4.8 mm) beneath the surface of the solution and located midway between the outer surface of the electrode enclosure and the inner surface of the water reservoir. The unit is to be tested in a room ambient of 25°C (77°F).

Exception: This requirement does not apply to electrode-type appliances with a water reservoir or boiling chamber having a capacity of 8 ounces (23.7 mL) or less and marked in accordance with 72.2.

37.1.21 For an appliance in which clips to be applied to the hair are heated by an external heater, the test is to consist of operation of the appliance until temperatures are constant, with the clips in place on the heater.

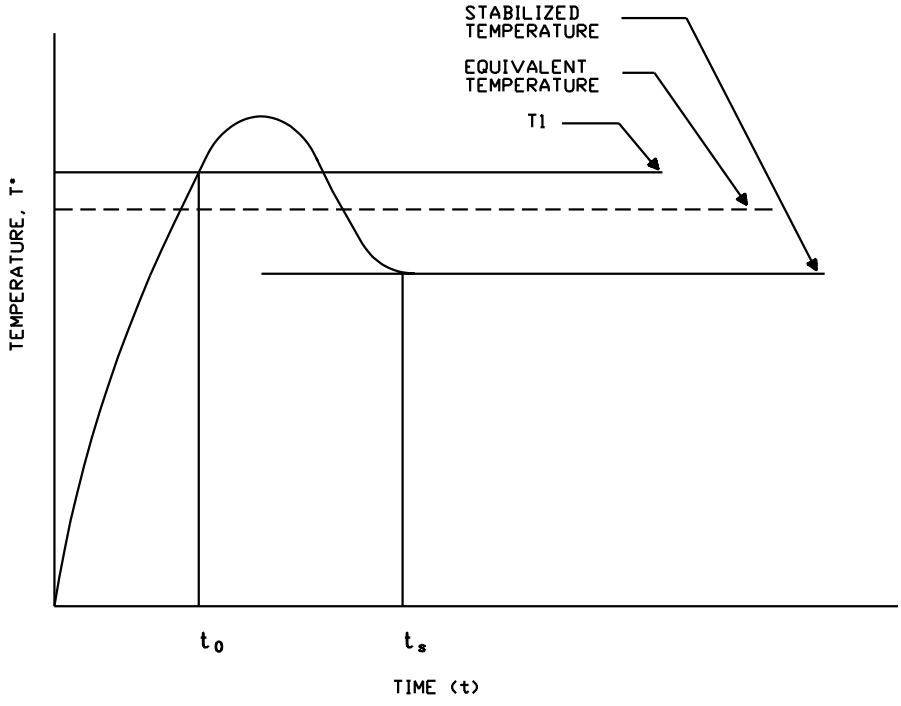
37.1.22 With regard to the Exception to 37.1.1, the equivalent continuous normal use temperature is to be determined as follows. The graph of the temperature plotted against time from the start of the test until a stabilized condition has been established is to be obtained, and the area under the curve over the period of time, ts minus t_0, is to be determined. Figure 37.1 shows t_0 as the time when the graph first crosses the line, TI, and t_s as the time when a stabilized temperature is obtained. (TI represents the temperature index or the temperature acceptable for the material or component in question.) The area under the curve, divided by the period of time (t_s minus t_0), will yield the equivalent continuous normal use temperature. The area under the curve may be determined mathematically (Simpson's Rule), graphically, or by using a planimeter.

Figure 37.1
Determination of the equivalent continuous normal use temperature



Example using a thermostatically–controlled appliance

SM1168



Example using a preheat–type appliance

SM1170

37.2 Wax depilatory appliances

37.2.1 The appliance is to be loaded with the maximum recommended amount of wax and operated continuously until constant temperatures have been reached. An adjustable temperature control is to be set for maximum heating. If the appliance has several heat settings for different functions (as noted in 7.3.3), it is to be operated at the highest heat setting, as well as at the maximum setting intended to maintain the molten wax at the temperature for application to the skin.

37.2.2 The wax temperature is to be measured by means of a thermocouple immersed beneath the surface of the wax to a depth of approximately one-half of the total depth, at the approximate center of the reservoir. The wax is to be slowly and continuously stirred while temperatures are being recorded. For depilatory appliances having self-contained wax applicators (no open reservoirs), thermocouples are to be inserted into the wax applicators to a depth of approximately one-half of the total depth of the wax.

37.2.3 In addition to complying with the requirements specified in 7.3.1, 7.3.2, and 37.1.1, the visible overheat condition indicator, when required as specified in 7.3.3(b), shall function when the wax temperature exceeds 75°C (167°F).

37.3 Heated air curling irons and brushes

37.3.1 A heated air curling iron or brush is to be operated continuously with all air intake and outlet openings unrestricted until temperatures stabilize. The appliance is then to be operated through 30 cycles, with one cycle consisting of one minute of operation with the air intake and outlet openings blocked as described in 37.3.2, followed by 10 seconds of operation with all air openings open.

Exception: With the concurrence of all concerned, the cycling portion of the test may be replaced with 30 minutes of continuous operation with the openings blocked as described in 37.3.2.

37.3.1 revised June 16, 2004

37.3.2 With regard to 37.3.1, air intake openings provided in the gripping area of the handle that may be blocked by the user's hand, such as those shown in Figure 37.2, are to be blocked such that all openings in three or fewer quadrants of the handle circumference will be blocked. (If there are openings in all quadrants, those in one quadrant are to be left open. Openings provided in the base of a cylindrical handle, such as those shown in Figure 37.3, are not considered likely to be blocked by the user's hand and are not to be blocked.) Three-fourths of the air outlet openings in the barrel are also to be blocked. For example, in a unit provided with eight parallel rows of openings in the length of the barrel, two adjacent rows are to be left unblocked.

Figure 37.2
Example of a curling brush with air intake openings provided in the gripping area of the handle

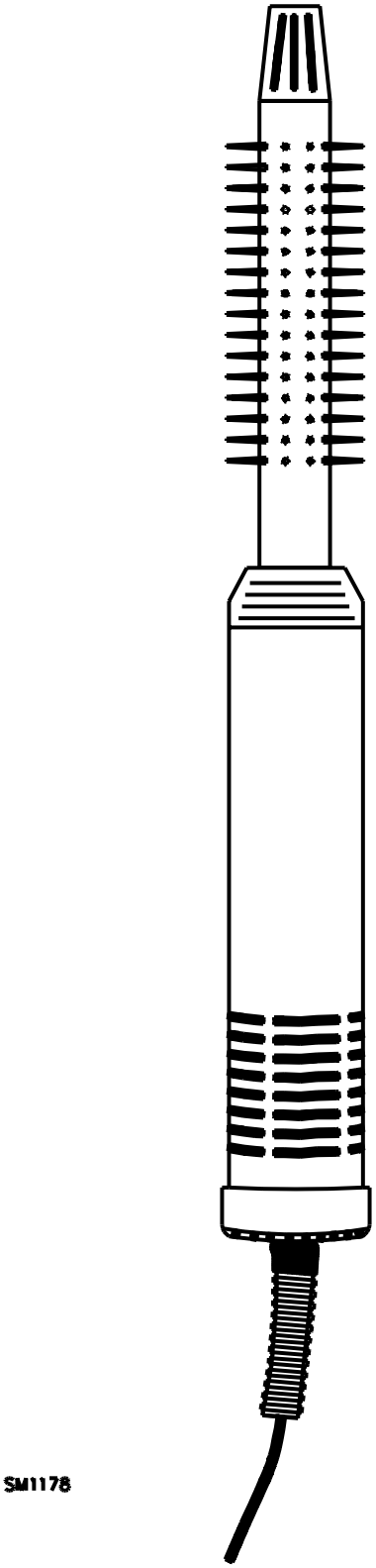
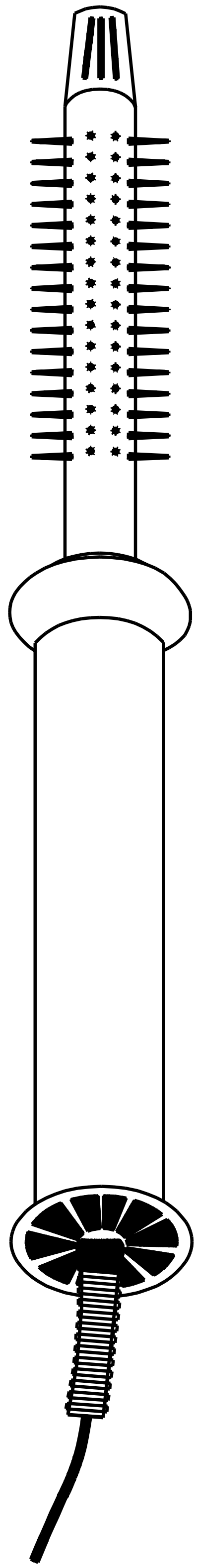


Figure 37.3
Example of a curling brush with air intake openings provided in the base of the handle


SM1179

37.4 Hair-drying appliances

37.4.1 For a floor- or table-supported hair dryer having a bonnet or rigid hood and provided with an adjustable temperature control, temperatures are to be recorded after 15 minutes of operation with the control set for maximum heating and with the dummy head in the position normally occupied by the human head under the dryer. The control is then to be set for the coolest condition that results in an average temperature of no less than 43°C (109.4°F) on the top and sides of the dummy head, and operation is to be continued until all temperatures become constant. The dummy head is then removed, the control is to be reset for maximum, and operation is to be continued until temperatures become constant. A hair dryer that has a flexible air tube that can be separated from the bonnet or rigid hood is also to be tested under the conditions described in 37.5.1.

37.4.2 For a hair dryer that is provided with a rigid hood, the dummy head is to be located so that its surface will be a minimum of 1 inch (25.4 mm) from the interior surface of the hood and so positioned in the hood that maximum temperatures will result.

37.4.3 A floor-supported hair dryer not provided with an adjustable temperature control is to be operated continuously (with the dummy head in place) until all temperatures become constant.

37.5 Hand-supported hair dryers

37.5.1 A hand-supported hair dryer shall be tested with the adjustable temperature control, if any, set for the most severe condition of use and supported in the position representing the most severe conditions of use. The dryer shall be operated continuously until stabilized conditions are achieved, first without any attachment on the heated air outlet nozzle, and then, if the dryer is provided with one or more attachments for the heated air outlet, in turn with each attachment in place, as intended.

Revised 37.5.1 effective July 1, 2007

37.5.1.1 A dryer with screen-covered air inlet openings shall have two layers of fabric loosely secured over the openings to simulate the accumulation of hair, lint, or other particulate matter. The fabric shall be white, 100 percent untreated cotton terrycloth having a pile weave and a nominal weight of 8 ounces per square yard (271 g/m^2).

Added 37.5.1.1 effective July 1, 2007

37.5.1.2 During each of these tests, the plane of the thermocouple grid specified in 37.5.2 is to be positioned 1 inch (25.4 mm) from the plane of the heated air outlet of:

a) The dryer nozzle or

b) The attachment nozzle.

The center of the air stream is to be directed at the center of the grid. Temperatures are to be measured throughout the test. There shall not be a temperature rise greater than the limits specified in Tables 37.1 and 37.2, nor greater than 100°C (180°F) for the average of the five highest thermocouple readings on the grid described in 37.5.2.

Added 37.5.1.2 effective July 1, 2007

37.5.2 The thermocouple grid assembly is to consist of two pieces of 1/16-inch (1.6-mm) thick glass epoxy board of the configuration and dimensions shown in Figure 37.4. The two boards are to be separated 1/8-inch (3.2-mm) by one 5-1/4- by 1/4- by 1/8-inch (133- by 6.4- by 3.2-mm) wood spacer at the top and bottom edges. Each spacer is to be secured by four 4 – 40 by 3/8-inch countersunk flat head machine screws. Each end screw is to be threaded from the face of the assembly into a nut against the rear epoxy board. Each of the middle screws is to be located approximately 1-1/2 inches (38.1 mm) from the nearest longer edge of the board and threaded from the face into a standoff leg of a sheet aluminum back plate. The 5-1/2 by 3-1/4 inch (140 by 83 mm) stand-off back plate is to consist of sheet aluminum that is 0.05 inch (1.3 mm) thick, having a minimum 7/16-inch (11.1-mm) wide integral standoff leg formed at each corner by means of an extension of the metal being bent in two successive 90-degree angles to cause the back plate to stand away from the rear epoxy board a distance of 1/4 inch. The back plate is to be secured to the center 5-1/2 by 3-1/4 inch section of the board. The board assembly is to be provided with 53 No. 30 AWG (0.05 mm^2) thermocouples. The thermocouples are to be located on the grid spaced

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as shown in Figure 37.4. The thermocouples are to be passed through the two thicknesses of glass epoxy board, and the thermocouple junction is to be cemented to the face of the board using epoxy cement, as shown in Figure 37.5.

Figure 37.4
Spacings on thermocouple grid

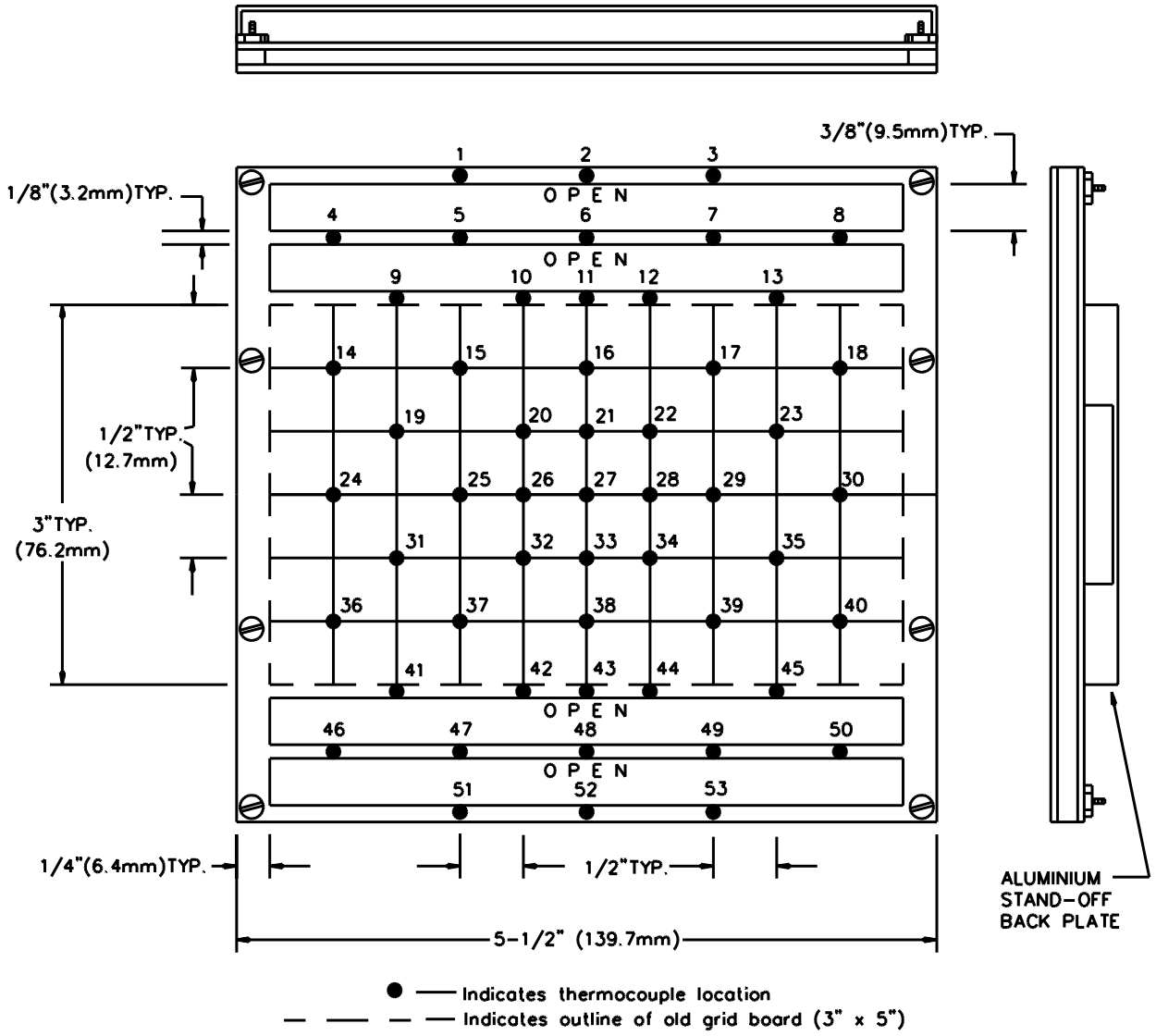
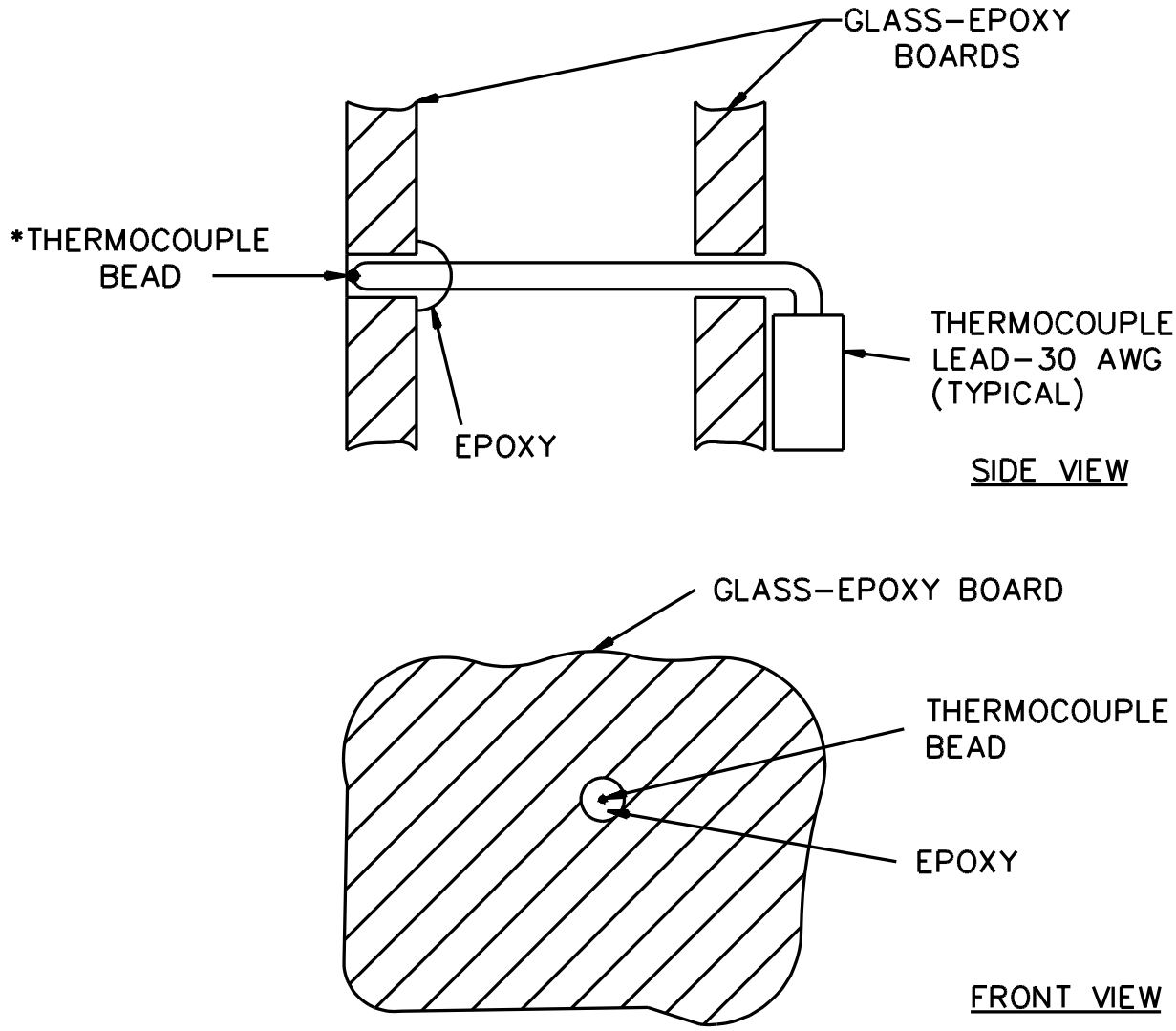


Figure 37.5
Glass bead construction



* TIP OF BEAD EXPOSED AT OUTER SURFACE OF BOARD BY SANDING AWAY EPOXY AFTER ASSEMBLY.
BEAD NOT NECESSARILY CENTERED IN HOLE.

SB1752

37.6 Motor slowdown test method

37.6.1 *37.6.1 – 37.6.5 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004*

37.6.2 *37.6.1 – 37.6.5 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004*

37.6.3 *37.6.1 – 37.6.5 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004*

37.6.4 *37.6.1 – 37.6.5 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004*

37.6.5 *37.6.1 – 37.6.5 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004*

37.7 Temperature test – motor slowdown

37.7.1 *37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004*

37.7.2 *37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004*

38 Dielectric Voltage-Withstand Test

38.1 An appliance, while heated to its operating temperature, shall be subjected for 1 minute to a 60 hertz essentially sinusoidal potential as specified in Table 38.1 applied between live parts and exposed dead-metal parts. There shall not be dielectric breakdown.

Table 38.1
Dielectric test potential

Appliance	Test potential, volts (rms)
An appliance not intended to be applied directly to a person, such as a wig dryer, hair curler heater (hair setter), hand-supported hair dryer, or similar appliance.	1,000
An appliance intended to be applied directly to a person without moisture present, such as a dry curling iron	1,000 + 2V[a]
An appliance (or attachment provided with it) intended to be applied in a wet or moist condition directly to a person, such as a steam curling iron, a mist-type hair curler, or similar appliance.	2,500[b]
An appliance such as a hair dryer-styler or hair untangler having comb or brush accessories, or both, that may be used for setting or styling of wet or damp hair	2,500[b]

[a] V is the maximum marked voltage but no less than 120 volts for a nominal 120-volt appliance or 240 volts for a nominal 240-volt appliance.

[b] A 2,500-volt potential is also to be applied to the handle, which is wrapped in metal foil, of a hand-supported appliance and to selected switch areas of any other appliance.

38.2 With respect to 38.1, an appliance that has no exposed dead-metal parts is to be closely wrapped in metallic foil and the test potential is to be applied between the foil and all live parts.

38.3 To determine compliance with the requirements in 38.1 and 38.2, the test is to be made using a 500 volt-ampere or larger capacity testing transformer, the output voltage of which is essentially sinusoidal and can be regulated. The applied potential is to be increased from zero until the required value is reached and is to be held at that value for 1 minute. The increase in the applied potential is to be at a substantially uniform rate and sufficiently rapid to be consistent with its value being correctly indicated by a voltmeter.

38.4 An appliance provided with a normally-open immersion protective device is to be tested as follows. The appliance is to be connected to a supply circuit of rated voltage, the protective device is to be reset (closed), an on-off switch of the appliance is to be in the ″off″ position, and the test potential is to be applied between each supply circuit conductor and exposed dead-metal parts as described in 38.1 – 38.3.

39 Abnormal Operation Tests

39.1 General

39.1.1 A hair dryer shall not cause ignition of any material or emission of flame, sparks, molten metal, or similar result when operated under the conditions described in:

a) 39.1.2, 39.1.3, and 39.2.1 – 39.3.7.13 for a hand-supported type, or

b) 39.1.2, 39.1.3, and 39.2.1 – 39.2A.4 for other than a hand-supported type.

The dryer shall not collapse or experience displacement of any part that results in a risk of fire or electric shock, such as short-circuiting or grounding.

Revised 39.1.1 effective July 1, 2007

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39.1.2 In a test to determine compliance with the requirement in 39.1.1, the dryer is to be connected to a supply circuit of a voltage in accordance with 37.1.13. Temperature-control adjustments or the equivalent, if any, are to be set in the position that will result in the most severe test, and thermostats or other temperature controls are to be shunted out of the circuit unless it has been determined that they are rugged, reliable, and not likely to be defeated by the user. The fuseholder of the branch circuit to which the dryer is connected is to be of the size that normally would be used with the dryer, and the branch-circuit fuse (or fuses) is to be of the maximum current rating that such a fuseholder will accommodate. Exposed metal parts are to be connected to ground through a 3-ampere fuse. A cord-connected dryer is to be placed on white tissue paper on a softwood surface. Operation is to be continued until the ultimate effects of the heating have been observed.

39.1.3 The test procedures described in 39.2.1 – 39.3.6.1 are for a conventional-type appliance. If the appliance involves unusual features, the test procedures may be modified or supplemented as necessary in order to take such unusual features into account.

39.1.4 A curling iron is to be operated without any separable stand on a softwood surface covered with two layers of white tissue paper. The curling iron is to be covered loosely with a double layer of cheesecloth as described in 39.2.1.

39.1.5 A steam-type curling iron is to be energized at rated wattage and the water reservoir filled with a solution of hard water (1/2 gram of calcium sulfate, $CaSO_4$ $2H_20$, per liter of distilled water) in an amount equal to the capacity of the reservoir. With the steam outlet opening blocked, a steam actuator control is to be operated at the fastest possible rate that produces steam, until the water supply is exhausted or for 15 minutes, whichever occurs first. The sample is to be positioned in the most unfavorable position with respect to internal components, and the leakage current is to be continuously monitored. The result is acceptable if the leakage current does not exceed that specified in the Leakage Current Test, Section 31. Immediately following the test, the sample shall be subjected to a 2,500-volt dielectric voltage-withstand test as described in the Dielectric Voltage-Withstand Test, Section 38. There shall not be dielectric breakdown.

39.1.6 A steam-type curling iron or mist-type hair styler having an integral liquid reservoir shall be subjected to an overfill test consisting of pouring a solution of hard water as described in 39.1.5 into the reservoir. The amount of solution shall be 200 percent of the intended capacity of the reservoir. During the test the appliance is to be held in its fill position and the leakage current is to be continuously monitored. There shall not be the leakage current exceeding that specified in the Leakage Current Test, Section 31. Immediately following the test, the sample shall be subjected to a 2,500-volt dielectric voltage-withstand test as described in the Dielectric Voltage-Withstand Test, Section 38. There shall not be dielectric breakdown.

39.1.7 In order to determine if a steam-type hair curler having an integral liquid reservoir will need to have the wording specified in 63.7(g)(16), the appliance shall be subjected to a water droplet test consisting of pouring a solution of hard water, as described in 39.1.5, into the reservoir. The amount of solution shall be the specified capacity of the reservoir. During the test the appliance is to be energized at rated wattage. The appliance steam control system is to be actuated continuously, commencing with the appliance cold, and ending beyond the point when the appliance becomes fully heated. If no water droplets are emitted from the steam vents at any time during the test, the appliance Important Safety Instructions need not include the information described in 63.7(g)(16).

39.1.7 revised August 30, 2002

39.2 Hair dryers – drape test

39.2.1 A bonnet-style hair dryer shall be operated without the use of a dummy head until all temperatures stabilize, and then draped with a double layer of cheesecloth.

Revised 39.2.1 effective July 1, 2007

39.2.2 A handheld hair dryer shall be placed on a flat, horizontal hardwood surface, operated until all temperatures stabilize, and then draped with a double layer of cheesecloth.

Revised 39.2.2 effective July 1, 2007

39.2.3 The cheesecloth shall be draped in a manner so as to retard the air flow and cover the hottest area of the hair dryer but not be deliberately manipulated to cause an overly restrictive air flow.

Revised 39.2.3 effective July 1, 2007

39.2.4 The hair dryer shall be operated for 8 hours or until stabilized conditions are apparent, whichever is longer. The cheeselcloth shall not discolor, glow, or flame as a result of this test.

Added 39.2.4 effective July 1, 2007

39.2A Hair dryer locked rotor test

39.2A.1 The sample from the drape test shall be used for this test.

Added 39.2A.1 effective July 1, 2007

39.2A.2 The motor blower shall be locked and a single layer of cheesecloth loosely draped over the appliance as described in 39.2.3. The dryer is then to be operated for 7.5 hours or until stabilized conditions are apparent, whichever is longer.

Added 39.2A.2 effective July 1, 2007

39.2A.3 A second handheld hair dryer sample shall be subjected to the conditions in 39.2A.2 while mounted with the air outlet nozzle pointed downward 45 degrees from vertical.

Added 39.2A.3 effective July 1, 2007

39.2A.4 The tests in 39.2A.2 and 39.2A.3 shall be conducted at each heat setting. A new sample shall be used if a limit control operates to render a sample inoperative prior to completing all tests.

Added 39.2A.4 effective July 1, 2007

39.3 Hand-supported hair dryers

39.3.1 Softwood surface temperature test

39.3.1.1 A hand-supported hair dryer is to be placed on a flat, horizontal, softwood surface covered with two layers of white tissue paper, and operated until constant temperatures are attained. During this test, both the heating element and the blower are to be operating. The position of the dryer is to be such (considering the possibilities of actual service) that the maximum temperature will be produced on the paper-covered supporting surface. The temperature rise on the paper shall not exceed 125°C (225°F).

39.3.2 Bypassed temperature control test

39.3.2.1 *Deleted June 16, 2004*

39.3.2.2 *Deleted June 16, 2004*

39.3.3 Restricted air inlet test

39.3.3.1 Three samples shall each be subjected to a restricted air inlet condition in which the unit is oriented in the most adverse operating condition and operating at the maximum permitted wattage (110 percent of rated wattage in accordance with 36.1 and 36.2) and at the highest heat and motor speed setting. The air inlet opening shall be gradually obstructed until the operation of all circuits is interrupted by the functioning of a limit or a temperature control, or until ultimate results are otherwise obtained (see 39.3.3.2). If the highest heat and motor speed settings do not result in the most adverse condition, the restricted air inlet procedure is to be repeated under the conditions that produce the most adverse results. In addition to the conditions specified in 39.1.1, there shall not be circuit interruption by component burnout other than operation of a limit control.

39.3.3.2 The air intake openings are to be gradually obstructed by using layers of terrycloth, as defined in 39.3.3.3, sized at least 2 inches (50.8 mm) greater than the dimension of the intake opening. The terrycloth is to be placed over the opening one layer at a time at 3 minute intervals up to a maximum of 10 layers, and remain over the opening for 7-1/2 hours of operation, at which point ultimate results may be considered obtained. If draping does not restrict the air opening, then additional restraint, such as taping, may be necessary to hold the terrycloth in place. Tape is not to be used as the means of blocking the air openings. If the unit is provided with two separate sets of intake openings (such as the gun-type dryer), both sets of intake openings are to be gradually obstructed simultaneously.

39.3.3.3 Fabric used in the test described in 39.3.3.2 shall be white, 100 percent untreated cotton terrycloth having a pile weave and a nominal weight of 8 ounces per square yard (271 g/m^2).

39.3.3.4 The same test conditions specified in 39.3.3.1 and 39.3.3.2 shall be applied, but with all temperature controls simultaneously bypassed and with no additional layers of terrycloth added after the limit control operates. When the limit control operates, the test shall be stopped.

39.3.4 Restricted air outlet test

39.3.4.1 The tests and the investigation of the results specified in 39.3.3.1 shall be repeated but the air outlet is to be blocked, as described in 39.3.4.2.

39.3.4.2 The air outlet is to be gradually obstructed using masking tape such that approximately 50, 75, 90, and 100 percent of the outlet opening area is progressively blocked for 3 minutes at each of the four positions. For each of three samples, the location at which the blocking begins (the top, a side, or bottom) is to progress in the same direction in which it was started and is to be such that the limit control will remain in the air flow for the longest possible time as blocking progresses. If temperatures cause degradation of the tape, or if the use of tape would cause deformation of an outlet nozzle, a metal plate or other material resistant to combustion may be used to block the outlet opening. If the final 100 percent blockage test does not result in interruption of all heater and motor circuits by a limit control, the test is to be continued, at 100 percent blockage, for 7-1/2 hours, at which time ultimate results are considered to be achieved.

39.3.4.3 The same test conditions specified in 39.3.4.2 shall be applied, but with all temperature controls simultaneously bypassed and with no additional masking tape added. When the limit control operates, the test is to be stopped.

39.3.5 Floor drop test

39.3.5.1 Each of three samples (without thermocouples) shall be energized at rated wattage and set to operate at maximum intended speed. While operating, they are to be dropped three times from a height of 36 inches (914 mm) onto a hardwood surface so that the point of impact is different for each of the three drops. After each drop, compliance with 39.3.5.3(a), (c) and (d) is to be determined. After the third and final drop in each case, compliance with 39.3.5.3(b) and (e) is to be determined.

Exception: It is acceptable for a heating element to break if tests show that after this occurs the appliance consistently:

a) Complies with the requirements in 39.1.1 and 39.1.2 and

b) Has no spacing reduced below the minimum required level.

39.3.5.1 revised June 16, 2004

39.3.5.2 If a hand-supported hair dryer appears operable following the three drops, it is to be set up as indicated for the full motor speed test as specified in 37.5.1, and temperatures on the thermocouple grid are to be recorded. In addition, current input to the unit and motor speed are to be recorded. If the temperatures on the thermocouple grid do not exceed the limits specified in 37.5.1, and if the current input to the unit and the motor speed do not differ from the values obtained in the initial full motor speed test by more than ±10 percent, the test results are considered acceptable and the test is to be discontinued.

39.3.5.3 The result is not acceptable if, after being subjected to the test specified in 39.3.5.1, a sample:

a) Permits the entry of the accessibility probe, as shown in Figure 6.1, into the enclosure to contact an uninsulated live part;

b) Is unable to comply with the Dielectric Voltage-Withstand Test, Section 38;

c) Experiences circuit interruption by component burnout other than operation of a limit control;

d) Has caused the 3-ampere fuse to ground to open; or

e) If still in an operating condition, exceeds the temperature limits specified in Tables 37.1 and 37.2 when tested as described in 37.7.1 and 37.7.2.

39.3.5.3 added June 16, 2004

39.3.6 Broken heating element test

39.3.6.1 The heating element in a hand-supported hair dryer shall be constructed so that if the wire is cut at any point, electrical spacings shall not be reduced below the limits specified in this standard. After being cut, no portion of the heating element wire shall be accessible to contact by the accessibility probe, as illustrated in Figure 6.1, through any opening in the enclosure while the hair dryer is rotated and moved as intended during use without intentional jerking or shaking. The test shall be conducted on an as-received sample or on a sample that has been conditioned by 1 hour of continuous, intended operation with heat selectors set for maximum heat. In the event that unacceptable results are obtained on an as-received sample, a referee test shall be conducted on a conditioned sample.

39.3.7 Motor slowdown test

39.3.7.1 Three samples of a hand-supported hair dryer, heated air curling iron, or heated air brush shall be subjected to the test described in 39.3.7.2 – 39.3.7.13 to determine compliance with 39.1.1 under conditions of maximum heat and minimum airflow as described in this section.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.2 The input voltage to and wattage drawn by the motor, along with the motor speed, shall be measured and recorded with the appliance operating at rated input voltage.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.3 The motor leads shall be brought outside the appliance and connected to a separate variable supply source so that the motor speed can be varied with negligible effect on the heater circuit.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.4 Hair dryers with a motor load connected in the heating element circuitry (such as a low-voltage direct-current motor) shall have a motor identical to the motor in the appliance (a dummy motor load) electrically connected to replace the motor in the appliance so the internal motor speed can be separately controlled and adjusted without affecting the heater circuit.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.5 A temperature-regulating control shall be shorted out during the test.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.6 The input voltage to the appliance shall be adjusted so that the appliance draws 110 percent rated wattage.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.7 For an appliance tested without a dummy motor load, the target wattage in 39.3.7.6 shall be 110 percent of the rated appliance wattage minus the normal wattage drawn by the motor as recorded under 39.3.7.2. The (separately controlled) input voltage to the internal appliance motor shall be adjusted to obtain the motor speed measured under 39.3.7.2.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.8 The samples shall be mounted in the orientation, provided with the attachment(s), and operated at the heater settings that cause the highest temperatures on polymeric materials near the heater elements.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.9 The samples shall be operated for 30 minutes to obtain stabilized temperatures. A sample whose temperature control operates during that time frame shall have its input voltage incrementally reduced, to lower the wattage drawn by 10 percent, until the sample is able to operate without disruption.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.10 The voltage to the internal motor shall then be reduced as follows, recording the motor speed at each step:

a) At a rate of 1 volt per minute for a motor operating at 30 volts or less or

b) At a rate of 5 volts per minute for all other motors.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.11 The motor voltage and speed at the point when a temperature control operates to open all heater and motor circuits shall be recorded. If all heater and motor circuits are not interrupted by operation of a temperature control, then the motor speed is to be reduced until the limit control operates or to a stopped condition.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.12 A sample for which a (non-resettable) limit control operates before a temperature control shall be replaced by an alternate sample. The alternate sample shall be subject to 39.3.7.13 based on the data recorded on the nonfunctional original sample.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.3.7.13 The appliance shall then be operated under the conditions of 39.3.7.8 with the internal motor operated under either conditions (a) or (b) below:

a) The motor input voltage set at the voltage recorded under 39.3.7.11 plus 10 percent of the difference between that voltage and the original voltage measured under 39.3.7.2 or

b) The motor speed adjusted to the speed recorded under 39.3.7.11 plus 10 percent of the difference between that speed and the original speed measured under 39.3.7.2.

37.6.1 – 37.6.5 and 37.7.1 and 37.7.2 revised and relocated as 39.3.7.1 – 39.3.7.13 June 16, 2004

39.4 Dual-voltage appliances

39.4.1 In addition to the applicable tests described in 39.2.1 – 39.3.6.1, a dual-voltage appliance shall be subjected to the tests described in 39.4.2 – 39.4.4. These tests are subject to the test conditions described in 39.1.2 and the acceptance criteria described in 39.1.1. There shall be no electrical or mechanical breakdown of the voltage selector switch.

39.4.2 The appliance shall have its voltage selector set in any marked supply-circuit voltage position with the equipment connected to any one of the rated supply circuits. The combination of selector settings and supply circuit to which the equipment is connected is to be that which develops the most severe operating conditions.

39.4.3 If provided, an externally operable input voltage selector is to be operated for 25 cycles with the appliance operating at the minimum rated voltage and for 25 cycles with the appliance at the maximum rated voltage. Each cycle is to consist of moving the voltage selector to its alternate position and back at a rate of 6 cycles per minute, with the voltage selector in each position for 5 seconds. The operating and temperature controls are to be set so as to result in the most adverse operating conditions.

Exception: If an externally operable voltage selector switch interlocks with the power switch and cannot be operated with the power switch in the on position, the test procedure will be as described in 39.4.4.

39.4.4 For an externally operable voltage selector switch that interlocks with the power switch and cannot be operated with the power switch in the on position, the voltage selector is to be operated for 25 cycles each at the maximum and the minimum rated voltages. Each cycle is to consist of the following steps:

a) With the power switch in the off position, move the voltage selector to the alternate position;

b) Turn the power switch on and operate the appliance for 5 seconds;

c) Turn the power switch off;

d) Move the voltage selector to the original position; and

e) Turn the power switch on and operate the appliance for 5 seconds.

39.5 All appliances – short-circuit, stall tests

39.5.1 A motor in a limited-energy circuit is to be short-circuited and, as a separate test, is to be stalled. A motor in a low-voltage circuit is to be stalled. Any solid-state device, such as a rectifier, a transistor, a resistor, or a capacitor, is to be subjected to the tests described in 39.5.2 and 39.5.3.

Exception: The tests referenced in 39.5.1 are not required on a motor in a limited-energy circuit or low-voltage circuit when the motor's insulation system and spacings are provided as applicable for the line voltage involved.

39.5.2 If an appliance uses one or more solid-state devices such as a rectifier, a transistor, a resistor, or a similar component, no condition that involves a risk of fire, electric shock, or injury to persons shall develop when the circuit between any two terminals of any such component is opened or shorted. If the appliance uses a capacitor in combination with one of the above-specified components, no condition that involves a risk of fire, electric shock, or injury to persons shall develop when the capacitor is short-circuited. Only one of the simulated fault conditions described is to be imposed at one time. Exposed dead-metal parts of the appliance are to be connected to ground through a 3-ampere fuse, and the results are acceptable if the fuse does not rupture during the test. During the test operations, the appliance is to be draped with a double layer of cheesecloth.

Exception: A wire-wound resistor is not required to be shorted.

39.5.3 Short-circuit tests to determine compliance with the requirements in 39.5.2 are to take into account the intended usage of the appliance. For example, if the appliance is provided with a momentary contact switch having no provision for being locked in the on position, and if there is indication of malfunction (abnormal operation of the appliance, emission of smoke, failure of the appliance to operate in the intended manner, or other indication), the test is to be discontinued when the malfunction becomes evident. Otherwise, the test is to be continued until ultimate results occur.

39.5.4 If an appliance is provided with means for controlling speed, the test is to be conducted at both the maximum and minimum speed settings of the control, and may be conducted at interim speed settings.

39.6 Hair curler heater – short-circuit test

39.6.1 If a hair curler heater uses one or more automatic resetting thermostats, the thermostats are to be short-circuited and the appliance is to be operated under the conditions described in 39.6.2. Six samples of the appliance shall be tested.

39.6.2 Three samples of the hair curler heater are to be tested with the curlers in place, and three samples are to be tested without the curlers. The samples are to be placed on a white, tissue-paper-covered soft pine wood surface in a draft-free location and connected to a circuit of a voltage in accordance with 37.1.13. Exposed dead-metal parts are to be connected to ground through a 3-ampere quick-acting plug fuse. The samples are to be arranged for operation under the most adverse conditions, including with the cover closed if the appliance can be so operated, and are to be draped with a double layer of cheesecloth. Operation is to be continued in this manner until ultimate results are noted or until a manually resettable protector or a replaceable cutoff opens the circuit.

39.6.3 The results of the test described in 39.6.2 are acceptable if:

a) There is no glowing of the supporting surface, flaming of the cheesecloth, or similar manifestation of a risk of fire;

b) There is no degradation of the enclosure material exposing uninsulated current-carrying parts to contact; and

c) The fuse in the grounding connection does not rupture.

39.6.4 A manually-resettable protector or a replaceable thermal cutoff (fusible link) used to provide compliance with the requirement in 39.6.1 shall not function during the normal temperature test.

39.7 Bonnet-type hair dryers – hair entanglement test

39.7.1 A bonnet- or helmet-type hair dryer with heater and blower integral with the head piece shall be subjected to the test described in 39.7.2.

39.7.2 A sample of the hair dryer is to be mounted on a stand and connected to a 120-volt, 60-hertz source of power supply. The hair dryer bonnet is to be installed in the intended operating position over a dummy head equipped with orifices, pitot tubes, and interconnecting tubing such that air pressure can be measured at various points on the head. While the dryer is operating, air pressures are to be measured by means of an air pressure gage having a scale of minus 0.10 inch of water (0.025 kPa) to plus 0.14 inch of water (0.035 kPa). Results are acceptable if no negative pressures are recorded on the gage.

Exception: Negative air pressure may be acceptable if an investigation shows that hair entanglement is not likely to occur.

39.8 Wax depilatory appliances

39.8.1 If a wax depilatory appliance uses one or more automatic reset temperature controls, all such controls are to be short-circuited and the appliance is to be operated under the conditions described in 39.8.2 and 39.8.3.

Exception: Acceptable limit controls tested for 100,000 cycles of operation are not to be short-circuited.

39.8.2 The appliance is to be operated empty and also with the maximum recommended amount of wax. A movable part or cover is to be in the intended position resulting in the most adverse conditions. A self-closing cover (as described in 7.3.4) is to remain in its closed position.

39.8.3 One sample is to be tested under each condition in 39.8.2. Each sample is to be placed on a white, tissue-paper-covered soft pine wood surface in a draft-free location. The sample is to be draped with a double layer of cheesecloth and connected to a circuit of the voltage as specified in 37.1.13. Adjustable temperature controls are to be set for maximum heating. Exposed dead-metal parts of the appliance are to be connected to ground through a 3-ampere, nontime-delay plug fuse. Operation is to be continued in this manner for 7-1/2 hours, or until a manual reset limit control or thermal cutoff opens the circuit. If a limit control can be manually reset without disassembling the appliance, the control is to be held in the on position until 7-1/2 hours of operation elapse or the ultimate results are obtained. If a manually-reset limit control cannot automatically reset when the reset means is held in the ″on″ position, the control is to be reset as quickly as possible after each tripping for a total of four times or for the number of cycles for which it can be reset during the 7-1/2-hour period, whichever is less. The maximum temperature of the wax, as specified in 37.2.3, shall be recorded during wax heating. The maximum temperatures of the interior surface(s) of the wax reservoir(s) shall be recorded during wax heating and empty operation.

39.8.4 The results are acceptable if:

a) There is no glowing of the supporting surface, flaming of the cheesecloth, or similar manifestation of a risk of fire;

b) There is no degradation of the enclosure material exposing uninsulated current-carrying parts to contact;

c) The fuse in the grounding connection does not rupture; and

d) The maximum wax and empty reservoir temperatures do not exceed the flash point temperature of the wax, as determined by the Standard Test Methods for Flash-Point by Pensky-Martens Closed Cup Tester, ASTM D93.

39.8.5 An abnormal test is also to be conducted by operating the appliance under the conditions of intended use, as described in 37.2.1 and 37.2.2, but defeating the temperature control that operates to keep the wax temperature at or below 75°C (167°F). The visible overheat condition indicator specified in 7.3.5 shall function when the wax temperature exceeds 75°C.

39.8.5 revised August 30, 2002

39.9 Hair dryer immersion protective devices with convenience receptacles

39.9.1 To determine compliance with 5.10(h), the hair dryer immersion protective device shall not present a risk of fire or electric shock when tested as described in 39.9.2 – 39.9.5. Additionally, if the immersion protective device is functional at the end of the test, it shall comply with the applicable requirement in the high-resistance ground faults test specified in the Standard for Ground-Fault Circuit-Interrupters, UL 943.

39.9.2 With regard to the requirement specified in 39.9.1, a risk of fire or electric shock is considered to exist if any of the following occur:

a) Glowing, charring, or flaming of the cheesecloth as specified in 39.9.3;

b) Opening of the 3-ampere fuse as specified in 39.9.3;

c) Emission of flame, sparks, or molten metal from the enclosure;

d) Development of an opening in the body of the immersion protective device that exposes live parts involving a risk of electric shock to contact by persons (see 6.5.1 – 6.5.4); or

e) Loss of structural integrity to such a degree that the immersion protective device collapses or experiences such displacement of parts that may lead to short-circuiting or grounding of live parts, or cannot be removed from a receptacle immediately after the test without deformation that may present a risk of electric shock.

39.9.3 The immersion protective device is to be plugged into a duplex receptacle. The outlet's face of the duplex receptacle is to be in a vertical plane. The test voltage and frequency are to be in accordance with 37.1.13. The supply circuit is to be protected by a 20-ampere nontime-delay fuse. During the test, the device is to be draped with a double layer of cheesecloth conforming to the outline of the device. Exposed dead-metal parts of the device are to be connected to earth ground through a 3-ampere nontime-delay fuse. A user-serviceable fuse is to be effectively defeated. The hair dryer is to be operated with its

temperature and speed control adjustments set in the positions that will result in the most severe test. The convenience receptacle is to be connected to a resistive load adjusted to 15 amperes. Operation is to be continued for 7 hours or until one or more of the following results are observed:

a) A risk of fire or electric shock develops (see 39.9.2);

b) The branch-circuit fuse opens;

c) The appliance protective device opens;

d) Any other circuit component opens. If this occurs, the test is to be repeated two more times using new components for each test; or

e) A minimum of 1 hour has elapsed, the circuit conditions have stabilized, and there is no further evidence of overheating of parts. The overheating of parts may be detected by indicators such as odor, smoke, discoloration, cracking of materials, charring, flaming, glowing, arcing, changes in circuit current, or similar phenomena.

If the results in (b), (c), or (d) occur, additional tests as indicated in 39.9.4 shall be conducted.

39.9.4 If the 20-ampere line fuse, appliance protective device, or any other circuit component opens as indicated in 39.9.3(b), (c), or (d), the load on the convenience receptacle is to be adjusted to the highest value that will permit the test to be conducted for 7 hours or a minimum of 1 hour with stabilized conditions.

Exception: If agreeable to those concerned, the size of the overcurrent protective device for the supply circuit may be increased or the appliance protective device or other circuit components which opened may be short-circuited or replaced with higher rated devices in order to conduct the test without adjusting the load.

39.9.5 If operation of the supervisory circuit indicates that the immersion protective device is functional, the device shall comply with the applicable requirement in the high-resistance ground faults test specified in the Standard for Ground-Fault Circuit-Interrupters, UL 943.

39.10 Appliances having an automatically-controlled preheat cycle

39.10.1 Six samples of a hair curler heater (hair setter) and three samples of other appliances are to be tested. Three samples of a hair curler heater are to be tested with the curlers in place and three samples are to be tested without the curlers. The samples are to be placed on a white-tissue-paper-covered soft pine wood surface in a draft-free location. Exposed dead-metal parts are to be connected to ground through a 3 ampere non-time delay fuse. The samples are to be arranged for operation under the most adverse conditions, including with the cover closed, if the appliance can be so operated, and draped with a double layer of cheesecloth. The samples initially at room temperature are to be energized on a supply circuit with a voltage in accordance with 37.1.13 and then de-energized at a rate of one cycle per minute for 10 cycles or until a limit control opens, whichever is less. A cycle is to consist of one energization and one de-energization. The ″on″ time shall be sufficient for the preheat cycle to be completed. The cycle rate and ″on″ and ″off″ or times per cycle may be adjusted as necessary to obtain the intended abnormal heating conditions.

39.10.1 revised August 30, 2002

39.10.2 The results are acceptable if:

a) There is no ignition of any material;

b) There is no emission of flame, sparks, molten metal, or similar result;

c) The appliance does not collapse or experience such displacement of any part that may result in a risk of fire or electric shock, such as short-circuiting or grounding;

d) The enclosure does not permit the entry of the accessibility probe, as shown in Figure 6.1, to contact an uninsulated live part; and

e) The 3-ampere fuse to ground does not open.

40 Exposure to Moisture Test

40.1 An appliance that may alternately be used wet and dry (such as a hair dryer-styler having comb and brush accessories that may be used for setting or styling of wet or damp hair and then used as a dryer, or a hair untangler) shall be tested as described in 40.2 – 40.6.

40.2 One sample is to be subjected to this test in an unenergized condition. Any attachment is to be oriented to result in the most unfavorable condition of use.

40.3 Each sample is to be oriented above a standard test solution (consisting of 1/2 gram of calcium sulfate per liter of water) so that the comb teeth or the center row (or rows) of brush bristles are pointing vertically downward. While held in this position, and without axial rotation, jerking or shaking, the sample is to be lowered so that the teeth or bristles enter the test solution. The depth of insertion is to be such that the exposed bases of the teeth or bristles are at the surface of the water. The sample is to be held in this position for 2 seconds, then removed from the water without changing the angle of the appliance and then tilted to a vertical position with the accessory end up. This position is to be held for 5 seconds, after which the original position is to be resumed and the sample again dipped into the water as before. This operation is to be repeated without interruption a total of ten times at the nominal rate of six per minute.

40.4 Following the dipping cycles, and while being held in its final vertical position, the sample is to be completely and closely wrapped in metal foil. The foil is to contact all exposed accessible dead-metal parts, if any. The sample is then to be oriented in the most unfavorable position with regard to components (such as switches, and the like) and subjected to the dielectric voltage-withstand test described in 40.5.

40.5 The results are acceptable if the appliance, in an unenergized condition, withstands for 1 minute without breakdown a 60-hertz essentially sinusoidal potential of 2,500 volts applied between live parts and the foil wrapping.

40.6 If the appliance is supplied with one or more accessory attachments, the complete moisture test is to be conducted using each accessory. Samples of the appliance are to be in operating condition for this test.

41 Strain Relief Test

41.1 The strain relief means provided on an attached flexible cord, when tested in accordance with 41.2, shall withstand for 1 minute a pull of 35 pounds force (156 N) applied to the cord.

Exception: In the case of a hand-held appliance having a mass of 1/2 pound (227 g) or less, exclusive of the cord, the pull applied to the cord shall be 20 pounds force (89 N).

41.2 The connections of the cord inside the appliance are to be disconnected. The specified force is to be applied to the cord and so supported by the appliance that the strain relief means will be stressed from any angle that the construction of the appliance permits. At the point of disconnection of the conductors, there shall not be movement of the cord to indicate that stress on the connections would have resulted.

42 Cord Flexing Test

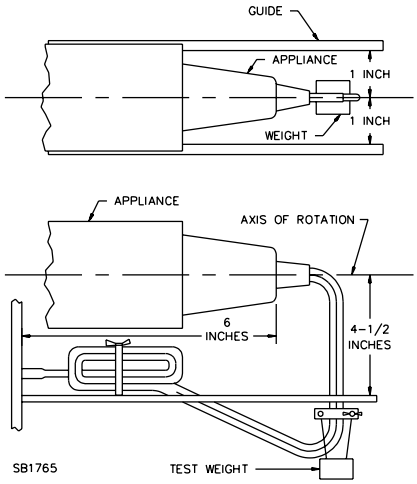
42.1 Each of six ″as received″ samples of a hand-supported hair-drying appliance (such as a hair dryer, blower-styler, heated air comb or brush, hair dryer-curling iron combination, wall-hung hair dryer, or the hand unit of a wall-mounted hair dryer), comb, curling iron, untangler, hair crimping iron, hair straightening iron, or similar hand-supported appliance shall be subjected to a cord flexing test as described in 42.2. Three additional samples of a hand-supported hair-drying appliance shall be subjected to the conditioning and flexing test described in 42.6.

42.2 Each sample is to be mounted in a guide with a 1/4 pound (113 g) weight attached to the cord 8 inches (203 mm) from the cord entry hole so that the unit can be rotated 540 degrees about the axial center of the cord. A typical arrangement is shown in Figure 42.1. The rate of flexing is to be 10 cycles per minute, where 1 cycle is equivalent to three complete rotations as defined in Note (a) of Table 42.1, resulting in a rotational speed of 30 rotations per minute. During the test, the supply cord conductors of the sample are to carry current equal to the current rating of the appliance at rated voltage. The ″as received″ samples are to be subjected to the number of cycles of flexing specified in Table 42.1. The conditioned samples of a hand-supported hair-drying appliance are to be subjected to 1,000 cycles of flexing.

Exception No. 1: With the concurrence of all concerned, the attached weight may be other than 1/4 pound, adjusted such that the cord is held taut and the intended flexing action is produced.

Exception No. 2: With the concurrence of all concerned, the rate of rotation or cycle rate may be greater than specified.

Figure 42.1
Cord flexing test apparatus



Inches	(mm)
1	25.4
4-1/2	114
6	152

Table 42.1
Number of cycles of test for ″as received″ samples

Revised Table 42.1 effective July 1, 2007

Type of appliance	Number of cycles required
Hand-supported hair-drying appliances, other than curling irons and brushes, with or without swivel assemblies	6,000
Curling irons and brushes with or without swivels	5,000
Other hand-supported appliances such as hair crimpers and hair straighteners, with or without swivels	1,000
NOTE – A cycle consists of 540 degrees of rotation in one direction plus 540 degrees in the reverse direction back to the starting point.	

42.3 For an appliance using a cord swivel construction, the test described in 42.2 is to be conducted with the swivel locked in place.

Exception: An appliance using a cord swivel construction can be tested with the swivel operating provided it complies with 42.5.

42.4 For both ″as received″ and conditioned samples, test results are acceptable if:

a) There is no breakage of the cord or exposure of an uninsulated conductor strand except as noted in (d);

b) Each sample is subjected to and complies with a 1,000–volt dielectric voltage-withstand test between the individual conductors of the flexible cord with the internal connections to the unit severed and insulated;

c) For an appliance using a 3-conductor grounding-type cord, the conditions of the grounding continuity test specified in 49.1 are met; and

d) Following the required number of cycles of operation, for an appliance using a cord containing an IDCI sensor, the sensor conductor completes 1,000 cycles after breakage of a power conductor or a maximum of 6,000 cycles, whichever is less.

42.5 An appliance using a cord swivel construction and tested with the swivel operating is to be tested with and without the weight, using separate sets of six samples for each condition, with the cord hanging freely during the test. The swivel shall remain functional during and after completion of the test and shall comply with the requirements in 42.4. A functional swivel shall serve to keep the cord from rotating past the horizontal plane through the axis of rotation.

42.6 Three samples of a hair-drying appliance are to be conditioned in an air oven maintained at a temperature of 100°C (212°F) for 96 hours or at 87°C (189°F) for 168 hours, as specified by the manufacturer. Following oven conditioning and cooling to a room temperature of 23 ±2°C (73 ±3.6°F), the samples are to be tested as described in 42.2.

42A Cord Flexing Test for Appliance Leakage-Current-Interrupter (ALCI)

42A.1 An appliance leakage-current-interrupter (ALCI) configured as an attachment plug cap shall be subjected to the cord flexing test described in 42A.2 – 42A.4. There shall be no damage to the power supply cord insulation or appliance leakage-current-interrupter enclosure and no loss of continuity in any power supply conductor.

Added 42A.1 effective July 1, 2007

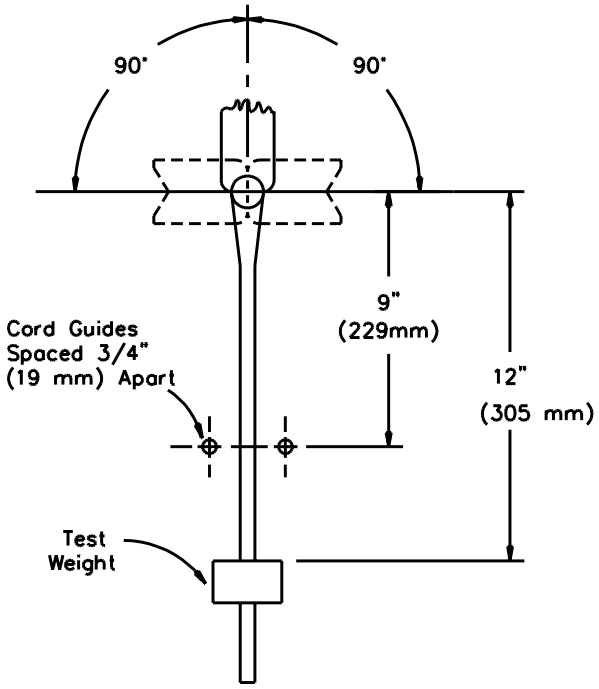
42A.2 To conduct this test, the specified units of the ALCI are to be assembled to the test fixture shown in Figure 42A.1 so there is no interference with the test procedure. Each unit is to be mounted with the point of cord entry into the ALCI at the center of rotation. For the start of the test, the cord is to hang vertically downward. The cord is to be passed through the two cord guides spaced ¾ inch (19.1 mm) apart and located 9 inches (229 mm) below the cord entry into the ALCI. The cord guides are to have smoothly rounded edges where they may be contacted by the cord. A ¼-pound (113-gram) unsupported weight is to be attached to the free end of the cord, 12 inches (305 mm) from the cord entry into the ALCI. The conductors of each unit are to be connected in series with each other, and with a low-voltage, low-current relay circuit that will shut down the flexing machine if a conductor opens.

Added 42A.2 effective July 1, 2007

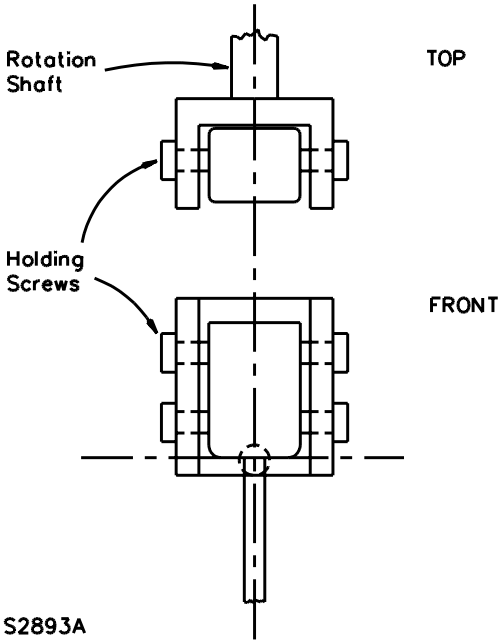
Figure 42A.1
Flexing test apparatus

Added Figure 42A.1 effective July 1, 2007

FLEXING CYCLE



TYPICAL CLAMPING/ROTATING MEMBER



42A.3 Six units are to be subjected to 6,000 cycles of flexing at a rate of 10 cycles per minute in the plane of the face of the ALCI. The test is to be repeated using six additional units with the flexing in the direction perpendicular to the plane of the face of the ALCI.

Added 42A.3 effective July 1, 2007

42A.4 With reference to 42A.3, each cycle consists of a 90-degree rotation of the unit in one direction; a 180-degree rotation in the opposite direction; and then a return to the starting point.

Added 42A.4 effective July 1, 2007

43 Test for Security of Swivel Assembly

43.1 The supply swivel assembly on one as-received sample and three conditioned samples (as described in 43.2) are each to be subjected to a direct pull force of 35 pounds (156 N) for 1 minute with the force applied at any angle the construction of the appliance will permit. The appliance is to be energized at rated wattage during this test. The result is acceptable if:

a) There is no displacement of the cord and no evidence of intermittent contact in the electrical circuit and

b) The appliance complies with 6.5.3 during and after the test.

Exception: The direct pull force for an appliance weighing 1/2 pound (227 g) or less (exclusive of the cord) is to be 20 pounds (89 N).

43.1 revised August 30, 2002

43.2 With regard to 43.1, the conditioned samples are to be maintained for 7 hours at a temperature of 10°C (18°F) higher than the temperature measured on the swivel assembly during the normal temperature test, but not less than 70°C (158°F).

44 Swivel Endurance Test

44.1 An appliance provided with a cord swivel shall be subjected to the cord swivel endurance test described in 44.2 – 44.6.

44.2 If a hand-supported comb, curling iron, hair untangler, or similar hand-supported appliance is provided with a cord swivel, each of the same six samples subjected to the Cord Flexing Testing, Section 42, under the condition of the swivel operating are to be subjected to the tests described in 44.3 and 44.5. For a hand-supported hair dryer provided with a cord swivel, six new samples are to be tested as described in the exception of 44.3 and in 44.5.

44.3 The cord flexing test described in 42.2 is to be continued and the swivel is to be cycled for the additional number of cycles required to total 100,000 cycles. (A cycle consists of 540 degrees in one direction plus 540 degrees in the reverse direction back to the starting point).

Exception: The cycle for the cord swivel of a hand-supported hair dryer is to consist of 100 degrees in one direction, back to the starting point, then 100 degrees in the reverse direction and back to the starting point. Other test conditions are specified in 42.2.

44.4 A hand-supported hair dryer that can be converted into a curling iron (for example, by use of a hair-curling attachment) is to be cycled in accordance with 44.3, with the appliance in the curling iron configuration and, in accordance with the Exception to 44.3, with the appliance in the hair dryer configuration. A separate set of six samples is to be used for testing in each configuration.

44.5 At the conclusion of the cycling in 44.3, a dielectric voltage-withstand test, at a voltage in accordance with the requirements in Table 38.1, is to be performed, as described in 38.1 – 38.3, between live parts and exposed surfaces of the swivel assembly.

44.6 Test results are acceptable if:

a) There is no breakage of the cord or cord swivel, or exposure of an uninsulated conductor strand;

b) Each sample operates as intended;

c) Each sample complies with the requirements of the dielectric voltage-withstand test as required in 44.5; and

d) For an appliance using a 3-conductor grounding-type cord, the conditions of the grounding continuity test specified in 49.1 are met.

45 Hinge Endurance Test

45.1 A hair crimping iron, a hair straightening iron, or an appliance such as a hair dryer having a foldable handle shall be subjected to the hinge endurance test described in 45.2 – 45.4.

45.2 Three samples are to be energized at the voltage specified in 37.1.13. Each sample of a hair crimping or hair straightening iron is then to be subjected to 30,000 cycles of opening and closing the appliance. Each sample of an appliance with a foldable handle is to be subjected to 6,000 cycles of folding and unfolding the handle. The rate of cycling is to be 10 cycles per minute, with one cycle consisting of closing the moveable part from the fully open position to the fully closed position and then back to the fully open position.

Exception: With the concurrence of all concerned, the cycle rate may be greater than specified.

45.3 At the conclusion of the cycling described in 45.2, a dielectric voltage-withstand test as described in the Dielectric Voltage-Withstand Test, Section 38, is to be conducted. The test potential is to be applied between live parts and exposed surfaces of the hinge assembly.

45.4 The results of the cycling described in 45.2 are acceptable if, upon completion of the required number of cycles, the samples are operable (that is, no electrical or mechanical change occurs that renders the appliance inoperable) and:

a) There is no exposure of an uninsulated live part or a normally enclosed insulated wire, and

b) Each sample complies with the requirements in the Dielectric Voltage-Withstand Test, Section 38.

46 Test of Automatic Controls

46.1 Overload

46.1.1 An automatic control provided on an appliance for temperature regulating or limiting shall be capable of operating successfully for 50 cycles of operation when the appliance is connected to a circuit having a voltage of 120 percent of the voltage in accordance with 37.1.13. There shall not be dielectric or mechanical breakdown of the control, or undue burning, pitting, or welding of the contacts.

46.1.2 To determine whether an automatic control complies with the requirement specified in 46.1.1:

a) The appliance is to be connected to a grounded supply circuit;

b) The enclosure, if of metal, is to be connected to ground through a 3-ampere fuse; and

c) The control, if single-pole, is to be connected in an ungrounded conductor. The test is to be made with direct-current. The fuse shall not open.

Exception: An appliance intended for use on alternating-current only is to be tested with alternating-current.

46.2 Endurance

46.2.1 Unless it has been shown by previous tests to be acceptable, an automatic temperature control provided on an appliance shall be subjected to an endurance test that shall consist of the number of cycles of operation indicated in Table 46.1 when connected as described in 46.1.2. If it is indicated in the table that the test is to be conducted under load, the thermostat shall make and break, at a voltage in accordance with 37.1.13, the maximum rated current that it carries under any condition of intended operation of the appliance. There shall not be dielectric or mechanical breakdown of the thermostat and no undue burning, pitting, or welding of the contacts.

Table 46.1
Number of cycles of operation for endurance test

Type of control	Automatically reset control	Manually reset control
Temperature-regulating	A number of cycles equivalent to 1,000 hours of intended operation, but no less than 6,000 cycles. However, the test may be omitted if, with the control short-circuited, no temperature rises of more than the limiting values described in Table 37.1 are attained in a normal temperature test of the appliance.	To be made the subject of an appropriate investigation.[a]
Temperature-limiting	A number of cycles equivalent to 100 hours of operation of the appliance under any condition which causes the control to function, or 100,000 cycles, whichever is greater. However, the test may be omitted if, with the control short-circuited, there is no evidence of a risk of fire as described in 39.1.1 during continuous abnormal operation of the appliance.	1,000 cycles under load and 5,000 cycles without load. However, the test may be omitted if, with the control short-circuited, there is no evidence of a risk of fire as described in 39.1.1 during continuous abnormal operation of appliance.
Combination temperature-limiting and -regulating	100,000 cycles if, with the control short- circuited, there is evidence of a risk of fire as described in 39.1.1. If there is no such evidence, the control is to be tested as described for a temperature-regulating control.	To be made the subject of an appropriate investigation.[a]
Temperature control for hand- supported hair dryers	6,000 cycles. See also 3.25.	

[a] If the operation of the control involves physical movement of a part of the appliance, the test is to be so arranged that each cycle will involve the complete intended operation of the appliance.

46.2.2 With reference to Table 46.1, controls are classified as follows:

a) A temperature-regulating control functions only to regulate the temperature of the appliance under conditions of intended use. The breakdown of the control would not result in a risk of fire, electric shock, or injury to persons.

b) A temperature-limiting control functions only under conditions that produce temperatures higher than intended. The breakdown of the control might or might not result in a risk of fire, electric shock, or injury to persons.

c) A combination temperature-regulating and -limiting control functions to regulate the temperature of the appliance under conditions of intended use, and also serves to reduce the risk of fire, electric shock, or injury to persons that might result from temperatures higher than intended.

47 Test of Thermal Cutoffs (Fusible Links)

47.1 A thermal cutoff shall open the circuit in the intended manner without causing the short circuiting of live parts and without causing live parts to become grounded to the enclosure. This determination is to be made with the appliance connected to a circuit of a voltage in accordance with 37.1.13 and operated in a position to cause excessive heating.

47.2 In the case of a hand-supported hair dryer using a thermal cutoff, each of five samples shall be tested with the dryer oriented in the position most likely to:

a) Cause molten metal from the cutoff to short-circuit a heating element or other electrical part or

b) Expel molten metal through an enclosure opening.

A separate sample shall be used for each different test position.

47.3 To determine whether a thermal cutoff complies with the requirement in 47.1, the appliance is to be operated five times as indicated, and it is required that the cutoff perform acceptably each time.

Exception: Tests are not required on a thermal cutoff complying with the Standard for Thermal Cutoffs for Use in Electrical Appliances and Components, UL 1020.

47.4 The opening temperature of a thermal cutoff shall not differ by more than 8.3°C (15.0°F) from the rated opening temperature. A thermal cutoff shall be investigated with respect to its aging characteristics and its ability to open without a risk of fire, electric shock, or injury to persons under overload and short-circuit conditions.

Exception: A thermal cutoff may have an opening temperature of more than 8.3°C from its rated opening temperature if tests indicate that a greater temperature tolerance is acceptable for a particular appliance. The test will normally consist of those specified in 47.2 and 47.3, using selected thermal cutoffs that will not open at more than 8.3°C below the temperature obtained by adding the tolerance to be conducted to determine that the cutoff does not operate during the normal temperature test in accordance with 37.1.17.

48 Motor Control Overload Test

48.1 A motor control device supplied as a part of an appliance and not having a horsepower rating equivalent to the motor it controls, shall be capable of performing effectively when subjected to an overload test consisting of 50 cycles of operation, making and breaking the stalled rotor current of the motor. Dielectric or mechanical breakdown of the device or undue pitting or burning of the contacts shall not occur.

48.2 To determine whether a motor control device complies with the requirement in 48.1, the device is to be tested with the appliance connected to a supply circuit of rated frequency and a voltage in accordance with 37.1.13, and with the rotor of the motor locked in position. During the test, the frame or enclosure of the appliance is to be connected to ground through a 3-ampere plug fuse, and the electrical connections are to be such that any single pole, current-rupturing device will be located in an ungrounded conductor of the supply circuit. If the appliance is intended for use on direct-current, the exposed dead-metal parts of the appliance are to be connected so as to be positive with respect to a single pole, current-rupturing device. The fuse in the grounding connection shall not open.

49 Grounding Continuity Test

49.1 The resistance of the grounding path between a dead-metal part of an appliance as specified in 25.3 and the equipment grounding terminal or lead or the point of attachment of the wiring system or the grounding blade of an attachment plug shall be no more than 0.1 ohm.

49.2 With reference to 49.1, the resistance may be determined by any convenient method. If the results do not comply with the requirement specified in 49.1, either a direct- or alternating-current at a potential of no more than 12 volts, and equal to the current rating of the maximum-current-rated branch circuit overcurrent protective device that may be used with the appliance, is to be passed from a dead-metal part to either the:

a) Equipment grounding terminal,

b) Point of attachment of the wiring system, or

c) Grounding blade of the attachment plug.

The resulting drop in potential is to be measured between these two points. The resistance in ohms is to be determined by dividing the drop in potential in volts by the current in amperes passing between the two points.

50 Test for Permanence of Cord Tag for Hand-Supported Hair-Drying Appliances

50.1 General

50.1.1 To determine compliance with 61.4.2 and 61.4.4, representative samples that have been subjected to the tests described in 50.2.2 – 50.3.1 shall meet the following requirements:

a) The tag shall resist tearing for longer than 1/16 inch (1.6 mm) at any point;

b) The tag shall not separate from the power supply cord;

c) The tag shall not slip or move along the length of the power supply cord more than 1/2 inch (12.7 mm);

d) There shall be no permanent shrinkage, deformation, cracking, or any other condition that will render the marking on the tag illegible; and

e) Overlamination shall remain in place and shall not be torn or otherwise damaged. The printing shall remain legible.

50.2 Test conditions

50.2.1 For each type of conditioning specified in 50.2.2 – 50.2.4, three samples of the tag applied to the power supply cord in the intended manner are to be used. If tags are applied by an adhesive, tests are to be conducted no sooner than 24 hours after application of the tag.

50.2.2 Three samples are to be tested as received.

50.2.3 Three samples are to be tested at the end of 30 minutes of conditioning at a room temperature of 23 ±2°C (73.4 ±3.6°F) and 50 ±5 percent relative humidity, following conditioning in an air-circulating oven at 60 ±1°C (140 ±1.8°F) for 240 hours.

50.2.4 Three samples are to be tested within 1 minute after exposure for 72 hours to a humidity of 85 ±5 percent at 32 ±2°C (89.6 ±3.6°F).

50.3 Test method

50.3.1 Each sample is to consist of a length of power supply cord to which the tag has been applied. The power supply cord, with the attachment plug pointing up, is to be held tautly in a vertical plane. A force of 5 pounds (22.2 N) is to be applied for 1 minute to the uppermost corner of the tag farthest from the power supply cord, within 1/4 inch (6.4 mm) of the vertical edge of the tag. The force is to be applied vertically downward in a direction parallel to the major axis of the cord. In determining compliance with 50.1.1(d), manipulation is permissible, such as straightening of the tag by hand. To determine compliance with 50.1.1(e), each sample is to be scraped 10 times across printed areas and edges, with a force of approximately 2 pounds (8.9 N), using the edge of a 5/64 inch (2.0 mm) thick steel blade held at a right angle to the test surface.

51 Mounting Means Strength Test

51.1 To determine compliance with 10.1 after the appliance is installed, the appliance is to be mounted in accordance with the manufacturer's installation instructions using fasteners and constructions as described. If no wall constructions are specified, 3/8-inch (9.5-mm) thick plasterboard – drywall on 2 by 4 studs at 16-inch (406.4-mm) centers – is to be used as the support surface. Fasteners are to be applied as specified in the instructions and if not noted are to be positioned in the plasterboard between studs. An adjustable appliance is to be adjusted to the position that will give the maximum projection from the wall. A gradually increasing force is to be applied to act vertically through the center of gravity of the appliance in the extended position. The force is to be increased over a period of 5 to 10 seconds until a load of four times the weight of the appliance, but no less than 10 pounds (44.5 N), is applied to the mounting system. The load is to be sustained for 1 minute. Results should show no evidence of damage to the mounting surface, to the hanging means, or to the appliance.

52 Extended Operation Test

52.1 To determine if a higher temperature rise than that specified in Table 37.1 is acceptable for a fiberglass sleeving (see Note (h) of Table 37.1), three samples of the appliance are to be tested as described in 52.2 – 52.5.

52.2 Each sample is to be operated continuously for 1,000 hours. The test voltage (as specified in 37.1.13) is to be increased, if necessary, to cause the wattage input to the appliance to be equal to its marked wattage rating. Each sample is to be placed on a thermal insulating surface, supported by its stand, if provided. Adjustable temperature controls are to be adjusted for maximum heating. Each sample of an appliance having an automatically controlled preheat cycle is to be subjected to 6,000 cycles of operation. Each cycle is to consist of energizing the appliance from room temperature to the maximum stabilized temperature condition, then de-energizing and cooling to room temperature. Forced cooling, such as by directing air jets at the appliance, may be used to reduce the cooling time. The ″on″ time of each cycle is to be such that the total ″on″ time will be no less than 1,000 hours. Following the successful completion of the 6,000 cycles of operation or the 1,000-hour continuous operation, and after being allowed to cool to room temperature, each sample is to be tested for compliance with the Leakage Current Test, Section 31.

Exception: The appliance is not required to be subjected to the 6,000 cycles of operation if aged for 1,000 hours at a temperature equal to the maximum temperature during the preheat cycle.

52.3 Each sample, while at room temperature, is then to be subjected to impacts as described in 52.4 – 52.6. After each drop for a hand-supported appliance and the one impact for other types of appliances, the leakage current test is to be repeated. After the leakage current test, each sample is to be subjected to the Dielectric Voltage-Withstand Test, Section 38. For a hand-supported appliance, the dielectric voltage-withstand test is to be conducted after the final leakage current test.

52.4 Each of three samples of a hand-supported portable appliance is to be dropped 3 feet (0.91 m) to strike a hardwood surface in the position most likely to produce adverse results. The hardwood surface is to be as described in 27.5. Each sample is to be dropped three times so that, in each drop, the sample strikes the surface in a position different from those in the other two drops.

52.5 Stationary, fixed, counter-supported, or floor-supported appliances are to be subjected to the ball impact test described in 52.6.

52.6 Each of three samples of the appliance is to be subjected to a single impact of the value specified in Table 52.1 for the applicable appliance type, on any surface that can be exposed to a blow during normal use. This impact is to be produced by dropping a steel sphere, 2 inches (50.8 mm) in diameter and weighing 1.18 pounds (0.535 kilogram mass) from a height necessary to produce the specified impact as shown in Figure 52.1. For surfaces other than the top of an enclosure, the steel sphere is to be suspended by a cord and swung as a pendulum, dropping through the vertical distance necessary to cause it to strike the surface with the specified impact as shown in Figure 52.1.

Table 52.1
Ball impact requirements for equipment

Portable				Stationary or fixed,	
Counter-supported,		Floor-supported,			
foot-pounds	(joules)	foot-pounds	(joules)	foot-pounds	(joules)
0.75	1.02	5.0	6.8	5.0	6.8

Figure 52.1
Ball impact tests

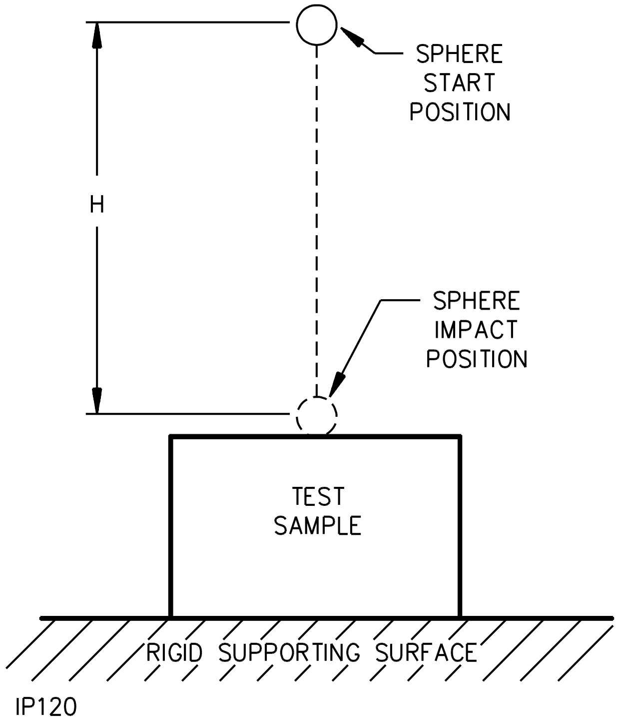
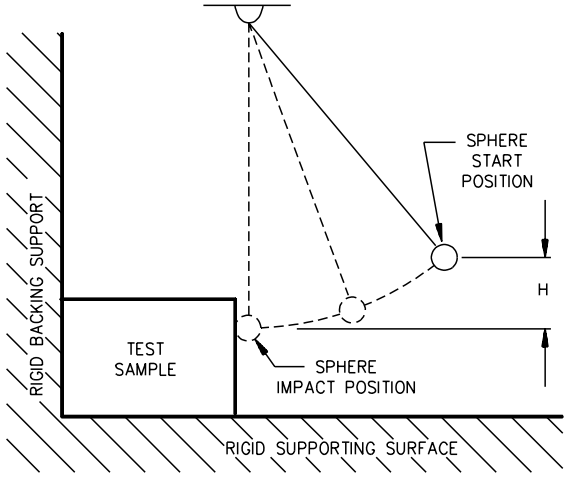


Figure 52.1 (Cont'd)



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NOTES

1 H indicates the vertical distance the sphere must travel to produce the desired impact.

2 For the ball-pendulum impact test, the sphere is to contact the test sample when the string is in the vertical position.

3 The rigid supporting surface is to be as described in 27.5.

52.7 The results are acceptable if all samples:

a) Are operable at the end of the 1,000 hours or 6,000 cycles of operation as specified in 52.2 and

b) Comply with the Leakage Current Test, Section 31, and the Dielectric Voltage-Withstand Test, Section 38.

It is acceptable for the samples to become inoperable after a drop or an impact.

53 Heating Element Endurance Test

53.1 Each of six samples of an appliance having an automatically controlled preheat cycle are to be subjected to 6,000 cycles of operation. Each cycle is to consist of energizing the appliance at the test voltage specified in 37.1.13 from room temperature to the maximum stabilized temperature condition, then de-energizing and cooling to room temperature. Forced cooling, such as directing air jets at the appliance, may be used to reduce the cycling time. Following the successful completion of the 6,000 cycles of operation and after being cooled to room temperature, each sample is to be subjected to Leakage Current Test, Section 31, and subjected to a the Dielectric Voltage-Withstand Test, Section 38.

Exception No. 1: Failure of the heating element assembly before the 6,000 cycles are completed is permissible if breakage of the heating element, and movement of the broken pieces of the element within the appliance, will not result in a risk of fire or electric shock.

Exception No. 2: The heating element endurance test is not required to be conducted if the Extended Operation Test, Section 52, is conducted.

54 Test of Physical Properties of a Liquid Container, Seal, or Diaphragm

54.1 If physical deterioration of a liquid container, seal, diaphragm, or similar part would result in a risk of fire or electric shock, the component shall be tested to determine its resistance to deterioration from the liquid intended to contact it.

Exception: Physical properties of the component are not required to be investigated if it is removed during an abnormal operation test. During and after the abnormal operation test, the Leakage Current Test, Section 31, and the Dielectric Voltage-Withstand Test, Section 38, are to be conducted. Acceptable test results for the leakage current and dielectric voltage-withstand tests are specified in 31.1 and 38.3.

54.2 The test procedure for determining whether a component complies with the requirements specified in 54.1 depends upon the material of which it is composed, its size and shape, the mode of application in the appliance, and similar criteria. The test procedure includes visual inspection for cracks, deformation, and similar deterioration after accelerated aging and a comparison of hardness, tensile strength, and elongation before and after accelerated aging.

54.3 With respect to 54.1 and 54.2, a component of rubber, neoprene, or thermoplastic material shall be tested to compare its tensile strength and elongation before and after artificial aging. The results are acceptable if the properties are found to be no less than the minimum values indicated in Table 54.1 corresponding to the temperature of the component during the temperature test.

Exception No. 1: A part that is too small to be a practical subject of the physical properties measurements in Table 54.1 shall show no cracking or significant deformation or change in hardness after accelerated aging as determined by visual inspection.

Exception No. 2: Test phase II of Table 54.1 is not required to be conducted on materials that have a temperature index as a result of long-term aging or a generic temperature index of at least the measured temperature. See the relative thermal indices in the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B.

Table 54.1
Accelerated aging conditions

Test phase	Test conditions					Minimum percent of original tensile strength and elongation
I	Immersion for 7 days in the liquid used with the material at a temperature no less than 10°C (18°F) higher than the maximum operating temperature of the material measured under intended operating conditions, but no less than 70°C (158°F) in any case.					50
Test phase	Maximum temperature of material during temperature tests, °C	(°F)	No. of days in circulating air oven	Oven temperature, °C	(°F)	Minimum percent of original tensile strength and elongation
II	60	140	7	87	189	60
	75	167	7	100	212	60
	80	176	7	113	234	60
	90	194	7	121	250	60
	105	221	7	136	277	60
	145	293	10	150	302	60
	150	302	10	160	320	60
	160	320	30	170	338	60
	170	338	30	180	356	60
	180	356	30	190	374	60
	190	374	30	200	392	60
	200	392	30	210	410	60

54.4 As an alternative to the air oven aging specified in Table 54.1, the acceptability of a liquid container, seal, or diaphragm may be determined by means of an aging test on the complete appliance under service conditions.

55 Label Adhesion Test

55.1 To determine if a pressure-sensitive label or a label secured by cement or adhesive meets the requirements for its intended use, representative samples that have been subjected to the tests specified in 55.2 – 55.7 shall meet all of the following conditions:

a) Each label shall demonstrate strong adhesion and the edges shall not be curled,

b) The label shall resist defacement or removal as demonstrated by scraping across the test panel with a flat metal blade 1/32 inch (0.8 mm) thick held at a right angle to the test panel, and

c) The printing shall be legible and shall not be defaced by rubbing with thumb or finger pressure.

55.2 For each of the types of conditioning specified in 55.3 – 55.7, three samples of a label are to be applied to the same test surface used in the intended application. The labels are to be applied to the test surface no less than 24 hours prior to testing.

55.3 Three samples of the labels are to be investigated as received.

55.4 Investigation of samples at the end of each test as indicated in 55.5 – 55.7 is to be made:

a) Immediately following removal from each test medium and

b) After exposure to room temperature for 24 hours following removal from each test medium.

55.5 Three samples of the labels under test are to be placed in a full-draft circulating-air oven maintained at the temperature indicated in Table 55.1 for 240 hours.

Table 55.1
Oven temperature

Maximum operating temperature of surface of applied label,		Air-oven test temperature,	
°C	(°F)	°C	(°F)
60	140	87	189
80	176	105	221
100	212	121	250
125	257	150	302
150	302	180	356

55.6 Three samples of the labels under test are to be immersed in water at a temperature of 23.0 ±2.0°C (73.4 ±3.6°F) for 48 hours.

Exception: In place of the immersion test, labels intended for use on clean, dry equipment may be suspended for 72 hours in a humidity cabinet at 32 ±2°C (89.6 ±3.6°F) with an 85 ±5 percent relative humidity.

55.7 If the labels are exposed to unusual conditions in service, such as exposure to medicant, detergents, oil, or other substances, three additional samples are to be conditioned as follows. The samples are to be immersed in a solution representative of service use, maintained at 23.0 ±2.0°C (73.4 ±3.6°F) for 48 hours. For exposure to detergents, the solution is to consist of a mixture of 25 grams of a commercial detergent per liter of water.

56 Flammability Test – Wax for Depilatory Appliances

56.1 The wax for a depilatory appliance shall comply with the flammability test described in 56.2.

Exception: This requirement does not apply to constructions in which the molten wax is stored in a closed applicator and is not exposed to external sources of ignition before being dispensed.

56.2 The depilatory appliance is to be loaded with the maximum recommended amount of wax and operated at the voltage specified in 37.1.13 and the highest heat setting until the molten wax is at its maximum temperature. A wooden match is then to be lighted and touched against the surface of the wax. The wax in the reservoir shall not ignite.

MANUFACTURING AND PRODUCTION-LINE TESTS

57 Dielectric Voltage-Withstand Test

57.1 As a routine production-line test, each appliance shall be subjected to the application of a potential at a frequency within the range of 40 – 70 hertz:

a) Between the primary wiring, including connected components, and accessible dead-metal parts that are likely to become energized and

b) Between primary wiring and accessible low voltage (42.4 volts peak or less) metal parts, including terminals.

57.2 Each power supply cord terminating in a swivel assembly shall be subjected to a test potential between:

a) Line conductors and

b) Each line conductor and grounding conductor, if provided.

The 40 – 70 hertz test potential is to be 1,250 volts maintained for 60 seconds or 1,500 volts maintained for 1 second. The test is to be conducted prior to assembly of the appliance.

Exception: The end product manufacturer is not required to conduct the test if:

a) The power supply cord-swivel assembly combination has been investigated with respect to the requirements covering wiring harnesses and

b) The test is conducted as a routine production-line test by the manufacturer of the power supply cord-swivel assembly combination.

57.3 The production-line test described in 57.1 shall be in accordance with either condition A or B of Table 57.1. The results are acceptable if there is no dielectric breakdown.

Table 57.1
Production-line test conditions

Appliance type or component	Condition A		Condition B	
	Applied potential, volts	Time, seconds	Applied potential, volts	Time, seconds
An appliance not intended to be applied directly to a person during operation, such as a wig dryer, lotion heater with removable reservoir, curler heater, hand- or counter-supported hair dryer, and the like	1,000	60	1,200	1
An appliance intended to be applied directly to a person but without moisture present, such as a dry curling iron	1,000 + 2V[a]	60	1,200 + 2.4V[a]	1
An appliance (or attachment provided with it) intended to be applied in a wet or moist condition directly to a person, such as a steam curling iron, a mist-type hair curler, or the like	2,500	60	3,000	1
An appliance such as a hair dryer/styler or hair untangler having comb or brush accessories, or both, that may be used for setting or styling of wet or damp hair	2,500	60	3,000	1

[a] V is the maximum marked voltage but not less than:
1) 120 volts for a nominal 120-volt appliance or
2) 240 volts for a nominal 240-volt appliance.

57.4 The appliance may be in a heated or unheated condition for the test.

57.5 The test described in 57.1 shall be conducted when the appliance is complete (fully assembled). It is not intended that the appliance be unwired, modified, or disassembled for the test.

Exception No. 1: A part such as a snap cover or friction fit knob that would interfere with conducting the test is required to be in place.

Exception No. 2: The test may be performed before final assembly if the test represents that for the completed appliance.

57.6 When the appliance uses a solid-state component that is not relied upon to reduce the risk of electric shock and that can be damaged by the dielectric potential, the test described in 57.1 may be conducted before the component is electrically connected, only when a random sampling of daily production is tested at the potential specified in Table 57.1. The circuitry may be rearranged for the purpose of the test to reduce the likelihood of solid-state component damage while retaining representative dielectric stress of the circuit.

57.7 The test equipment shall include:

a) A transformer having an essentially sinusoidal output,

b) A means of indicating the test potential,

c) An audible or visible indicator of dielectric breakdown, and

d) Either a manual reset device to restore the equipment after dielectric breakdown or an automatic reject feature activated by any unit indicating dielectric breakdown.

57.8 If the output of the test equipment transformer is less than 500 volt-amperes, the equipment shall include a voltmeter in the output circuit to directly indicate the test potential.

57.9 If the output of the test equipment transformer is 500 volt-amperes or larger, the test potential shall be indicated by:

a) A voltmeter in the primary circuit or in a tertiary winding circuit,

b) A selector switch marked to indicate the test potential, or

c) In the case of equipment having a single test potential output, a marking in a visible location to indicate the test potential. When a marking is used without an indicating voltmeter, the equipment shall include a positive means, such as an indicator lamp, to indicate that the manual reset switch has been reset following a dielectric breakdown.

57.10 Test equipment other than that described in 57.7 – 57.9 may be used if the intended factory test is accomplished.

57.11 During the test described in 57.1, the primary switch is to be in the on position, both sides of the primary circuit of the appliance are to be connected together and to one terminal of the test equipment, and the second test equipment terminal is to be connected to the accessible dead metal.

Exception No. 1: An appliance (resistive, high-impedance winding, and the like) having circuitry not subject to excessive secondary voltage buildup in case of dielectric breakdown during the test may be tested with:

a) A single-pole primary switch, if used in the off position, or

b) Only one side of the primary circuit connected to the test equipment when the primary switch is in the on position or when a primary switch is not used.

Exception No. 2: An appliance provided with a normally-open immersion protective device is to be tested as follows. The appliance is to be connected to a supply circuit of rated voltage, the protective device is to be reset (closed), the on-off switch of the appliance is to be in the "off" position, and the test potential is to be applied between each supply circuit conductor and exposed dead-metal parts.

58 Grounding Continuity Test

58.1 Continuity of grounding connection

58.1.1 Each cord-connected appliance having provision for grounding shall be tested, as a routine production-line test, to determine that grounding continuity exists between the grounding blade of the attachment plug and the accessible dead-metal parts of the appliance that are likely to become energized.

58.1.2 Only a single test is required to be conducted if the accessible metal selected is conductively connected by design to all other accessible metal.

58.2 Electrical indicating device

58.2.1 Any effective indicating device (an ohmmeter, a battery and buzzer combination, or the like) may be used to determine compliance with the requirements specified in 58.1.1 and 58.1.2.

59 Hair Dryer Power Input Test

59.1 The power input to each hand-supported hair dryer shall be tested as described in 59.2, as a routine production-line test.

59.2 The power input is to be measured with the dryer at operating temperature under full-load conditions while connected to a circuit maintained at:

a) 120 ±6 volts for a dryer rated 110 – 120 volts,

b) 240 ±12 volts for a dryer rated 220 – 240 volts, or

c) The marked voltage on the dryer for all other voltage ratings.

Control switches or the equivalent, if provided, are to be set to result in the maximum power input.

Revised 59.2 effective August 30, 2004

59.3 The results are acceptable if the power input to a dryer is within the inclusive range of 90 – 110 percent of the rating.

59.4 With regard to 59.3, the wattage of a dryer that has its electrical rating marked only in amperes and volts will be assumed to be the product of those two values.

RATINGS

60 Details

60.1 An appliance shall be rated in volts and amperes or watts. It may be rated for alternating current only or direct current only. The rating shall include the number of phases if the appliance is for use on a polyphase circuit and the frequency, if needed to comply with requirements in this standard, for a motor relay coil or other component. To determine compliance, the requirements in 36.3 shall be used. For a preheat type appliance, the ampere or wattage rating shall be based on the maximum value measured during the preheat cycle.

60.2 The current rating of an appliance shall include 15 amperes for a single receptacle provided as part of the appliance and intended as a general use outlet, 20 amperes for two or more receptacles (including a single duplex receptacle), or, if the outlet is marked as noted in 61.1.6, that marked rating shall be included in the current rating of the appliance.

60.3 The voltage rating of a cord-connected appliance intended for connection to a nominal 120-volt supply circuit shall not exceed 125 volts. The voltage rating of a dual-voltage appliance intended for connection to a nominal 120/240 volt supply circuit shall not exceed 125/250 volts.

MARKINGS

61 Details

61.1 General

61.1.1 An appliance shall be legibly and permanently marked, where it will be plainly visible (after installation in the case of a permanently connected appliance), with:

a) The manufacturer's name, trade name, trademark, or other descriptive marking by which the organization responsible for the product is identified;

b) The date or other dating period of manufacture not exceeding any three consecutive months, which may be abbreviated or in a nationally recognized code, or in a code affirmed by the manufacturer;

c) A distinctive (catalog) (model) number or the equivalent; and

d) The electrical rating.

Exception No. 1: The date of manufacture may be located where visible behind a cover that is movable without the use of a tool. If the cover is removable, the marking shall be on other than the cover.

Exception No. 2: The date of manufacture may be located on the body or blade of the attachment plug.

61.1.2 The repetition time cycle of a date code shall not be less than 10. The date code shall not require reference to the manufacturer's records to determine when the appliance was manufactured.

61.1.3 If a manufacturer produces or assembles appliances at more than one factory, each appliance shall have a distinctive marking, which may be in code, to identify it as the product of a particular factory.

61.1.4 A marking shall be:

a) Paint-stenciled, die-stamped, molded, or indelibly stamped;

b) In the form of pressure-sensitive labels; or

c) In a form that has been determined to be the equivalent.

A pressure-sensitive label, if used, shall comply with the requirements in the Label Adhesion Test, Section 55.

61.1.5 Block lettering shall be used for the marked words ″CAUTION,″ ″WARNING,″ or ″DANGER,″ and for the marking wording that follows any of these words.

61.1.6 An appliance provided with general-use receptacles intended for limited current loads shall have each such receptacle permanently marked ″___ amperes, maximum, ___ watts, maximum ″ or the equivalent, adjacent to the receptacle. The ampere rating shall be the receptacle ampere load used during the normal temperature test. The absence of this marking shall be construed as permitting the loading of the receptacle during the normal temperature test to the full current rating of the receptacle.

61.1.7 With regard to 5.10(i)(1), the convenience receptacle shall be permanently marked ″___ Amperes maximum, ___ Watts maximum ″ or the equivalent adjacent to the convenience receptacle. The ampere and wattage values shall not exceed the rating of the immersion protective device minus that of the hand-supported hair-drying appliance. For an immersion protective device and a hand-supported hair-drying appliance rated in amperes, the wattage rating may be assumed to be the product of the rated current and voltage. For an immersion protective device and a hand-supported hair-drying appliance rated in watts, the current rating may be assumed to be the quotient of the rated wattage and voltage.

61.1.8 Each individual heating element or unit that is replaceable in the field shall be marked plainly in accordance with the requirement specified in 61.1.1.

61.1.9 Cleaning of the appliance or similar servicing by the user involves the exposure of any normally enclosed or protected live part to unintentional contact, the appliance shall be plainly marked to indicate that all such servicing is to be done with the appliance disconnected from the supply circuit.

61.1.10 An appliance having field-wiring terminals rated for supply connection using aluminum wire shall be marked with the following or the equivalent, as appropriate for the terminals. This marking shall be independent of all other markings on terminal connectors and shall be visible during and after installation.

a) ″Use Aluminum Conductors Only ″ or ″Use Aluminum or Copper-Clad Aluminum Conductors Only ″ if the terminal is intended for connection to aluminum wire only.

b) ″Use Copper or Aluminum Conductors ″ or ″Use Copper, Copper-Clad Aluminum, or Aluminum Conductors ″ if the terminal is intended for connection to either copper or aluminum wire.

61.2 Body- or table-supported hood- or bonnet-type hair dryers

61.2.1 A hand-, shoulder-, or table-supported hair dryer provided with a rigid hood or bonnet intended to be placed over or directly on the head while in use shall be marked in letters no less than 7/64 inch (2.8 mm) high with the word ″WARNING ″ and the following or the equivalent: ″To reduce the risk of possible electric shock do not use while bathing ″. The marking shall be located adjacent to the controls or in a location that is readily visible during positioning of the hood or bonnet. The marking may be located inside the hood or bonnet on the headband. Equivalent information shall be included in the instructions packed with the unit.

Exception: The marking is not required on an appliance that has been investigated and determined to be immersible. An appliance that complies with the requirements in the Hair Dryer Immersion Protection, Section 5, is not deemed to be immersible.

61.3 Dual-voltage appliances

61.3.1 An input voltage selector shall be marked to indicate each individual voltage position.

61.4 Hand-supported hair-drying appliances

61.4.1 A hand-supported hair-drying appliance, such as a hair dryer, blower-styler, styler-dryer, heated air comb, curling iron-dryer combination, or similar appliance (with or without attachments) shall be permanently marked where readily visible in letters having a color contrasting with the color of the background: ″DANGER – ELECTROCUTION POSSIBLE IF USED OR DROPPED IN TUB. UNPLUG AFTER USING ″. The height of the letters in the word DANGER shall be no less than 1/8 inch (3.2 mm) and the height of the remaining letters shall be no less than 1/16 inch (1.6 mm).

Exception No. 1: The marking need not be in contrasting colors if the word ″DANGER″ is 1/8 inch in height – or at least 7/64 inch (2.8 mm) in height and underlined – and the remaining text is at least 7/64 inch in height.

Exception No. 2: The marking is not required on an appliance that has been investigated and determined to be immersible. An appliance that complies with the requirements in the Hair Dryer Immersion Protection, Section 5, is not deemed to be immersible.

61.4.2 An appliance of the type described in 61.4.1 shall be provided with a tag that is permanently attached to the power supply cord. The tag material and means of attachment to the power supply cord shall be judged under the requirements specified in the Test for Permanence of Cord Tag for Hand-Supported Hair-Drying Appliances, Section 50. The tag shall contain the following warning instructions.

KEEP AWAY FROM WATER

DANGER –

AS WITH MOST ELECTRICAL APPLIANCES, ELECTRICAL PARTS IN THIS DRYER ARE ELECTRICALLY LIVE EVEN WHEN THE SWITCH IS OFF:

TO REDUCE RISK OF DEATH BY ELECTRIC SHOCK:

a) ALWAYS ″UNPLUG IT″ AFTER USE.

b) DO NOT PLACE OR STORE WHERE DRYER CAN FALL OR BE PULLED INTO TUB, TOILET, OR SINK.

c) DO NOT USE WHILE BATHING.

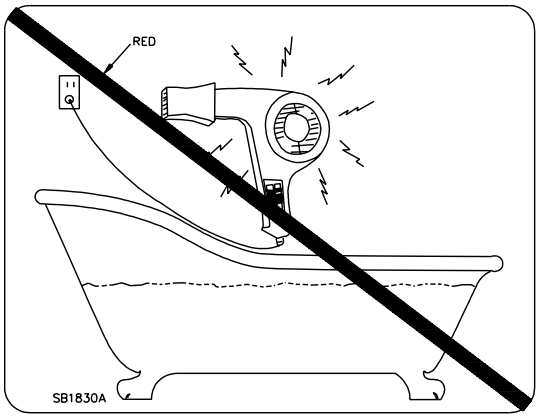
d) DO NOT USE NEAR OR PLACE IN WATER.

e) IF DRYER FALLS INTO WATER, UNPLUG IMMEDIATELY. DO NOT REACH INTO WATER.

The word ″DANGER″ in the above warning and the heading ″KEEP AWAY FROM WATER″ shall be in red letters at least 3/16 inch (4.8 mm) in height. All other letters on the tag shall be black and shall be no less than 1/16 inch (1.6 mm) in height. All lettering shall be in block letters.

61.4.3 The reverse side of the warning tag shall provide the pictorial warning illustrated in Figure 61.1, or the equivalent. The illustration shall consist of a black outline on a contrasting color background, with the slash mark in red. The height of the illustration shall be no less than 1 inch (25.4 mm) and the width shall be no less than 2 inches (50.8 mm). The heading ″UNPLUG IT″ shall be in red letters at least 3/16 inch (4.8 mm) in height. The headings ″DO NOT REMOVE THIS TAG!″ and ″WARN CHILDREN OF THE RISK OF DEATH BY ELECTRIC SHOCK!″ shall be in black letters no less than 3/16 inch in height. All lettering shall be in block letters.

Figure 61.1
Immersion warning illustration



″UNPLUG IT″

DO NOT REMOVE THIS TAG!

WARN CHILDREN OF THE RISK OF DEATH BY ELECTRIC SHOCK!

61.4.4 The warning tag shall be permanently affixed to the power supply cord, no more than 6 inches (152.4 mm) from the attachment plug and shall be made of substantial material (cardboard, cloth, plastic, or the equivalent) to provide mechanical strength and to prevent easy removal. All exposed surfaces shall have a clear plastic overlay, or the equivalent, to protect the markings. The tag shall comply with the requirements specified in the Test for Permanence of Cord Tag for Hand-Supported Hair-Drying Appliances, Section 50. The tag shall be either of the following forms:

a) A flag-type tag having a hole to permit securement to the power supply cord by a plastic strap or equivalent means. The strap shall not be removable without cutting.

b) A flag-type tag with an adhesive back. The tag is to be wrapped tightly once around and is to adhere to the power supply cord. The ends of the tag are to adhere to each other and project as a flag. The required markings are to be positioned on the projecting flag portion of the tag.

61.5 Permanently-installed wall-mounted hair dryers

61.5.1 A permanently-installed wall-mounted hair dryer shall be permanently marked either on the wall unit or on the hand unit where readily visible after installation in letters having a color contrasting with the color of the background: ″DANGER – ELECTROCUTION POSSIBLE IF USED OR DROPPED IN TUB. TURN UNIT OFF AFTER USING ″. The height of the letters in the word DANGER shall be no less than 1/8 inch (3.2 mm) and the height of the remaining letters shall be no less than 1/16 inch (1.6 mm).

Exception No. 1: The marking need not be in contrasting colors if the word ″DANGER″ is 1/8 inch in height-or at least 7/64 inch (2.8 mm) in height and underlined – and the remaining text is at least 7/64 inch in height.

Exception No. 2: The marking is not required on an appliance that has been investigated and determined to be immersible. An appliance that complies with the requirements in the Hair Dryer Immersion Protection, Section 5, is not deemed to be immersible.

61.5.2 A permanently-installed wall-mounted hair dryer shall be provided with a marking that is readily visible after installation on:

a) The wall unit,

b) The hand unit, or

c) A tag that is permanently attached to the cord of the hand unit. The tag material and means of attachment to the hand unit shall be evaluated under the requirements specified in the Test for Permanence of Cord Tag for Hand-Supported Hair-Drying Appliances, Section 50.

The marking shall contain the following warning instructions.

KEEP AWAY FROM WATER

DANGER –

AS WITH MOST ELECTRICAL APPLIANCES, ELECTRICAL PARTS IN THIS DRYER ARE ELECTRICALLY LIVE EVEN WHEN THE SWITCH IS OFF:

TO REDUCE RISK OF DEATH BY ELECTRIC SHOCK:

a) DO NOT PLACE OR STORE WHERE HAND UNIT CAN FALL OR BE PULLED INTO TUB, TOILET, OR SINK.

b) DO NOT USE WHILE BATHING.

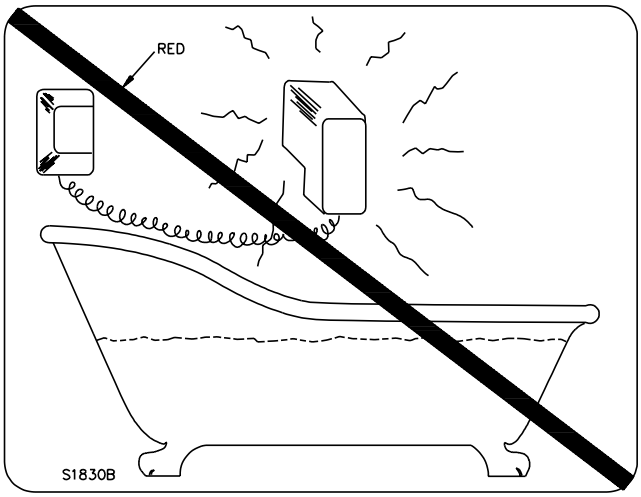
c) DO NOT USE NEAR OR PLACE IN WATER.

d) IF HAND UNIT FALLS INTO WATER, TURN UNIT OFF IMMEDIATELY. DO NOT REACH INTO WATER.

The word ″DANGER″ in the above warning and the heading ″KEEP AWAY FROM WATER″ shall be in red letters at least 3/16 inch (4.8 mm) in height. All other letters on the tag shall be black and shall be no less than 1/16 inch (1.6 mm) in height. All lettering shall be in block letters.

61.5.3 The reverse side of the warning tag or the marking on the wall unit or on the hand unit shall provide the pictorial warning illustrated in Figure 61.2, or the equivalent. The illustration shall consist of a black outline on a contrasting color background, with the slash mark in red. The height of the illustration shall be no less than 1 inch (25.4 mm) and the width shall be no less than 2 inches (50.8 mm). The headings ″DO NOT REMOVE THIS TAG!″ and ″WARN CHILDREN OF THE RISK OF DEATH BY ELECTRIC SHOCK!″ shall be in black letters no less than 3/16 inch (4.8 mm) in height. All lettering shall be in block letters.

Figure 61.2
Immersion warning illustration for permanently installed wall-mounted hair dryer



DO NOT REMOVE THIS TAG!

WARN CHILDREN OF THE RISK OF DEATH BY ELECTRIC SHOCK!

61.5.4 The warning tag shall be permanently affixed to the cord of the hand unit, no more than 6 inches (152.4 mm) from the wall unit and shall be made of substantial material (cardboard, cloth, plastic, or the equivalent) to provide mechanical strength and to prevent easy removal. All exposed surfaces shall have a clear plastic overlay, or the equivalent, to protect the markings. The tag shall comply with the requirements specified in the Test for Permanence of Cord Tag for Hand-Supported Hair-Drying Appliances, Section 50. The tag shall be either of the following forms:

a) A flag-type tag having a hole to permit securement to the cord of the hand unit by a plastic strap or equivalent means. The strap shall not be removable without cutting.

b) A flag-type tag with an adhesive back. The tag is to be wrapped tightly once around and is to adhere to the cord of the hand unit. The ends of the tag are to adhere to each other and to project as a flag. The required markings are to be positioned on the projecting flag portion of the tag.

61.5.5 A permanently installed wall-mounted hair dryer shall be marked on the wall unit or on the wall bracket where readily visible during installation with the word ″DANGER ″ and the following or the equivalent: ″To reduce the risk of death by electric shock, install only where hand unit cannot reach tub, sink, or shower ″. The height of the letters in the word ″DANGER″ shall be no less than 1/8 inch (3.2 mm) and the height of the remaining letters shall be no less than 1/16 inch (1.6 mm). The letters shall be in a color which contrasts with the background. Block lettering shall be used for all words.

Exception: The marking need not be in contrasting colors if the letters are embossed or indented to a depth of not less than 0.020 inch (0.5 mm).

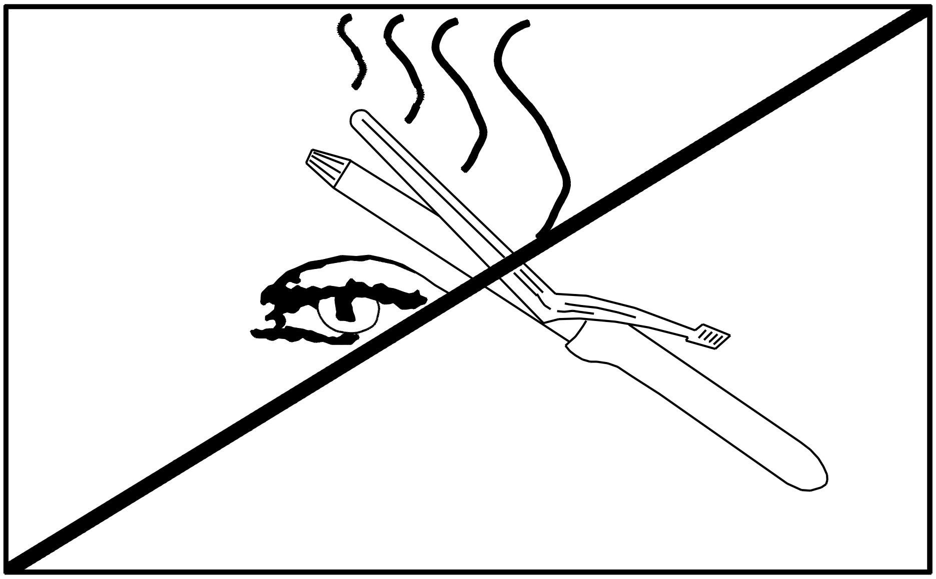
61.6 Curling irons

61.6.1 A hair curling iron or a heated comb shall be permanently marked, where readily visible, in letters no less than 7/64 inch (2.8 mm) in height with the word ″WARNING ″ and the following or the equivalent: ″To reduce the risk of possible electric shock do not immerse or use while bathing ″ or ″Possible electric shock, do not immerse or use while bathing ″.

Exception: The marking is not required on an appliance that has been investigated and determined to be immersible. An appliance that complies with the hair dryer immersion protection requirements in the Test for Hair Dryer Immersion Protection, Section 5, is not deemed to be immersible.

61.6.2 A curling iron shall be provided with a marking on a tag that is non-permanently attached to the appliance or the power supply cord. The marking shall provide the pictorial warning illustrated in Figure 61.3, including the cautionary statement shown. The illustration shall consist of a black outline on a contrasting color background. The height of the illustration shall not be less than 1 inch (25.4 mm) and the width shall not be less than 2 inches (50.8 mm). The warning instruction ″CAUTION – THIS PRODUCT CAN BURN EYES ″ shall be in black letters no less than 3/16 inch (4.8 mm) in height. All lettering shall be in block letters.

Figure 61.3
Eye contact warning for curling irons



CAUTION – THIS PRODUCT CAN BURN EYES

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61.6.3 The reverse side of the tag specified in 61.6.2 shall provide the pictorial warning illustrated in Figure 61.4 including the cautionary statements shown. The illustration shall consist of an outline on a contrasting color background. The illustration shall be no less than 2 inches (50.8 mm) in diameter. The warning instructions ″WARNING – BURN HAZARD ″ and ″KEEP AWAY FROM CHILDREN ″ shall be in letters no less than 7/64 inch (2.8 mm) in height. All lettering shall contrast with the background and shall be in block letters.

Exception: If the curling iron is provided with instructions in accordance with 65.12, the marking need not be provided.

Figure 61.4
Warning instruction for curling irons

61.7 Direct plug-in appliances

61.7.1 A direct plug-in appliance having a mounting tab shall be marked – on the appliance, a marking tag, or an instruction sheet packed with the appliance – with the word ″CAUTION ″ and all of the following mounting instructions or the equivalent:

a) ″To reduce the risk of electric shock – Disconnect power to the receptacle before installing or removing the appliance. When removing receptacle cover screw, cover may fall across plug pins or receptacle may become displaced. ″

b) ″Use only with duplex receptacle having center screw. ″

c) ″Secure appliance in place by the screw provided with the appliance. ″

61.8 Wax depilatory appliances

61.8.1 A wax depilatory appliance shall be legibly and permanently marked, in a location readily visible during intended use, with the following information. Each statement shall be separate and distinct. The height of the letters in the word ″CAUTION″ shall not be less than 1/8 inch (3.2 mm) and the height of the remaining letters shall not be less than 1/16 inch (1.6 mm). The lettering shall also comply with 61.1.4.

a) ″CAUTION – TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT IMMERSE IN WATER OR OTHER LIQUIDS. ″

b) ″CAUTION – TO REDUCE THE RISK OF BURNS, KEEP CHILDREN AWAY WHEN WAX IS HOT. APPLY WAX ONLY WHEN HEATED AT (show heat selector marking) SETTING AND THE OVERHEAT CONDITION INDICATOR IS OFF. REFER TO INSTRUCTION MANUAL BEFORE EACH USE. ″

c) ″CAUTION – TO REDUCE THE RISK OF BURNS OR INJURY, DO NOT DRAPE THE CORD OVER A COUNTER OR A TABLE TOP SUCH THAT IT CAN BE PULLED ON BY CHILDREN OR TRIPPED OVER UNINTENTIONALLY. ″

d) ″THE PHYSIOLOGICAL EFFECTS OF THIS APPLIANCE HAVE NOT BEEN INVESTIGATED BY ___ (Name, or abbreviation of name, of organization that investigated the appliance for compliance with this standard). ″

Exception No. 1: The marking in (a) is not required on an appliance that has been determined to be immersible.

Exception No. 2: The second sentence in (b) only applies when the appliance provides more than one heat selector setting.

61.9 Appliances with IDCIs, GFCIs, or similar protective devices

61.9.1 The surface of a plug that contains an IDCI, a GFCI, or a similar protective device shall be marked with the word ″WARNING ″ and the following or the equivalent: ″To reduce the risk of electric shock, do not remove, modify, or immerse this plug. ″ The height of the letters in the word ″WARNING ″ shall not be less than 1/8 inch (3.2 mm) and the height of the remaining letters shall not be less than 1/16 inch (1.6 mm).

61.10 Convenience receptacle of a hand-supported hair dryer immersion protective device

61.10.1 A permanent and legible marking shall be provided near the convenience receptacle of an immersion protective device that is integral with the attachment plug of a hand-supported hair-drying appliance. The marking shall contain the word ″WARNING ″ and the following or the equivalent: ″To reduce the risk of fire, electric shock, or injury to persons, unplug appliance from this convenience receptacle after using. Do not use a direct plug-in (cordless) appliance on this convenience receptacle. ″ The height of the letters in the word ″WARNING″ shall not be less than 1/8 inch (3.2 mm) and the height of the remaining letters shall not be less than 1/16 inch (1.6 mm) high.

INSTRUCTION MANUALS

62 General

62.1 An appliance shall be provided with a user instruction manual that warns the operator of reasonably foreseeable uses or misuses so as to reduce the risk of fire, electric shock, or injury to persons. The instruction manual shall also consist of legible installation, operation, and, as applicable, user-maintenance instructions. The manual or other literature packaged with the product shall also indicate that the product is for household use. If included in the manual, the statement regarding intended use shall be in the operating instructions shown in Installation Instructions, Section 65.

62.2 The instructions pertaining to a risk of fire, electric shock, or injury to persons shall be:

a) In the first part of the manual;

b) Before the operating instructions;

c) Separate in format from other detailed instructions related to assembly, operation, and maintenance; and

d) A permanent part of the manual.

62.3 The instruction manual shall include instructions or illustrations to identify important parts of the appliance, such as the integral stand of a curling iron. An illustration may be used with a required written instruction to clarify its intent, but shall not be used in place of a required written instruction.

62.4 The following items shall be entirely in upper-case letters or shall be emphasized to distinguish them from the remainder of the text:

a) The opening and closing statements of the instructions specified in 63.4 – ″IMPORTANT SAFETY INSTRUCTIONS ″ or the equivalent, ″READ ALL INSTRUCTIONS BEFORE USING,″ ″KEEP AWAY FROM WATER,″ and ″SAVE THESE INSTRUCTIONS;″

b) The headings ″GROUNDING INSTRUCTIONS,″ ″SERVICING OF DOUBLE-INSULATED APPLIANCES;″ and

c) The headings for the installation, operation, and user-maintenance instructions.

62.5 Unless otherwise indicated, the instructions shall be in the exact words specified or shall be in equally definitive terminology. Substitutes shall not be used for the words ″WARNING″ and ″DANGER.″

Exception: Specified wording that is not appropriate for an appliance or part being evaluated may be omitted or changed as necessary for that appliance or part.

62.6 Wording in parentheses in Sections 63 – 66 is explanatory, indicating options, alternatives, or cross-references. Wherever the words ″the (or this) appliance″ are used, the name of the specific appliance may be substituted in the final text.

63 Instructions Pertaining to a Risk of Fire, Electric Shock, or Injury to Persons

63.1 Instructions pertaining to a risk of fire, electric shock, or injury to persons shall warn the user of reasonably foreseeable risks and state the precautions that should be taken to reduce such risks. Such instructions shall be preceded by the heading ″IMPORTANT SAFETY INSTRUCTIONS ″ or the equivalent.

63.2 The items in the list in 63.6 may be numbered and other instructions pertaining to a risk of fire, electric shock, or injury to persons that the manufacturer believes are needed may be included.

63.3 The instructions shall be legible and contrast with the background. Upper-case letters in the instructions shall not be less than 5/64 inch (2.0 mm) in height and lower-case letters shall not be less than 1/16 (1.6 mm) in height. The heading ″IMPORTANT SAFETY INSTRUCTIONS″ or the equivalent and ″SAVE THESE INSTRUCTIONS″ shall be in letters not less than 3/16 inch (4.8 mm) in height. ″READ ALL INSTRUCTIONS BEFORE USING,″ ″GROUNDING INSTRUCTIONS,″ ″SERVICING OF DOUBLE-INSULATED APPLIANCES,″ ″WARNING,″ and ″DANGER″ shall be in letters not less than 5/64 inch in height, but less than 3/16 inch in height.

63.4 The instructions pertaining to a risk of fire, electric shock, or injury to persons shall include those items in 63.5 (a) – (c) that are applicable to the appliance. The statements ″IMPORTANT SAFETY INSTRUCTIONS″ or the equivalent, ″READ ALL INSTRUCTIONS BEFORE USING,″ and ″KEEP AWAY FROM WATER″ shall precede the list in the order shown in 63.6, and the statement ″SAVE THESE INSTRUCTIONS″ or the equivalent shall follow the list.

63.5 The words ″DANGER″ and ″WARNING″ shall be entirely in upper-case letters or shall be emphasized to distinguish them from the rest of the text. The sequence of the instructions in 63.6 under the word ″DANGER″ shall follow the expected sequence of user exposure to the situation during use of the appliance such as to address the most important item first and, in descending order, the remaining instructions.

63.6 Two sets of instructions are shown for the sequence ″IMPORTANT SAFETY INSTRUCTIONS″ through the ″DANGER″ instructions. The instructions in (a) are applicable to all hand-supported hair dryers and curling irons. The instructions in (b) are applicable to all appliances other than hand-supported hair dryers and curling irons. The manufacturer of personal grooming appliances other than hand-supported hair dryers and curling irons has the option of using either the instructions in (a) or (b). The sequence of the instructions under the word ″WARNING″ in (c) is applicable to all types of personal grooming appliances. The other items in 63.7 shall follow in the stipulated sequence. Other instructions pertaining to the risk of fire, electric shock, or injury to persons that are determined necessary by the manufacturer may be included.

a) For hand-supported hair dryers and curling irons:

IMPORTANT SAFETY INSTRUCTIONS

When using electrical appliances, especially when children are present, basic safety precautions should always be followed, including the following:

READ ALL INSTRUCTIONS BEFORE USING

KEEP AWAY FROM WATER

DANGER – As with most electrical appliances, electrical parts are electrically live even when the switch is off:

To reduce the risk of death by electric shock:

1. Always ″unplug it″ immediately after using.

2. Do not use while bathing.

3. Do not place or store appliance where it can fall or be pulled into a tub or sink.

4. Do not place in or drop into water or other liquid.

5. If an appliance falls into water, ″unplug it″ immediately. Do not reach into the water.

b) For appliances other than hand-supported hair dryers and curling irons:

IMPORTANT SAFETY INSTRUCTIONS

When using electrical appliances, especially when children are present, basic safety precautions should always be followed, including the following:

READ ALL INSTRUCTIONS BEFORE USING

DANGER – To reduce the risk of electrocution:

1. Always unplug this appliance immediately after using.

Exception: This instruction is not required for a permanently installed wall-mounted hair dryer.

2. Do not use while bathing.

3. Do not place or store appliance where it can fall or be pulled into a tub or sink.

4. Do not place in or drop into water or other liquid.

5. Do not reach for an appliance that has fallen into water. Unplug immediately.

Exception: The instruction for a permanently installed wall-mounted hair dryer shall state "If hand unit falls into water, turn unit off immediately. Do not reach into water."

c) For all appliances:

WARNING – To reduce the risk of burns, electrocution, fire, or injury to persons:

1. An appliance should never be left unattended when plugged in.

Exception: This instruction is not required for a permanently installed wall-mounted hair dryer.

2. Close supervision is necessary when this appliance is used by, on, or near children or individuals with certain disabilities.

3. Use this appliance only for its intended use as described in this manual. Do not use attachments not recommended by the manufacturer.

4. Never operate this appliance if it has a damaged cord or plug, if it is not working properly, or if it has been dropped, damaged, or dropped into water. Return the appliance to a service center for examination and repair.

Exception: The "or if it has been dropped" part of this instruction is not required for a hand-supported hair dryer.

5. Keep the cord away from heated surfaces. Do not wrap the cord around the appliance.

6. Never block the air openings of the appliance or place it on a soft surface, such as a bed or couch, where the air openings may be blocked. Keep the air openings free of lint, hair, and the like.

7. Never use while sleeping.

8. Never drop or insert any object into any opening or hose.

9. Do not use outdoors or operate where aerosol (spray) products are being used or where oxygen is being administered.

10. Connect this appliance to a properly grounded outlet only. See Grounding Instructions.

Exception: This instruction is not required for an appliance that is not intended to be grounded.

11. Unplug this appliance before filling. Fill (reservoir) with water only. Do not overfill (or specify filling instructions).

Exception No. 1: The instructions for an appliance with a separable water reservoir need only include "Fill reservoir with water only."

Exception No. 2: This instruction is not required for an appliance that is not provided with a reservoir.

12. Do not use an extension cord with this appliance.

SAVE THESE INSTRUCTIONS

63.6 revised August 30, 2002

63.7 As applicable, the following instructions shall be included in addition to the instructions in 63.6:

a) For a facial steamer:

13. Use facial steamer only on a level surface.

14. Do not use additives.

15. Never hold this facial steamer close to your face in one position as this may cause scalding.

b) For a hair curler heater with water reservoir:

13. Use hair curler heater on a level surface.

14. When opening the lid, use the handles to reduce the risk of scalding. Stay away from the mist or steam vents.

15. Do not touch the posts that hold the curlers. They are hot.

c) For a hair curler heater without water reservoir:

11. Do not touch the posts that hold the curlers. They are hot.

d) For a hair dryer that uses a liquid and is not hand supported:

13. Use this hair dryer on a level surface.

e) For a hand-supported hair dryer, styling comb, or hair brush:

13. Do not direct hot air toward eyes or other heat sensitive areas.

14. Attachments may be hot during use. Allow them to cool before handling.

15. Do not place appliance on any surface while it is operating.

16. While using the appliance, keep your hair away from the air inlets.

17. Do not operate with a voltage converter.

Exception: For a dual-voltage hand-supported hair-drying appliance, the instructions shall:

1) Describe and may additionally illustrate a voltage converter and

2) Warn against the use of a voltage converter not specifically identified in the instructions as being acceptable for use with the appliance. Acceptable voltage converters identified for use with the appliance shall be identified in the instructions by the manufacturer's name and catalog designation, along with information on the sources from which they are available.

f) For a permanent wave appliance:

13. Do not touch hot surfaces of the appliance. Use the handles or knobs.

g) For a curling iron with water reservoir:

13. This curling iron and clip are hot when in use. Do not let eyes and bare skin touch heated surfaces.

14. Do not place the heated curling iron directly on any surface while it is hot or plugged in. Use the stand provided.

15. While emitting steam, this curling iron may cause burns if it is used too close to the skin, scalp, or eyes, or if it is used incorrectly.

16. To reduce the risk of contact with hot water emitted from steam vents, test curling iron before each use by holding it away from body and operating steam button.

Exception: This instruction is not required for a curling iron that will not produce water droplets under any condition of use as determined by the performance test described in 39.1.7.

h) For a curling iron without water reservoir:

11. This curling iron and clip are hot when in use. Do not let eyes and bare skin touch heated surfaces.

13. Do not place the heated curling iron directly on any surface while it is hot or plugged in. Use the stand provided.

i) For a wig or brush dryer:

11. Do not use this dryer to dry a wig (or brush) made of something that may burn easily.

13. Do not use this dryer to dry a wig (or brush) that has been cleaned in something that may burn if it may still have some of the cleaner on or in it.

j) For a lotion heater:

11. Use with ____ (type of lotion containers including aerosol containers, intended to be used with the lotion heater).

k) For a dual-voltage appliance:

13. Be sure dual-voltage selector is in correct voltage position before operating. Before plugging in, read the information about dual voltage contained in the instruction section of this manual.

Exception: The instructions for a dual-voltage appliance that is not provided with a dual-voltage selector need only include "Before plugging in, read the information about dual voltage contained in the instruction section of this manual."

14. "This appliance was set at the factory to operate at ____ volts. Refer to Operating Instructions section of this manual for conversion to ____ volt operation" or the equivalent. The blanks are to be filled in with the appropriate voltage information.

Exception: This instruction does not apply if an appliance operates over a range of voltages and requires no adjustment by the user, such as an appliance that uses a positive temperature coefficient (PTC) heating element intended for use over a range of voltages and requiring no adjustment by the user.

l) For a wax depilatory appliance:

13. Apply wax only when it has been heated at ____ (show heat selector marking) setting and after the wax has reached the proper temperature (describe how this is to be determined by the functioning of the overheat condition indicator – for example, when the indicator light goes out).

Exception: This only applies when the appliance provides more than one heat selector setting, as noted in 7.3.3.

14. Use only ____ wax (manufacturer's name and designation of the wax intended to be used with the appliance).

15. Do not apply hot wax near eyes or other heat-sensitive areas, to any skin injury, eruption, or surface growth.

16. Do not touch hot surfaces. Use handles or knobs (or specify other surfaces intended for handling).

17. Use this appliance on a level surface.

18. Do not let cord hang over edge of table or counter where it can be pulled on by children or tripped over unintentionally.

19. Unplug from outlet when not in use. Allow to cool before handling, cleaning, or storing the appliance.

20. The physiological effects of this appliance have not been investigated by ____ (name, or abbreviation of name, of organization that investigated the appliance for compliance with this standard).

21. Test hot wax on a small area of skin for warmth and possible skin reactions before using. If you are susceptible to allergic reactions or if you have circulatory problems, it is recommended that you consult a physician before using this appliance.

63.7 revised August 30, 2002

63.8 The instructions pertaining to a risk of fire, electric shock, or injury to persons shall include the instructions specified in 63.9 (a) – (f) as applicable. The instructions specified in 63.9 shall immediately follow the instructions in specified 63.6 (or 63.7, if applicable). The word ″DANGER″ shall be entirely in uppercase letters or shall be emphasized to distinguish it from the rest of the text.

63.9 The instruction manual shall include those instructions in (a) – (f) that are applicable to the appliance. Grounding instructions for a cord-connected appliance are shown in (a) – (c). The instructions in (a) are applicable to all grounded cord-connected appliances. The instructions in (b) are applicable to a grounded cord-connected appliance rated less than 15 amperes and intended for use on a nominal 120-volt supply circuit. The instructions in (c) are applicable to all cord-connected appliances rated other than as specified in the instructions in (b). The instructions in (d) are applicable to an appliance that may be used with an extension cord, and the instructions in (e) are applicable to a permanently-connected appliance. The instructions in (f) are applicable to a double-insulated cord-connected appliance.

a) For a grounded, cord-connected appliance:

GROUNDING INSTRUCTIONS

This appliance must be grounded. In the event of an electric short-circuit, grounding reduces the risk of electric shock by providing a path of low resistance for the electric current. This appliance is equipped with a cord having a grounding wire with a grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in compliance with all local codes and ordinances.

DANGER – Improper use of the grounding plug can result in a risk of electric shock.

Check with a qualified electrician or service personnel if you are in doubt as to whether the appliance is properly grounded. Do not modify the plug provided with the appliance – if it will not fit the outlet, have a proper outlet installed by a qualified electrician.

If repair or replacement of the cord or plug is necessary, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

b) For a grounded, cord-connected appliance rated less than 15 amperes and intended for use on a nominal 120-volt supply circuit:

This appliance is for use on a nominal 120-volt circuit and has a grounding plug that looks like the plug illustrated in sketch A in Figure 63.1. A temporary adapter, which looks like the adapter illustrated in sketches B and C, may be used to connect this plug to a 2-pole receptacle as shown in sketch B if a properly grounded outlet is not available. The temporary adapter should be used only until a properly grounded outlet (sketch A) can be installed by a qualified electrician. The green-colored rigid ear, lug, or the like extending from the adapter must be connected to a permanent ground such as a properly grounded outlet box cover. Whenever the adapter is used, it must be held in place by a metal screw.

c) For all other grounded, cord-connected appliances:

This appliance is for use on a circuit having a nominal rating of (or more than 120 volts) and is factory equipped with a specific electric cord and plug to permit connection to a proper electric circuit. Make sure that the appliance is connected to an outlet having the same configuration as the plug. No adapter should be used with this appliance. Do not modify the plug provided; if it

will not fit the outlet, have the proper outlet installed by a qualified electrician. If the appliance must be reconnected for use on a different type of electric circuit, the reconnection should be made by qualified service personnel.

d) For extension cords:

If it is necessary to use an extension cord, use only a 3-wire extension cord that has a 3-blade grounding plug and a 3-slot receptacle that will accept the plug on the appliance. Replace or repair a damaged cord.

e) For a permanently connected appliance:

GROUNDING INSTRUCTIONS

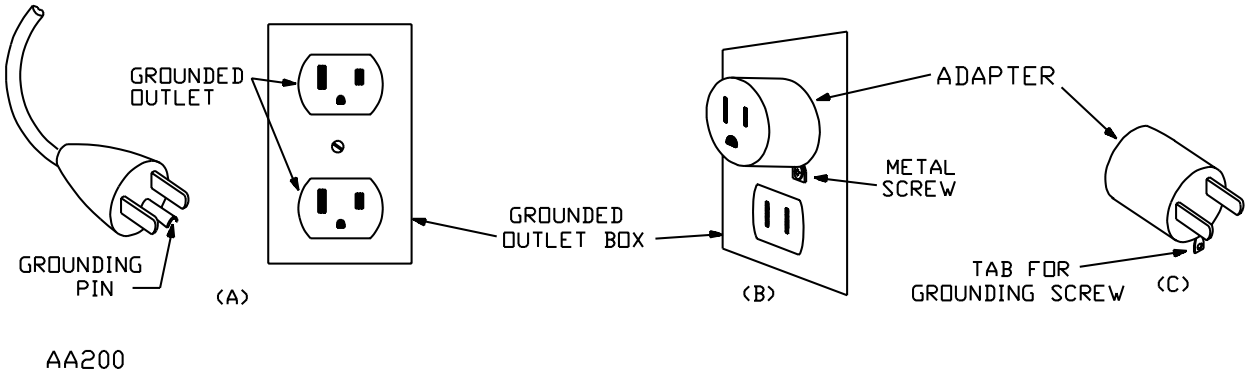
This appliance must be connected to a grounded, metallic, permanent wiring system or an equipment-grounding conductor must be run with the circuit conductors and connected to the equipment-grounding terminal or lead on the appliance.

f) For a double-insulated, cord-connected appliance:

SERVICING OF DOUBLE-INSULATED APPLIANCES

In a double-insulated appliance, two systems of insulation are provided instead of grounding. No grounding means is provided on a double-insulated appliance, nor should a means for grounding be added to the appliance. Servicing a double-insulated appliance requires extreme care and knowledge of the system, and should be done only by qualified service personnel. Replacement parts for a double-insulated appliance must be identical to the parts they replace. A double-insulated appliance is marked with the words ″DOUBLE INSULATION ″ or ″DOUBLE INSULATED.″ The symbol (square within a square) ⧈ may also be marked on the appliance.

Figure 63.1
Grounding methods



64 Installation Instructions

64.1 Installation instructions shall contain all the information needed to install the appliance for use as intended, and shall be preceded by the heading ″INSTALLATION INSTRUCTIONS ″ or the equivalent.

64.2 For an appliance provided with means for hanging, instructions regarding the correct installation of the hanging means intended for use shall be provided. See Use and Care Instructions, Section 80, for wall-hung hair dryers.

64.3 For a permanently installed wall-mounted hair dryer, the following instructions shall be provided: ″Install only where hand unit cannot reach tub, sink, or shower.″

64.4 If the mounting hardware specified in the Exception to 10.5 is not provided with the appliance, the instructions shall contain a description and an illustration of the hardware needed to mount the appliance.

65 Operating Instructions

65.1 Operating instructions shall contain all the information needed to operate the appliance as intended, and shall be preceded by the heading ″OPERATING INSTRUCTIONS ″ or the equivalent. The operating instructions shall immediately follow the instructions specified in 63.9.

65.2 Operating instructions shall explain and describe the location, function, and operation of each user-operated control of the appliance, and warn against tampering with such devices. They shall also include the information specified in 65.3 – 65.7, as appropriate.

65.3 For an appliance using an automatically resetting thermal limiter that shuts off the entire appliance, instructions shall be provided to the user on what to expect in the event the thermal limiter operates and the appropriate action to take.

65.4 An appliance intended to be used with water, additives, conditioners, or other solutions with or without water, or an appliance that relies on the conductivity of water for intended operation (electrode-type-appliance), and for which the use of baking soda, salt, or other substances to improve the conductivity of the water is stipulated, shall be provided with specific instructions regarding the proper liquid or additive to use and the exact amount to be used (see 73.1).

65.5 For a dual-voltage appliance, procedures to be followed in:

a) Changing the voltage selector, if provided, and

b) Providing correct supply connection means for each voltage setting shall be provided.

In addition, the following wording or the equivalent shall be provided: ″For use in the U.S.A., the voltage selector switch should be placed in the 120 volt position. For use in several countries overseas, the voltage selector may need to be placed in the 240 volt position. Confirm the voltage available at each overseas location before using the appliance. For connection to a 240-volt supply, use an attachment plug adapter of the proper configuration for the power supply receptacle.″

65.6 For an appliance required to have a polarized plug, the following instructions shall be provided: ″This appliance has a polarized plug (one blade is wider than the other). As a safety feature, this plug will fit in a polarized outlet only one way. If the plug does not fit fully in the outlet, reverse the plug. If it still does not fit, contact a qualified electrician. Do not attempt to defeat this safety feature.″

65.7 For an appliance of the type described in 61.4.1, instructions shall be provided for using the appliance (whenever it is used in bathrooms) on a circuit protected by a ground-fault circuit-interrupter. In addition, all of the following information shall be included (see Figure 65.1 for an example):

a) What a ground-fault circuit-interrupter is.

b) How it reduces the risk of death by electric shock.

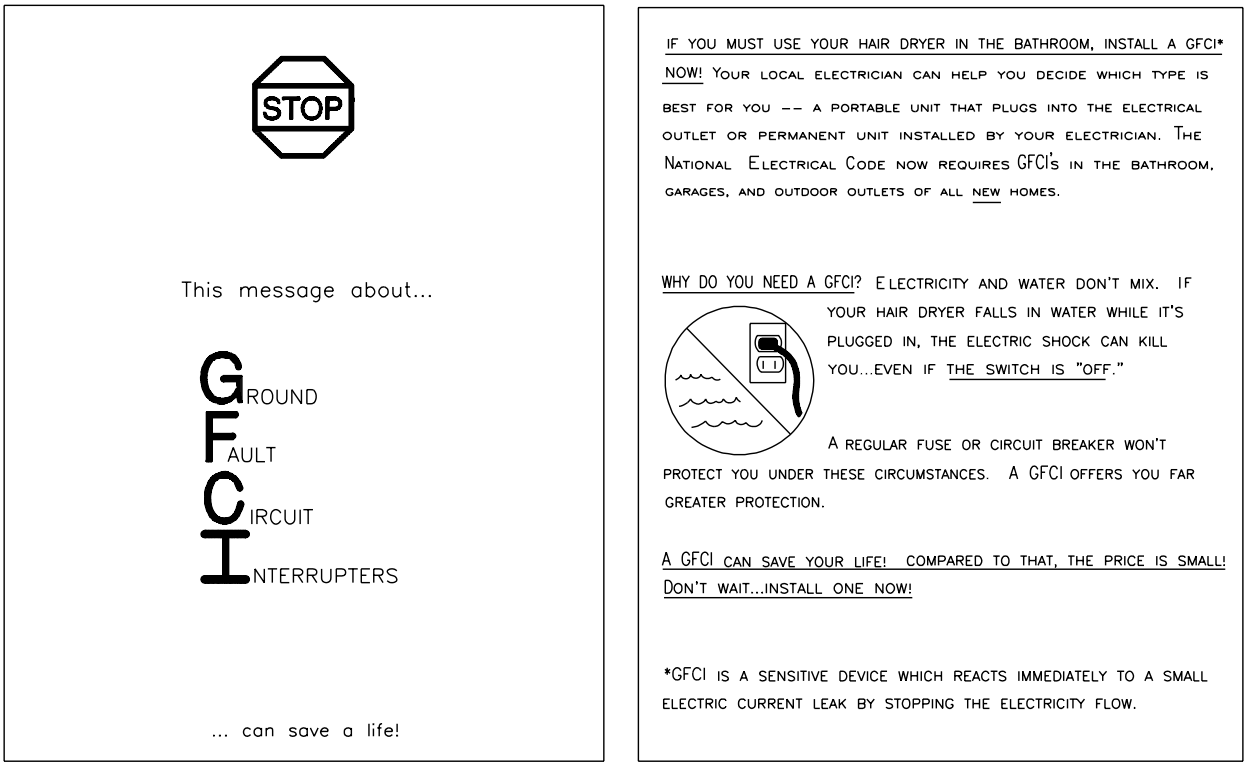
c) The types available (portable and permanent), and a statement that the permanent types are to be installed by an electrician.

d) A graphical symbol (such as the octagon on the front of the insert card in Figure 65.1) and a referent (such as the word ″stop″ within the octagon on the front of the insert card in Figure 65.1), or equally alerting words, in red on a contrasting background. The words ″Ground-Fault Circuit-Interrupter″ on the front of the insert card in Figure 65.1, and the symbol (circle and slant

line only) and words ″Don't wait, install one now!″ on the back of the insert card in Figure 65.1 may be in red on a contrasting background. The remainder of the instructions shall be in a color other than red and shall contrast with the background.

The instructions shall be a permanent part of the manual or on a stuffer sheet or equivalent not less than 3 inches by 6 inches (76.2 mm by 152.4 mm) in size. The minimum size shall not be reduced by folding a stuffer sheet or equivalent, by packaging methods, or by the arrangement of printed instructions on the manual.

Figure 65.1
Example of ground-fault circuit-interrupter instructions



65.8 For a wax depilatory appliance, the following instructions shall be provided:

a) Instructions for the type and amount of wax to be used, procedures to be followed in melting and heating the wax, and length of time at the intended heat setting or equivalent appropriate instructions to ascertain correct wax temperature before application to the skin.

b) Instructions for testing the wax on a small area of skin for warmth and possible skin reactions.

c) Recommended body areas where hair removal may be attempted and sensitive areas that should be avoided.

d) A warning against application of the wax to skin injuries, eruptions, and surface growths.

e) An explanation of the purpose of the overheat condition indicator, if required (see 7.3.3 and 7.3.5), and a warning against continued use when an overheat condition is indicated.

f) Instructions indicating the correct methods whereby the appliance may be cleaned of any spilled or residual wax.

65.9 For an appliance provided with an IDCI, a GFCI, or a similar protective device, the following or equivalent instructions shall be provided:

This appliance is provided with a protective device that may make the appliance inoperable under some abnormal conditions (such as immersion of the appliance). If the appliance becomes inoperable, return the appliance to a service center for examination and repair. For appliances provided with user- resettable protective devices, the instructions shall:

a) Describe the purpose of the test and reset buttons,

b) Specify the frequency of the testing,

c) Describe the indication of proper functioning of the protective device, and

d) Indicate that an appliance that does not operate in the proper functioning condition is to be discarded or returned to a service center for examination and repair.

Exception: For an appliance provided with a user-resettable protective device provided with a reset feature not providing a test function, the instructions shall alert the user to the reset feature and how and when to use it, and shall alert the user to not reset and reuse the appliance should the protective device trip as a result of immersion.

65.10 With regard to 5.10(j), the instructions shall:

a) Describe the intended use of the convenience receptacle, such as typical types of appliances intended to be used;

b) Indicate that the rating of the appliance shall not exceed the value marked next to the convenience receptacle;

c) Indicate that the appliance is to be unplugged after using;

d) Specify the sequence of plugging and unplugging the hair dryer and the second appliance; and

e) Warn against using a direct plug-in (cordless) appliance.

65.11 With regard to the sequence of plugging and unplugging the hair dryer and the second appliance as specified in 65.10(d), the instructions shall specify that the appliance is to be plugged into the convenience receptacle of the immersion protective device of the hair dryer first, then the hair dryer is to be plugged into the wall receptacle outlet. For unplugging the appliance, the instructions shall specify that the hair dryer is to be unplugged from the wall receptacle outlet first, then the appliance is to be unplugged from the convenience receptacle of the protective device.

65.12 A curling iron shall be provided with an instruction as a permanent part of the instruction manual or as an insert card consisting of the pictorial warning as illustrated in Figure 61.4 including the cautionary statements shown. The size of the illustration, lettering, and other specifications shall be as specified in 61.6.3.

Exception: If the curling iron is provided with a marking in accordance with 61.6.3, the instructions are not required to be provided.

66 User-Maintenance Instructions

66.1 Instructions for user maintenance shall include explicit instructions for all cleaning and servicing – lubrication, adjustments, and the like – that are intended to be performed by the user, and shall be preceded by the heading ″USER-MAINTENANCE INSTRUCTIONS ″ or the equivalent.

66.2 The instruction manual shall include a warning to the user that any other servicing should be performed by an authorized service representative or that the appliance has no user serviceable parts.

66.3 The instruction manual shall include specific instructions for the proper method of cord storage, total appliance storage, and the like when the appliance is not in use; and for cord care while in use (such as if the cord of a hand-supported appliance is twisted, to untwist the cord before use, or the like).

ELECTRODE-TYPE APPLIANCES

67 General

67.1 A portable electrode-type appliance designed for household use on nominal 120-volt branch circuits shall comply with all applicable requirements in this standard and the particular requirements that follow. Accessories provided for electrode-type vaporizers or heating appliances are covered under requirements for those appliances.

68 Construction

68.1 An electrode-type facial steamer or attachment shall include a guard or barrier assembly (or the equivalent) to prevent emission of hot water droplets into the facial area of the appliance during intended use. The barrier assembly shall be constructed of materials acceptable for and mounted in the manner required for the enclosure of live parts.

68.2 The interposed barrier assembly may consist of two or more layers arranged to provide a baffle effect for all openings.

69 Operation Test

69.1 An electrode-type facial steamer, when subjected to the operation test specified in 69.2, shall be such that

a) There is neither appreciable distortion nor any cracking of any of its parts,

b) There is no evidence of arcing or tracking over the surface or through insulating material,

c) There is no evidence of glowing or flaming,

d) There is no spitting of water in the area where the user's face may be located, and

e) There are no more than five fuses ruptured by a single appliance.

69.2 Three samples completely assembled as for intended use are to be subjected to the following test. A test solution of 4 grams of sodium chloride (NaCl) per liter of distilled water is to be prepared. The electrode portion of the appliance is to be connected to a 150-volt alternating-current supply through a 20-ampere time-delay fuse and filled to the recommended fill level from a nonconducting container with the test solution. After the current in the electrode portion has reduced to an average value of less than 20 percent of rated current of the electrode portion, the unit is to remain connected to the supply for an additional 10 minutes. Without emptying or cleaning, the unit is then to be filled to the fill level with distilled, deionized, or tap water having a resistivity greater than 20,000 ohm-centimeters. The cycling is to be continued for a total of 30 complete cycles. After the thirtieth cycle, the unit is to be de- energized and filled with tap water and then emptied. The preceding steps are to be repeated nine times starting with the filling using the saline test solution to obtain 300 cycles of operation. In cases where there is loss of solution salt, sufficient sodium chloride is to be added to the distilled, de-ionized, or tap water to prevent the operating portion of a cycle from exceeding 200 percent of the time consumed by the initial operating cycle. If the fuse blows at any time during the test, the appliance is to be emptied, filled with tap water, allowed to stand for 5 seconds, and emptied. The unit is then to be filled with the test solution, and the test continued. In each filling care should be taken to fill only to the manufacturer's recommended fill level and not to overfill the samples.

69.3 An electrode-type appliance other than specified in 69.1, when subjected to the operation test specified in 69.4, shall be such that:

a) There is neither appreciable distortion nor any cracking of any of its parts,

b) There is not evidence of arcing or tracking over the surface or through insulating material,

c) There is not evidence of glowing or flaming,

d) There is not continuous spitting of water beyond the outer perimeter of the appliance, and

e) There are not more than three fuses ruptured by a single appliance.

69.4 Three samples are to be subjected to the test indicated in 69.2.

Exception: The test solution is to be 3 grams of sodium chloride per liter of distilled water.

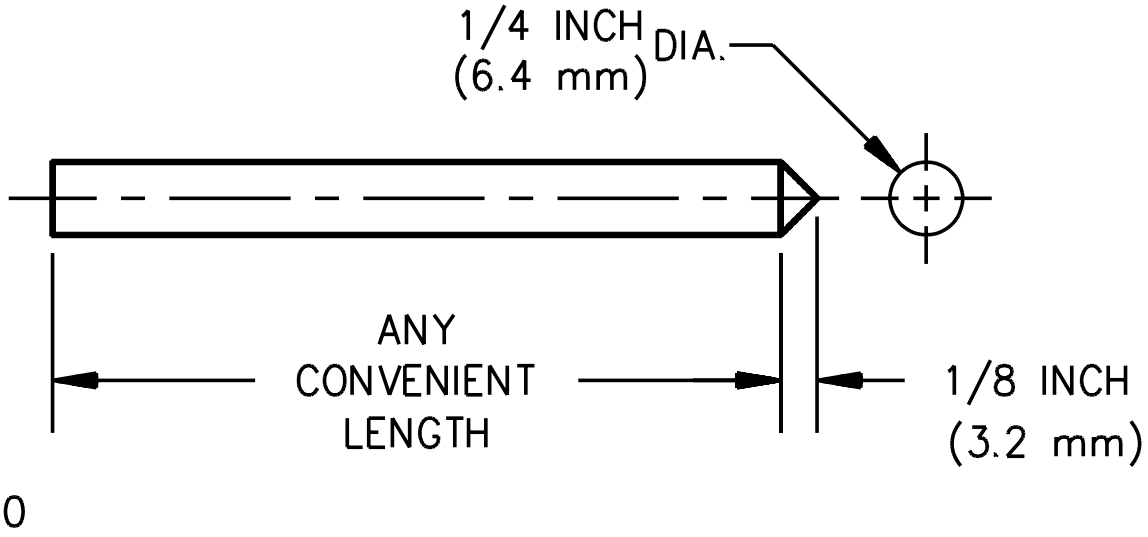
70 Leakage Current Test

70.1 An electrode-type appliance shall be constructed so that, with the appliance assembled for use in its intended manner, there are no openings in the enclosure or guard permitting contact with the energized water by a copper alloy rod sized as:

a) Illustrated in Figure 70.1 and

b) Determined in 6.5.3 – 6.5.5.

Figure 70.1
Probe for hand- or body-supported appliances or parts of hand-supported appliances



70.2 The leakage current available from accessible surfaces (including those moistened by the liquid) under any condition of intended operation shall not be greater than 0.5 milliampere when the unit is operated with a hard water solution consisting of 1/2 gram of calcium sulfate, $CaSO_4$ $2H_2O$, per liter of distilled water.

70.3 During the determination specified in 70.1, 70.2, and 70.4, a barrier or enclosure whose acceptability for the particular application has not been determined is to be removed.

70.4 The leakage current, measured under the following conditions (a) and (b), shall not be greater than 0.5 milliampere:

a) A sample at room temperature is to be filled with a volume of hard water solution (made as specified in 70.2) equal to 150 percent of the maximum recommended amount. The leakage to ground is to be made with the unit operating while tipped in any direction and at any angle not exceeding 30 degrees to cause maximum leakage current. The probe used in the measurements is to be a copper alloy rod with an insulating handle. The rod is to be sized as illustrated in Figure 70.1.

b) The test in (a) is to be repeated with the appliance mounted on a horizontal surface with 200 percent of the maximum recommended volume of hard water solution.

Exception: If the appliance is provided with a polarized attachment plug, the leakage current shall be no greater than 0.5 milliampere with the plug inserted in the receptacle in the intended position and shall be no greater than 5.0 milliamperes with the polarity reversed.

70.5 During the tests outlined in 70.2 – 70.4:

a) The appliance is to be energized with the attachment plug (including a polarized plug) inserted in one position into a receptacle connected to a grounded supply circuit and then with the polarity reversed and

b) The supply circuit voltage is to be adjusted to the test voltage as specified in 37.1.13.

Exception: The voltage is not to be increased to cause rated wattage input. The leakage current measurements are to be taken with the electrolyte in the heated condition producing maximum leakage, using the measurement circuit described in 31.5.

71 Disassembly and Reassembly

71.1 If the instructions involve disassembly of any parts for cleaning, it shall be determined that the appliance is unlikely to be reassembled in a manner that will result in a risk of fire, electric shock, or injury to persons.

72 Markings

72.1 The appliance shall be marked with the following:

a) A fill-level marking that can easily be compared with the actual water level during filling, or instructions for the use of any integral measuring container or other measuring means for filling. If the measuring container is not integral with the appliance, the amount shall be expressed in standard measurements in addition to the use of any measure provided.

b) The word ″CAUTION ″ and the following or the equivalent: ″Shock hazard. To provide continued protection against electric shock:

1) Disconnect the supply cord before filling, rinsing, or cleaning.

2) Do not fill above the fill-mark ″ or ″Do not fill with more than ___ cups of water. ″

c) Instructions for filling, cleaning, and rinsing the appliance and any instructions on additives to be used.

d) Instructions to keep the appliance out of reach of children.

e) Instructions to locate the appliance where it will not be likely to be upset.

72.2 An electrode-type appliance having a water reservoir or boiling chamber with a capacity of 8 ounces (23.7 mL) or less shall be marked with the word ″CAUTION ″ and the following or the equivalent: ″To reduce the risk of excessive water temperatures that may cause burns if the unit is upset, follow manufacturer's instructions on filling, cleaning, and rinsing. ″ The height of the letters in the word ″CAUTION″ shall not be less than 1/8 inch (3.2 mm), and the height of the remaining letters shall not be less than 7/64 inch (2.8 mm). For an electrode-type appliance, this marking shall be in addition to the marking specified in 72.1.

Exception: The additional marking is not required on an electrode-type appliance that, does not release more than 2 ounces (5.9 mL) of water when filled with water in accordance with the manufacturer's instructions and placed on a 30-degree inclined plane and in the position determined most likely to result in water spillage or overflow. For purposes of this test, the appliance may be restrained on the inclined plane to avoid tipover.

72.3 Cautionary markings and instructions shall be permanent and legible and shall be located on a part that cannot be removed without impairing the operation of the appliance.

72.4 Cautionary markings and instructions intended to instruct the operator shall be legible and clearly visible to the operator in the intended use of the appliance. Other such markings for servicing instructions should be legible and clearly visible when such servicing is being accomplished. Markings intended to reduce the risk of injury to persons shall be prefixed by the word ″CAUTION ″ in letters no less than 3/32 inch (2.4 mm) in height.

72.5 A marking that is required to be permanent shall be:

a) Molded, die-stamped, paint-stenciled, stamped, or etched on metal;

b) Indelibly stamped lettering; or

c) A pressure-sensitive label secured by adhesive that meets the requirements for the particular application (see 55.1 – 55.7). Ordinary usage, handling and storage of the appliance is to be considered in the determination of the permanence of the marking.

73 Operating Instructions

73.1 The manufacturer shall provide operating instructions with the appliance that shall include the following. These instructions shall be contained in a separate section or sections and immediately follow the instructions required in 63.6.

a) Information regarding potential risk of fire, electric shock, or injury to persons that may exist due to use of the appliance. The instructions shall caution the user to keep the appliance out of the reach of children and to locate the appliance where it would not be likely to be upset.

b) Sufficient information regarding the potential risk of electric shock due to overfilling or cleaning of the appliance without disconnecting the power supply cord.

c) Instructions regarding recommendations for cleaning the appliance including any need for disassembly (and reassembly) and any need for the use of additives.

WALL-HUNG HAIR DRYERS

74 Scope

74.1 These requirements cover cord-connected hair dryers rated 250 volts or less that consist of two non-detachable units– a hand unit and a wall unit with a length of flexible cord between the units. The hand unit provides the hair drying function and is supported by the user's hand during intended use. The wall unit is intended for hanging on a wall and has means for holding or supporting the hand unit when not in use.

75 General

75.1 The appliance shall comply with the applicable requirements specified in Sections 2 – 66 and with the requirements specified in Sections 76 – 80. The hand unit shall comply with the applicable requirements for a hand-supported hair dryer. If there is a discrepancy between the requirements in Sections 76 – 80 and those in Sections 2 – 66, the requirements in Sections 76 – 80 shall apply.

76 Construction

76.1 The appliance shall be provided with all the hardware necessary for hanging the wall unit in accordance with the installation instructions. The construction shall be such that the appliance withstands the force as described in 51.1 without damage to the supporting surface, to the hanging means, or to the appliance that results in the risk of electric shock, fire, or injury to persons.

76.2 The wall unit shall engage the hanging means on the wall. Dismounting the wall unit from the hanging means shall not require the use of a tool but shall require a positive and deliberate action by the user.

76.3 The appliance shall be constructed so that the hand unit cannot be energized while stored in the wall unit as intended.

76.4 The switch provided in accordance with 22.1.1 shall be in the wall unit, in the hand unit, or in both the wall unit and the hand unit. The switch shall be located so that it is readily accessible to the user to turn off the unit.

77 Performance

77.1 As part of the investigation, a wall-hung hair dryer shall be trial-installed to determine that the installation is feasible and that the instructions are detailed and correct.

77.2 The appliance shall comply with the Immersion-Detection Circuit-Interrupter (IDCI) Trip Time Measurement Test, Section 33. The hand unit and wall unit shall be immersed simultaneously and the hand unit shall be off its holder. Power switches shall be tested in both the ″on″ position and the ″off″ position.

Exception No. 1: A wall-hung hair dryer protected by a GFCI need not be subjected to this test.

Exception No. 2: A wall-hung hair dryer provided with a protective device as described in the Exception to 5.5 need not be subjected to this test.

78 Markings

78.1 A wall unit or a hanging bracket shall be permanently marked where readily visible during installation in letters having a contrasting color to the background with the word ″DANGER ″ and the following or the equivalent: ″To reduce risk of death by electric shock, do not install where unit can fall into a tub or sink. ″ The height of the letters in the word ″DANGER″ shall be no less than 1/8 inch (3.2 mm), and the height of the remaining letters shall not be less than 1/16 inch (1.6 mm). Block lettering shall be used for all words.

Exception: The marking is not required to be in contrasting colors if the letters are embossed or indented to a depth of not less than 0.020 inch (0.5 mm).

78.2 A warning tag that is in compliance with 61.4.2 – 61.4.4 shall be provided; however, use of following items are optional:

a) ″Always 'unplug it' after use.″ See 61.4.2(a).

b) The heading ″unplug it.″ See Figure 61.1.

79 Use and Care Instructions

79.1 Warning instructions in compliance with Instructions Pertaining to a Risk of Fire, Electric Shock, or Injury to Persons, Section 63, shall be provided, with the following modifications:

a) Item 1 under DANGER of Important Safety Instructions (see 63.6) shall be replaced with ″Do not install unit where it can fall into a tub or sink. Always return hand unit to wall unit after using.″

b) Item 1 under WARNING of Important Safety Instructions (see 63.6) need not be provided.

c) The following statement or the equivalent shall be included after Item 9 under WARNING of Important Safety Instructions (see 63.6): ″Periodically inspect the wall unit for secure mounting.″

80 Installation Instructions

80.1 Installation instructions for hanging of the wall unit as intended shall be packaged with a wall-hung hair dryer. The instructions shall include a list of the items provided (such as screws, anchors, brackets, and similar hardware); the tools needed; and the step-by-step instructions for preparation of mounting surface, application of the hanging hardware, method of hanging the wall unit, and the like.

80.2 The installation instructions shall include the warning specified in 78.1, preceding the detailed instructions specified in 80.1.

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SUPPLEMENT SA - HAIR DRYER ACCESSORIES

SA1 Scope

SA1.1 These requirements cover hair dryer accessories defined as direct plug-in devices intended to be used only with hand-supported hair dryers to reduce the risk of electrocution due to accidental immersion in water. These devices function to interrupt all conductors of the electric circuit to the connected hair dryer when the leakage current to ground exceeds a predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit. At the line side, a hair dryer accessory is provided with a polarized blade for use with a 15-ampere, 125-volt convenience receptacle. At the load side, a polarized 15-ampere, 125-volt receptacle outlet is provided for connection of a hand-supported hair dryer.

SA2 General

SA2.1 A hair dryer accessory shall comply with the requirements specified in this Supplement and with the applicable requirements specified in the Standard for Ground-Fault Circuit-Interrupters, UL 943.

Exception: A hair dryer accessory is not required to comply with the high-resistance ground fault tests in UL 943 when:

a) There is an open circuit in any one power conductor or

b) The circuit conductor that is normally grounded at the service only is also grounded at a point in the load circuit.

SA3 Markings

SA3.1 General

SA3.1.1 Hair dryer accessories, packaging, and instruction sheets shall contain markings that are readily visible in letters having a color contrasting with the color of the background. The height of the uppercase letters shall be no less than 1/8 inch (3.2 mm), and the height of the lowercase letters shall not be less than 1/16 inch (1.6 mm).

SA3.2 Hair dryer accessories

SA3.2.1 The face of a hair dryer accessory shall be permanently marked: "FOR USE WITH HAND-SUPPORTED HAIR DRYERS ONLY – NOT FOR USE WITH OTHER APPLIANCES OR WITH EXTENSION CORDS. "

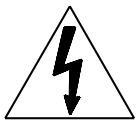
Exception: If the marking is too large to be placed on the face of the accessory, it may be located on another surface that is visible after installation if the face of the accessory is marked "HAIR DRYER ONLY."

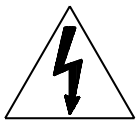
SA3.3 Product packaging

SA3.3.1 The packaging of a hair dryer accessory shall be marked:

THIS PRODUCT DOES

reduce the risk of electrocution due to accidental hair dryer immersion when used with a properly functioning receptacle.





WARNING

THIS PRODUCT DOES NOT

provide protection against the risk of electrocution due to ground faults caused by any other condition other than accidental immersion of a hair dryer connected to a properly functioning receptacle.

THIS IS NOT A GROUND–FAULT CIRCUIT–INTERRUPTER (GFCI)

FOR USE WITH HAND–SUPPORTED HAIR DRYERS ONLY – NOT FOR USE WITH OTHER APPLIANCES OR WITH EXTENSION CORDS

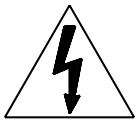
S4089

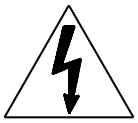
SA3.4 Instruction sheet

SA3.4.1 The instruction sheet of a hair dryer accessory shall include the following:

THIS PRODUCT DOES

reduce the risk of electrocution due to accidental hair dryer immersion when used with a properly functioning receptacle.





WARNING

THIS PRODUCT DOES NOT

provide protection against the risk of electrocution due to ground faults caused by any other condition other than accidental immersion of a hair dryer connected to a properly functioning receptacle.

THIS IS NOT A GROUND–FAULT CIRCUIT–INTERRUPTER (GFCI) FOR USE WITH HAND–SUPPORTED HAIR DRYERS ONLY – TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT USE WITH ANY OTHER APPLIANCE OR WITH EXTENSION CORDS.

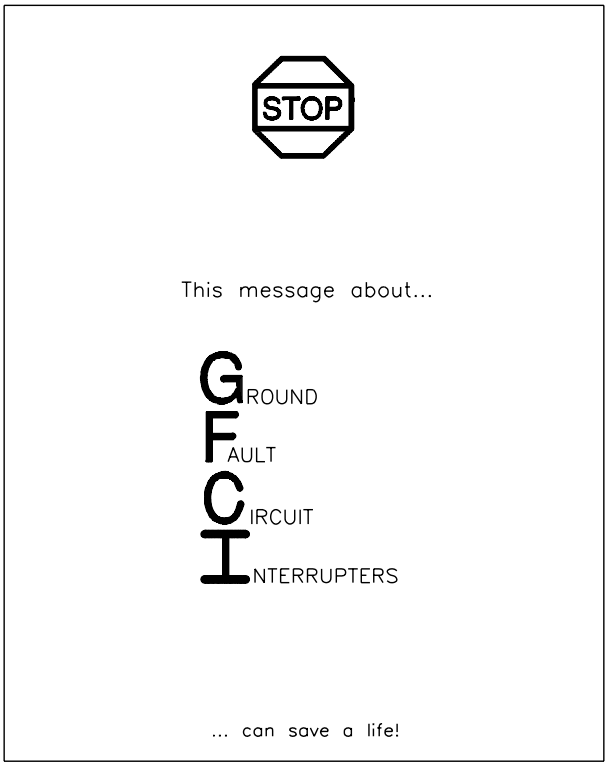
An improperly functioning receptacle could cause a hazardous condition to result and should be replaced immediately. An improperly functioning receptacle may not be immediately noticeable. Intermittent operation may be an indication of a faulty receptacle. If there is any question whether a receptacle is functioning properly, a qualified electrician should be consulted.

S4090

SA4 Instructions

SA4.1 Instructions shall be provided for using a hair dryer (whenever it is used in bathrooms) on a circuit protected by a ground-fault circuit-interrupter. Information shall be included describing what a ground-fault circuit-interrupter is, how it reduces the risk of death by electric shock, the types available (portable and permanent), and a statement that the permanent types are to be installed by a qualified electrician. Figure SA4.1 shows an example of these instructions. The instructions shall also consist of a graphical symbol (such as the octagon on the front of the insert card shown in Figure SA4.1), and a referent (such as the word ″stop″ within the octagon), or equivalent wording. These instructions shall be a permanent part of the instruction sheet or on a stuffer sheet.

Figure SA4.1
Example of ground-fault circuit-interrupter instructions



SB2937 (FRONT OF INSERT CARD)

IF YOU MUST USE YOUR HAIR DRYER IN THE BATHROOM, INSTALL A GFCI* NOW! YOUR LOCAL ELECTRICIAN CAN HELP YOU DECIDE WHICH TYPE IS BEST FOR YOU -- A PORTABLE UNIT THAT PLUGS INTO THE ELECTRICAL OUTLET OR PERMANENT UNIT INSTALLED BY YOUR ELECTRICIAN. THE NATIONAL ELECTRICAL CODE NOW REQUIRES GFCI'S IN THE BATHROOM, GARAGES, AND OUTDOOR OUTLETS OF ALL NEW HOMES.

WHY DO YOU NEED A GFCI? ELECTRICITY AND WATER DON'T MIX. IF YOUR HAIR DRYER FALLS IN WATER WHILE IT'S PLUGGED IN, THE ELECTRIC SHOCK CAN KILL YOU...EVEN IF THE SWITCH IS "OFF."

A REGULAR FUSE OR CIRCUIT BREAKER WON'T PROTECT YOU UNDER THESE CIRCUMSTANCES. A GFCI OFFERS YOU FAR GREATER PROTECTION.

A GFCI CAN SAVE YOUR LIFE! COMPARED TO THAT, THE PRICE IS SMALL! DON'T WAIT...INSTALL ONE NOW!

*GFCI IS A SENSITIVE DEVICE WHICH REACTS IMMEDIATELY TO A SMALL ELECTRIC CURRENT LEAK BY STOPPING THE ELECTRICITY FLOW.

(BACK OF INSERT CARD)

SA4.2 The instruction sheet shall be provided with instructions on the proper use of the accessory. These instructions shall include information on the purpose of the test and reset buttons of the accessory, and specify the frequency of testing. The instruction sheet shall also describe the indication of proper functioning of the accessory and instruct the user to not reuse a hair dryer which has been immersed, but to return it to a service center for examination and repair.

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APPENDIX A

Standards for Components

Standards under which components of the products covered by this standard are evaluated include the following:

Title of Standard − UL Standard Designation

Attachment Plugs and Receptacles – UL 498
Ballasts, Fluorescent-Lamp – UL 935
Circuit-Interrupters, Ground-Fault – UL 943
Circuit-Interrupters, Immersion-Detection – UL 1664
Cord Sets and Power-Supply Cords – UL 817
Double Insulation Systems for Use in Electrical Equipment – UL 1097
Flexible Cord and Fixture Wire – UL 62
Fuseholders – UL 512
Lampholders, Edison-Base – UL 496
Lampholders, Starters, and Starter Holders for Fluorescent Lamps – UL 542
Limit Controls – UL 353
Motor-Operated Appliances – UL 73
Motors, Electric – UL 1004
Polymeric Materials – Long Term Property Evaluations – UL 746B
Polymeric Materials – Short Term Property Evaluations – UL 746A
Polymeric Materials – Use in Electrical Equipment Evaluations – UL 746C
Printed-Wiring Boards – UL 796
Protectors for Motors, Thermal – UL 547
Switches, Clock-Operated – UL 917
Switches, Special-Use – UL 1054
Tape, Polyvinyl Chloride, Polyethylene, and Rubber Insulating – UL 510
Temperature-Indicating and -Regulating Equipment – UL 873
Thermal Cutoffs for Use in Electrical Appliances and Components – UL 1020
Wire Connectors and Soldering Lugs for Use with Copper Conductors – UL 486A
Wires and Cables, Rubber-Insulated – UL 44
Wires and Cables, Thermoplastic-Insulated – UL 83

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Superseded requirements for
the Standard for
Household Electric Personal Grooming Appliances

UL 859, Tenth Edition

The requirements shown are the current requirements that have been superseded by requirements in revisions issued for this Standard. To retain the current requirements, do not discard the following requirements until the future effective dates are reached.

37.5.1 A hand-supported hair dryer is to be tested as follows. With the adjustable temperature control, if any, set for the most severe condition of use, the dryer is to be operated continuously until stabilized conditions are achieved. During this operating time the dryer is to be supported in the position representing the most severe conditions of use, first without any attachment on the heated air outlet nozzle, and then, if the dryer is provided with one or more attachments for the heated air outlet, in turn with each attachment in place, as intended. During each of these tests the plane of the thermocouple grid specified in 37.5.2 is to be positioned 1 inch (25.4 mm) from the plane of the heated air outlet of:

a) The dryer nozzle or

b) The attachment nozzle.

The center of the air stream is to be directed at the center of the grid. Temperatures are to be measured throughout the test. There shall not be a temperature rise greater than the limits specified in Tables 37.1 and 37.2, nor greater than 100°C (180°F) for the average of the five highest thermocouple readings on the grid described in 37.5.2.

39.1.1 A hair dryer shall not cause ignition of any material or emission of flame, sparks, molten metal, or similar result when operated under the conditions described in:

a) 39.1.2, 39.1.3, and 39.2.1 – 39.3.6.1 for a hand-supported type, or

b) 39.1.2, 39.1.3, and 39.2.1 – 39.2.3 for other than a hand-supported type.

The dryer shall not collapse or experience displacement of any part that results in a risk of fire or electric shock, such as short-circuiting or grounding.

39.2.1 A hair dryer (both heating element and blower) is to be operated, without the use of a dummy head, until all temperatures stabilize. In the case of a hand-supported hair dryer, the position of the appliance is to be as described in 39.3.1.1. The hair dryer, while still operating, is then to be draped with a double layer of cloth in such manner as to retard the air flow effectively and to cover the hottest area of the appliance. However, the cloth is not to be manipulated deliberately in an endeavor to cause an overly restricted air flow. Operation is then to be continued until the ultimate effects of the heating are apparent.

39.2.2 The cheesecloth shall not be caused to glow or flame as a result of this test.

39.2.3 Following the operation described in 39.2.1, the cheesecloth is to be removed, the rotor of the blower locked, and the temperature control, if any, set in the position that will result in the most severe test. For a hand-supported hair dryer, a single layer of cheesecloth indicator is to be loosely draped over the appliance. The dryer is then to be operated until the ultimate effects of the heating have been achieved.

Table 42.1
Number of cycles of test for ″as received″ samples

Type of appliance	Number of cycles required
Hand-supported hair-drying appliances, other than curling irons and brushes, with or without swivel assemblies	3,000
Curling irons and brushes with or without swivels	5,000
Other hand-supported appliances such as hair crimpers and hair straighteners, with or without swivels	1,000
NOTE – A cycle consists of 540 degrees of rotation in one direction plus 540 degrees in the reverse direction back to the starting point.	

59.2 The power input is to be measured with the dryer at operating temperature under full load conditions while connected to a circuit maintained at:

a) 120 ±6 volts for a dryer rated 110 – 120 volts,

b) 240 ±12 volts for a dryer rated 220 – 240 volts, or

c) The marked voltage on the dryer for all other voltage ratings.

Control switches or the equivalent, if provided, are to be set to result in the maximum power input.

Exception: If it can be demonstrated that equivalent results are obtained, the input test may be conducted with production-line test equipment that does not operate each sample for the time necessary for it to reach its operating temperature, or does not indicate wattage directly, or both.