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Underwriters Laboratories Inc.®

A not-for-profit organization dedicated to public safety
and committed to quality service

August 22, 1996

Revision pages for

Standard for

Electric Commercial Clothes-Washing Equipment

UL 1206, Third Edition

Attached to this distribution notice is a revision of the Third edition of UL 1206.

A CHANGE ON A PAGE DATED AUGUST 22, 1996 IS INDICATED BY A SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM, PRECEDED AND FOLLOWED BY AN ASTERISK.

THESE NEW AND REVISED REQUIREMENTS IN THIS STANDARD ARE NOW IN EFFECT EXCEPT FOR THOSE PARAGRAPHS, SECTIONS, TABLES, FIGURES, AND OTHER ELEMENTS OF THE STANDARD HAVING FUTURE EFFECTIVE DATES AS INDICATED IN THE NOTE FOLLOWING THE AFFECTED ITEM. TO RETAIN THE REQUIREMENTS IN EFFECT UNTIL THESE FUTURE EFFECTIVE DATES, DO NOT DISCARD THE PAGES REPLACED BY THOSE HAVING FUTURE EFFECTIVE DATES UNTIL THOSE DATES.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this standard unless the applicant specifically requests that the product be judged under the current requirements. However, should the applicant elect 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.

The revised requirements are substantially in accordance with UL's Bulletin on this subject dated May 8, 1996. The bulletin is now obsolete and may be discarded.

As indicated on the title page (page 1), this UL Standard for Safety has been approved by the Department of Defense.

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

With the inclusion of the accompanying material, the standard consists of pages dated as shown in the following checklist:

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Table 35.1
Artificial-aging test for rubber and rubber-like materials

Temperature of component during temperature test		Artificial-aging procedure ^a	Minimum acceptable percent of value obtained for unaged samples ^b	
°C	°F		Tensile strength	Elongation
60 or less	140 or less	Aged in air oven for 70 hours at 100 ±2°C (212 ±3.6°F)	60	60
61 – 75	141 – 167	Aged in air oven for 168 hours at 100 ±2°C (212 ±3.6°F) at atmospheric pressure	50	50
76 – 90	168 – 194	Aged in full-draft, air-circulating oven for 168 hours at 121.0±1.0°C (249.8±1.8°F)	50	50
91 – 105	195 – 221	Aged in full-draft, air-circulating oven for 168 hours at 136.0±1.0°C (276.8±1.8°F)	50	50
	c	Immersion for 168 hours in boiling solution of commercial washing detergent – 25 grams per liter of water – and bleach – 50 milliliters per liter of water ^d	50	50

^a Each procedure is to be performed on three samples.

^b Tensile strength and elongation are to be determined using the test methods and apparatus described in ASTM D412-92.

^c All samples regardless of temperature are to be subjected to this test.

^d Tide or AHAM detergent is an acceptable laundry detergent. Any other detergent having the properties of either of these detergents is also acceptable. Chlorox bleach is an acceptable bleach. Any other bleach having the properties of this bleach is also acceptable.

Table 35.1 revised August 22, 1996

36 Dielectric Voltage Withstand

36.1 An appliance shall withstand for 1 minute without breakdown the application of a 60-hertz essentially sinusoidal potential between live parts and dead metal parts or between live parts of opposite polarity for a test on a capacitor as mentioned in (c). The test potential shall be:

- One thousand volts for an appliance employing a motor rated 1/2 horsepower (373 W) or less and 250 volts or less. See 23.8.
- One thousand volts plus twice rated voltage for an appliance employing a motor rated more than 1/2 horsepower or more than 250 volts. See 23.8.
- One thousand volts, or 1000 volts plus twice the rated voltage – depending upon the value of the test potential applied to the appliance as a whole – for a radio-frequency-interference-elimination or arc-suppression capacitor.

36.2 To determine whether an appliance complies with the requirements in 36.1, the appliance is to be tested by means of a 500-volt-ampere or larger-capacity transformer the output voltage of which is essentially sinusoidal and can be varied. The applied potential is to be increased from zero until the required test level is reached, and is to be held at that level for 1 minute. The increase in the applied potential is to be a uniform rate and as rapid as is consistent with its value being correctly indicated by a voltmeter. The appliance is to be at the maximum operating temperature reached in normal use.

37 Temperature

37.1 An appliance shall be tested as described in 37.4 – 37.12 and shall not:

- a) Reach a temperature, at any point, high enough to cause a risk of fire or to damage any material used in the appliance, or
- b) Exceed the temperature rises specified in Table 37.1.

37.2 A motor-protective device shall not operate during the temperature test described in 37.4 – 37.12.

37.3 A thermal- or overcurrent-protective device shall not open the circuit during the temperature test described in 37.4 – 37.12.

37.4 An appliance that has a single frequency rating is to be tested at that frequency. An appliance rated 50 – 60 hertz is to be tested on 60-hertz alternating current.

37.5 All values for temperature rises in Table 37.1 are based on an assumed ambient temperature of 25°C (77°F); however, tests may be conducted at any ambient temperature within the range of 10 – 40°C (50 – 104°F).

37.6 A temperature is considered to be constant when three successive readings taken at intervals of 10 percent of the previously elapsed duration of the test, but not less than 50 minutes, indicate no change.

37.7 Ordinarily, coil or winding temperatures are to be measured by thermocouples unless the coil is inaccessible for mounting these devices – for example, a coil immersed in sealing compound – or unless the coil wrap includes thermal insulation, such as asbestos, or more than two layers – 1/32 inch (0.8 mm) maximum – of cotton, paper, rayon, or the like. For a thermocouple-measured temperature of a coil of an alternating-current motor other than a universal motor (10 and 13 in Table 37.1) having a frame diameter (see Note c of Table 37.1) of 7 inches (178 mm) or less, the thermocouple is to be mounted on the integrally applied insulation of the conductor.

**Underwriters Laboratories Inc.®**A not-for-profit organization dedicated to public safety
and committed to quality service**February 7, 1996****Revision pages for****Standard for****Electric Commercial Clothes-Washing Equipment****UL 1206, Third Edition**

Attached to this transmittal notice is a revision of the Third edition of UL 1206.

A CHANGE ON A PAGE DATED FEBRUARY 7, 1996 IS INDICATED BY A SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM, PRECEDED AND FOLLOWED BY AN ASTERISK.

THESE NEW AND REVISED REQUIREMENTS ARE NOW IN EFFECT.

The new and revised requirements are substantially in accordance with UL's bulletin on this subject dated June 30, 1995. The bulletin is now obsolete and may be discarded.

Attention is directed to the note on the title page of this standard identifying that the Department of Defense has adopted the text of UL 1206.

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

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UL 1206

Standard for

Electric Commercial Clothes-Washing Equipment

Prior to the First edition, the requirements for the products covered by this Standard were included in the Standard for Electric Home-Laundry Equipment, UL 560.

First Edition – February, 1974

Second Edition – August, 1979

The First edition was titled Standard for Electric Coin-Operated and Commercial Clothes-Washing Equipment.

Third Edition

January 10, 1994

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

The Department of Defense (DoD) has adopted UL 1206 on June 14, 1989. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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

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FOREWORD

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

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

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

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

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

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

INTRODUCTION

1 Scope

1.1 These requirements cover electric commercial, industrial, and institutional clothes-washing equipment intended for use in accordance with the National Electrical Code. Equipment covered by this Standard is not intended for use by the general public, but only by trained or supervised personnel.

1.1 revised February 7, 1996

1.2 These requirements do not cover clothes dryers, coin-operated clothes washing appliances, flatirons, ironing machines, water heaters, water softeners, dry-cleaning machines, garment-finishing machines, appliances employing wringer mechanisms, or other equipment covered by requirements separate from this standard.

1.2 revised February 7, 1996

1.3 Appliances and field-attached accessories are investigated under these requirements and under such additional requirements as are applicable to the appliance under consideration.

1.3 revised February 7, 1996

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

1.4 revised February 7, 1996

2 References

Section 2 revised February 7, 1996

2.2 In the following text, a requirement that applies only to a specific class of equipment is so identified by a specific reference in that requirement to the class or classes of appliances involved. Absence of such specific reference or use of the term appliance indicates that the requirement applies to all classes of appliances unless the context indicates otherwise.

3.1 relocated as 2.2 February 7, 1996

2.3 In the following text, a specific requirement pertaining to a particular appliance takes precedence over a corresponding requirement specified as being applicable to all appliances.

3.2 relocated as 2.3 February 7, 1996

3 Glossary

Section 3, Glossary revised February 7, 1996

3.1 **APPLIANCE, AUTOMATIC** – An appliance is considered to be automatically controlled under one or more of the following conditions:

- a) If repeated starting of the appliance, beyond one complete predetermined cycle of operation, to the point where some form of limit switch opens the circuit is independent of any manual control.

- b) If, during any single predetermined cycle of operation, the motor is caused to stop and restart one or more times.
- c) If, upon energizing the appliance, the initial starting of the motor may be intentionally delayed beyond normal, conventional starting.
- d) If, during any single predetermined cycle of operation, automatic changing of the mechanical load may reduce the motor speed sufficiently to reestablish starting-winding connections to the supply circuit.

3.5 revised and relocated as 3.1 February 7, 1996

3.2 APPLIANCE, RECESSED – An appliance intended to be supported by the floor, and to sit immediately adjacent to a wall in the rear or to sit immediately adjacent to a wall, a cabinet, or another appliance on each side. If the design permits, a counter top may cover the appliance and adjacent cabinets and appliances. A recessed appliance is not intended for permanent attachment to the building structure or to adjacent cabinets or appliances.

3.4 revised and relocated as 3.2 February 7, 1996

3.3 APPLIANCE, SEMI-AUTOMATIC – An appliance employing two or more motors is considered to be semiautomatically controlled if:

- a) One or more motors are controlled in accordance with any of the conditions specified in 3.1, and
- b) At least one motor is not controlled in accordance with any of the conditions specified in 3.1.

3.6 revised and relocated as 3.3 February 7, 1996

3.4 APPLIANCE, WALL-INSERT – An appliance intended to be mounted permanently in a wall or other vertical surface of a building or cabinet.

3.3 revised and relocated as 3.4 February 7, 1996

3.5 ENCLOSURE – The part of the product that:

- a) Reduces the accessibility of all or any parts of the product that may otherwise result in a risk of electric shock or injury to persons; or
- b) Retards propagation of flame initiated by electrical disturbances that may occur within the product.

3.5 revised February 7, 1996

3.6 PART, DECORATIVE – A part used for ornamental purposes only and not as an enclosure or as insulation of electrically live parts.

3.6 revised February 7, 1996

3.7 PART, FUNCTIONAL – A part that is necessary for the proper functioning of the product, and that is used in such a way that deterioration or breakage of the part would result in a risk of fire, electric shock, or injury to persons.

3.7 added February 7, 1996

4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

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

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

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

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

5 Units of Measurement

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

6 Field-Attached Accessories

6.1 The requirements in 6.2 – 6.9 apply to accessories intended for installation on or connection to an appliance for the purpose of modifying or supplementing the functions of the appliance or accessory.

6.2 An appliance that has provision for the use of an accessory to be attached in the field shall be constructed so that the use of the accessory will not introduce a risk of fire, electric shock, or injury to persons.

6.3 The installation of an accessory by the user shall be restricted to an arrangement that can be accomplished by means of receptacles and plug-in connectors of other than the general-use or specific-purpose type.

6.4 The installation of an accessory by a qualified electrician or serviceman is acceptable if connections are made to existing terminals by use of wire connectors.

6.5 Accessories intended to be field wired shall be provided with a means for connection to the power-supply circuit of the appliance as specified in 11.1.1.

6.6 An appliance that has provision for field connection of a dispenser or the like shall include a circuit that provides a programmed signal to the dispenser.

6.7 Any installation that requires field rearrangement of components or wiring, cutting or splicing of wiring, or soldering of connections is not acceptable.

6.8 As part of the investigation, an accessory shall be tested and trial-installed to determine that installation is feasible, that the instructions are detailed and correct, and that the use of the accessory will not introduce a risk of fire, electric shock, or injury to persons.

6.9 An appliance that has provision for the field connection of an accessory and a field-attached accessory shall be marked as specified in 50.1 and 50.23 – 50.25, as applicable.

CONSTRUCTION

7 Frame and Enclosure

7.1 An appliance shall be formed and assembled so that it will have the strength and rigidity necessary to resist the abuses to which it may be subjected, without increasing the risk of fire, electric shock, or injury to persons due to total or partial collapse with resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

7.2 An appliance shall be provided with an enclosure of material found by investigation to be acceptable for the application that shall house all parts that may present a risk of fire, electric shock, or injury to persons under any condition of use.

7.3 Among the factors that shall be taken into consideration when judging the acceptability of an enclosure material are its:

- a) Mechanical strength,
- b) Resistance to impact,
- c) Moisture – absorptive properties,
- d) Combustibility, and
- e) Resistance to distortion at temperatures to which the material may be subjected under conditions of normal or abnormal use.

7.3 revised February 7, 1996

7.3.1 An enclosure constructed of polymeric material shall comply with the requirements in Polymeric Materials, Section 44A.

7.3.1 added February 7, 1996

7.4 For an unreinforced, flat surface, cast metal shall not be less than 1/8 inch (3.2 mm) thick, malleable iron shall not be less than 3/32 inch (2.4 mm) thick, die-cast metal shall not be less than 5/64 inch (2.0 mm) thick.

Exception: Metal of lesser thickness but not less than 3/32 inch, 1/16 inch (1.6 mm), and 3/64 inch (1.2 mm), respectively, may be acceptable provided the surface under consideration is:

- a) *Curved, ribbed, or otherwise reinforced to provide mechanical strength equivalent to that required; or*
- b) *Of a size or shape that provides mechanical strength equivalent to that required.*

7.5 An enclosure of sheet metal shall be judged with respect to size, shape, thickness of metal, and acceptability for the application considering the intended use of the complete appliance.

7.6 For an enclosure of sheet metal, sheet steel shall have a minimum thickness of 0.026 inch (0.66 mm), aluminum shall have a minimum thickness of 0.036 inch (0.91 mm), and copper or brass shall have a minimum thickness of 0.033 inch (0.84 mm).

Exception: This requirement does not apply to an area that is relatively small or a surface that is curved or otherwise reinforced.

7.7 At a point where the power-supply conductors enter the enclosure, sheet metal shall not be less than 0.032 inch (0.81 mm) thick if uncoated steel, not less than 0.034 inch (0.86 mm) if galvanized steel, not less than 0.044 inch (1.12 mm) if aluminum, and not less than 0.043 inch (1.09 mm) if copper or brass.

7.8 In an automatic free-standing or recessed appliance, provision shall be made to prevent molten metal, burning insulation, or the like from falling upon combustible materials, including the surface on which the appliance is supported.

Exception: This requirement does not apply to the supporting surface of an appliance that is:

- a) Intended to be permanently bolted to an uncovered concrete floor,*
- b) Marked in accordance with 50.26, and*
- c) Provided with installation instructions that include a warning statement in accordance with 50.27.*

11.4.3 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.

11.5 Cord-connected appliances

11.5.1 Cords and plugs

11.5.1.1 A flexible cord shall have an ampacity not less than the current rating of the appliance.

11.5.1.2 An attachment plug shall have an ampacity not less than the rated current of the appliance, and shall have a voltage rating not less than the rated voltage of the appliance.

11.5.1.3 Flexible cord provided with an appliance shall be Type SJ, SJO, SJT, SJTO, S, SO, ST, or STO.

Exception: Type SP-3 or SPT-3 cord may be used on an automatic appliance not mounted on wheels, casters, or the equivalent.

11.5.1.4 If the point of entry of the flexible cord into a nonautomatic appliance or a semiautomatically controlled appliance is 30 inches (0.76 m) or more above the floor, the cord shall not be less than 6 feet (1.83 m) long measured from the face of the attachment plug to the point of cord entry into the appliance.

11.5.1.5 If the point of entry of the flexible cord into a nonautomatic appliance or a semiautomatically controlled appliance is less than 30 inches (0.76 m) above the floor, the length of the cord shall not be less than 8-1/2 feet (2.59 m) minus the vertical distance between the point of cord entry into the appliance and the floor.

11.5.1.6 For an automatic appliance, the flexible cord shall not be less than 6 feet (1.83 m) long measured from the face of the attachment plug to the point of entry into the appliance.

11.5.1.7 The flexible cord shall be prevented from being pushed into the appliance through the cord-entry hole if such displacement may subject the cord to mechanical damage or to exposure to a temperature higher than that for which the cord is rated; or may reduce spacings, such as to a metal strain-relief clamp, below the minimum acceptable values.

11.5.2 Strain relief

11.5.2.1 A flexible cord shall be provided with strain relief so that stress on the cord will not be transmitted to terminals, splices, or internal wiring. The strain-relief means shall comply with the requirements in Strain Relief, Section 43.

11.5.2.2 If a knot in a flexible cord serves as strain relief, a surface against which the knot may bear or with which it may come in contact shall be free from projections, sharp edges, burrs, fins, etc., that may cause abrasion of the insulation of the cord.

11.5.3 Cord bushings

11.5.3.1 The edges of the entry hole for the power-supply cord, including the cord-entry hole in a bushing, shall be smooth and free from burrs, fins, or sharp edges.

11.5.3.2 If an insulating bushing is provided where the power-supply cord enters the enclosure, and if the bushing is of material other than ceramic, phenolic or cold-molded composition, fiber, or other material that has been investigated and found to be acceptable for the application, the hole in the metal in which the bushing is mounted shall be smooth and free from burrs, fins, or sharp edges.

12 Internal Wiring

12.1 For the purpose of these requirements, the internal wiring of an appliance is considered to be all the interconnecting wiring beyond the point where the power-supply cord of a cord-connected appliance enters the enclosure, or beyond the wiring terminals or leads for power-supply connection of a permanently connected appliance, even though some of such wiring may not be completely enclosed and even though some of it may be in the form of flexible cord.

12.2 The internal wiring and connections between parts of an appliance shall be protected or enclosed. A length of flexible cord may be employed for an external – unenclosed – connection between such parts if flexibility is necessary.

12.3 The protection of insulated wiring required by 12.2 is considered to exist if, when judged as though it were enameled wire, the wiring would be acceptable according to 8.2. Internal wiring not so protected may be accepted if it is secured within the enclosure so that it is unlikely to be subjected to stress or mechanical damage.

12.4 Unless it is to be judged as an uninsulated live part, insulated internal wiring of an appliance, including a grounding conductor, shall consist of wire that is acceptable for the application, when considered with respect to:

- a) The temperature and voltage to which the wiring may be subjected;
- b) Exposure to oil, grease, or other substances that may have a deleterious effect on the insulation;
- c) Exposure to moisture; and
- d) Other conditions of service to which it may be subjected.

12.5 **12.5 deleted February 7, 1996**

12.6 **12.6 deleted February 7, 1996**

12.7 If the wiring inside an appliance is located so that it may be in proximity to combustible material or may be subjected to mechanical damage, it shall be in armored cable, rigid metal conduit, electrical metallic tubing, or otherwise protected.

12.8 Wiring shall be protected from sharp edges – including screw threads – burrs, fins, moving parts, and other agencies that may cause abrasion of the insulation on conductors.

12.9 A hole through which insulated wires pass in a sheet-metal wall within the overall enclosure of an appliance shall be provided with a smooth, rounded bushing of one of the materials mentioned in 11.5.3.2; or shall have smooth surfaces, free of burrs, fins, sharp edges, etc., upon which the wires may bear, to prevent abrasion of the insulation.

12.10 Insulated wires may be bunched and passed through a single opening in a metal wall within the enclosure of the appliance.

12.11 All splices and connections shall be mechanically secure and shall provide reliable electrical contact.

Table 12.1
Characteristics of internal wiring

Table 12.1 deleted February 7, 1996

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

12.13 A wire-binding screw or nut shall be provided with a lock washer under the head of the screw or under the nut to prevent it from becoming loosened due to vibration, if such loosening may result in a risk of fire, electric shock, or injury to persons.

12.14 An open-end spade lug may not be used unless additional means are provided to hold the lug in place should the wire-binding screw or nut become loosened.

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

12.16 If the voltage involved is less than 250 volts, insulation consisting of two layers of friction tape, of two layers of thermoplastic tape, or of one layer of friction tape on top of one layer of rubber tape may be used on a splice. In determining if splice insulation consisting of coated fabric, thermoplastic, or other type of tubing is acceptable, consideration is to be given to such factors as its dielectric properties, heat-resistant and moisture-resistant characteristics, etc. Thermoplastic tape wrapped over a sharp edge is not acceptable.

12.17 The means of connecting stranded internal wiring to a wire-binding screw shall be such that loose strands of wire will be prevented from contacting other live parts not always of the same polarity as the wire and from contacting dead metal parts. This may be accomplished by use of pressure wire connectors, soldering lugs, crimped eyelets, soldering all strands of the wire together, or other equivalent means.

13 Live Parts

13.1 Current-carrying parts shall be of silver, copper, a copper alloy, or other material that has been investigated and found to be acceptable for the purpose.

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

- a) The temperature of which during normal operation is more than 100°C (212°F),
- b) Within a motor or associated governor, or
- c) If acceptable in accordance with 4.1;

but unplated iron or steel may not be used. Stainless steel and other corrosion-resistant alloys may be used for current-carrying parts regardless of temperature.

13.3 Uninsulated live parts shall be secured to the base or mounting surface so that they will be prevented from turning or shifting in position if such motion may result in a reduction of spacings below the minimum acceptable values.

13.4 Friction between surfaces is not acceptable as the sole means to prevent the turning of live parts, but a lock washer properly applied may be used for this purpose.

14 Electrical Insulation

14.1 An insulating washer, bushing, etc. and the base or support for the mounting of a live part shall be of a moisture-resistant material that will not be damaged by the temperatures to which it will be subjected under conditions of actual use – for example, porcelain, phenolic, cold-molded composition, or other material that has been investigated and found to be acceptable for the application.

14.2 Insulating material employed in an appliance is judged with respect to the application. Materials such as mica, some molded compounds, and certain refractory materials usually may be used as the sole support of live parts; and some other materials that are not acceptable for general use, such as asbestos and magnesium oxide, may be acceptable if used in conjunction with other acceptable insulating materials or if located and protected so that mechanical damage and the absorption of moisture are prevented. If an investigation is necessary to determine whether a material is acceptable, consideration is to be given to its mechanical strength, dielectric characteristics, insulation resistance, heat-resistant qualities, the degree to which it is enclosed or protected, and any other features that have a bearing on the risk of fire, electric shock, and injury to persons, in conjunction with the conditions of actual service.

14.3 A screw or other fastening used to mount or support a small, fragile, insulating part shall not be so tight as to crack or break such a part due to expansion and contraction. Generally, such a part should be slightly loose.

14.4 Ordinary vulcanized fiber may be used for an insulating bushing, a washer, a separator, and a barrier, but not as the sole support for an uninsulated live part if shrinkage, current leakage, or warpage may introduce a risk of fire or electric shock. Thermoplastic materials are not considered to be acceptable generally for the sole support of an uninsulated live part, but may be employed if shown to be acceptable by investigation.

27.2 Appliance stands

27.2.1 Hardware

27.2.1.1 An appliance stand shall contain all of the hardware needed to assemble the stand and to install the appliance on it.

Exception: A readily available part, such as a nail, a screw, or a piece of lumber, need not be provided if the instructions accompanying the kit include a description of the part and specify how the part is to be used.

27.2.2 Overturning

27.2.2.1 When installed as intended, the appliance shall be reliably attached to the stand assembly and shall not overturn when tested as described in 27.2.2.2 and 27.2.2.3.

27.2.2.2 An appliance/stand assembly that has been assembled as specified in the instructions is to be placed on a flat surface inclined at an angle of 10 degrees from the horizontal. A loading door is to be in the position most likely to cause the appliance to tip over. If the stand permits stacking of a dryer on top of a washing machine, the test is to be conducted both with and without the top appliance installed. The appliance stand assembly is to be rotated on the inclined surface so that all positions are evaluated. The assembly is to be blocked to prevent sliding, and the appliances are to be loaded as described in 31.3 with test cloths that are wet until they have absorbed a weight of water equal to the dry weight of the cloths, or unloaded, whichever results in the more severe test.

27.2.2.3 An appliance/stand assembly is to be assembled in accordance with the instructions. A fastener provided for anchoring the stand to a wall is not to be used if a tool is required to attach the appliance or the stand to the fastener or the fastener to the wall. The assembly is to be subjected to the tests specified in (a) and (b). If the stand permits stacking of a dryer on top of a washing machine, the tests are to be conducted both with and without the bottom appliance installed. The appliance or appliances are to be either loaded as described in 31.3 with test clothes that are wet until they have absorbed a weight of water equal to the dry weight of the cloths, or unloaded, whichever results in the most severe test.

a) A 50-pound (22.6-kg) weight is to be suspended from the front of the upper appliance or from the front edge of the loading door. The weight and the loading door are to be positioned to produce the most severe loading condition. The weight is to remain suspended for 1 minute.

b) A hollow rubber ball 75 to 78 centimeters in circumference is to be filled with sand to a total weight of 20 pounds (9.1 kg). The weight is to fall from rest as a pendulum through the distance necessary to strike with an impact of 30 foot pounds-force (40.7 J). The ball is to strike the appliance-stand assembly 5 feet (1.5 m) above floor level or at the top of the upper appliance, whichever is less. All four sides of the appliance-stand assembly are to be subjected to the impact.

28 Sharp Edges, Projections, and Moving Parts

28.1 An enclosure, an opening, a frame, a guard, a knob, a handle, or the like shall not be sufficiently sharp to cause a risk of injury to persons in normal use and routine user-maintenance of the appliance.

28.2 A moving part, such as a rotor of a motor, a pulley, a belt, and a gear, shall be enclosed or guarded to reduce the risk of unintentional contact therewith by persons.

29 Wringer Appliances

- 29.1 **29.1 deleted February 7, 1996**
- 29.2 **29.2 deleted February 7, 1996**
- 29.3 **29.3 deleted February 7, 1996**
- 29.4 **29.4 deleted February 7, 1996**
- 29.5 **29.5 deleted February 7, 1996**
- 29.6 **29.6 deleted February 7, 1996**
- 29.7 **29.7 deleted February 7, 1996**

29.8 *29.8 deleted February 7, 1996*

29.9 *29.9 deleted February 7, 1996*

29.10 *29.10 deleted February 7, 1996*

30 Centrifugal-Extraction Appliances

30.1 A centrifugal-extraction appliance or combination washer-dryer shall be provided:

- a) With a means to prevent opening of the clothes loading-and-unloading door during the spin portion of the cycle; or
- b) With an interlock that, when the clothes loading-and-unloading door is opened 2 inches (50 mm) or more during the spin portion of the cycle, will:
 - 1) Remove the driving force from the clothes basket, and
 - 2) Stop the movement of all accessible moving parts within 7 seconds with the appliance loaded as described in 31.3.

30.2 An appliance is considered to comply with the requirements in 30.1 if a deliberate action is required to defeat the lid-locking mechanism or basket-braking means. A deliberate action includes disconnecting the power-supply cord, manually advancing the timer to the end of the complete cycle, pulling the timer knob out, or manually rotating a rotary switch. In addition to defeating the lid-locking mechanism or basket-braking means, the deliberate action must also remove the driving force from the basket. Other than as noted in 30.3, pushing the timer knob in, actuating a toggle switch, or actuating any type of push-to-operate switch is not considered a deliberate action.

30.3 For a front-loading appliance with the controls in a console located at the rear of the top surface of the appliance, pushing the timer knob in, actuating a toggle switch, or actuating any type of push-to-operate switch is considered a deliberate action.

30.4 If an interlock provided on a top-loading appliance is not recessed or guarded to reduce the risk of inadvertent operation when the lid is opened, a secondary function control, manually operated from the outside of the appliance, shall be provided.

30.5 With reference to 30.1(b), the basket shall not rotate until the clothes loading-and-unloading door is closed to less than 2 inches (50 mm) of opening. A front-loading appliance shall not operate until a secondary function control, manually operated from outside the appliance, is actuated.

30.6 With reference to 30.1(b), a brake mechanism or other means that is employed to stop the rotation of the basket shall be subjected to a 6000-cycle endurance test consisting of starting and stopping the basket after it has reached its maximum speed or rotation. The test shall be conducted at the rate of three times an hour; however, with the concurrence of those concerned, a faster rate may be employed. A mechanical load twice that of the maximum dry-weight load specified by the manufacturer shall be equally distributed around the periphery of the basket. The construction complies with the requirements if, after 6000 cycles of operation, the stopping time is not more than 10 seconds.

30.7 In a front-loading appliance, a means shall be provided to prevent the flow of water into the tub under normal conditions unless the door is closed.

30.8 In a front-loading appliance, if the normal at-rest level of water with a clothes load as prescribed in 31.3 extends above the lower rim of the door opening, a means shall be provided for latching the door in the closed position until the water has been drained to the lower rim of the door opening.

30.9 A solenoid or similar component that is employed to hold the door latched in the closed position shall be subjected to a 6000-cycle endurance test consisting of energizing and de-energizing the component. There shall be no malfunction of the locking means or component as a result of this test.

30.10 If opening and closing the door affects mechanical operation of the component, the test is to be conducted in the normal manner. The test is to be conducted at the rate of six times per minute unless a slower rate is dictated by design factors inherent in the appliance.

PERFORMANCE

31 General

31.1 The fabric used for tests is to be bleached, preshrunk cotton suiting, warp 55 threads per inch (25.4 mm) and filling 48 threads per inch (25.4 mm). Individual cloths are to be 24 inches (610 mm) by 36 inches (915 mm), double hemmed to a size of 22 inches (560 mm) by 34 inches (865 mm). A small number of smaller cloths – 12 inches (305 mm) by 12 inches (305 mm), double hemmed to a size of 10 inches (255 mm) by 10 inches (255 mm) – may be used if necessary to make the total weight of cloth correct.

31.2 Unless otherwise noted in the individual requirements, all tests are to be conducted with the appliance connected to a supply circuit of rated frequency, and having a potential of:

- a) For an appliance rated from 110 volts to 120 volts, inclusive, 120 volts;
- b) For an appliance rated from 220 volts to 240 volts, inclusive, 240 volts; and
- c) For an appliance other than as mentioned in (a) or (b), the maximum rated voltage of the appliance.

Table 37.1
Maximum acceptable temperature rises

Materials and components	Degrees	
	C	F
1. Varnished-cloth insulation	60	108
2. Fuses		
a. Class G, J, L, T, and CC		
Tube	100	180
Ferrule or Blade	85	153
b. Others ^g	65	117
3. Fiber employed as electrical insulation	65	117
4. Wood or other combustible material, including the inside surfaces of the test enclosure and the surface supporting the appliance	65	117
5. Class 105 insulation systems on coil windings of an a-c motor having a frame diameter of more than 7 inches (178 mm), of a d-c motor, and of a universal motor ^{a,b,c} :		
a. In an open motor:		
Thermocouple method	65	117
Resistance method	75	135
b. In a totally enclosed motor:		
Thermocouple method	70	126
Resistance method	80	144
6. Phenolic composition employed as electrical insulation or as a part the deterioration of which could result in a risk of fire or electric shock ^d	125	225
7. Insulated wire and cord ^d	35	63
8. At any point within a terminal box or wiring compartment of a permanently connected appliance	35	63
9. Capacitor:		
Electrolytic ^e	40	72
Other types ^f	65	117
10. Class 105 insulation systems on coil windings of an a-c motor having a frame diameter of 7 inches or less, not including a universal motor ^{a,b,c}		
a. In an open motor –		
Thermocouple or resistance method	75	135
b. In a totally enclosed motor –		
Thermocouple or resistance method	80	144

(Continued)

Table 37.1 (Cont'd)
Maximum acceptable temperature rises

Materials and components	Degrees	
	C	F
11. Class 130 insulation systems, other than as specified in items 12 and 13 ^a :		
Thermocouple method	85	153
12. Class 130 insulation systems on coil windings of an a-c motor having a frame diameter of more than 7 inches, of a d-c motor and of a universal motor ^{a,b,c} :		
a. In an open motor:		
Thermocouple method	85	153
Resistance method	95	171
b. In a totally enclosed motor:		
Thermocouple method	90	162
Resistance method	100	180
13. Class 130 insulation systems on coil windings of an a-c motor having a frame diameter of 7 inches or less not including a universal motor ^{a,b,c} :		
a. In an open motor and on vibrator coils:		
Thermocouple or resistance method	95	171
b. In a totally enclosed motor:		
Thermocouple or resistance method	100	180
14. Class 155 insulation systems on coil windings of an a-c motor having a frame diameter of 7 inches or less, not including a universal motor ^c :		
In an open motor:		
Thermocouple or resistance method	120	216
^a At a point on the surface of a coil where the temperature is affected by an external source of heat, the temperature rise, as determined by means of a thermocouple, may be more than the maximum acceptable temperature rise specified in this table provided the temperature rise as determined by the resistance method is not more than that specified. The temperature rise as determined by means of a thermocouple may be more than the specified value by:		
Item	Additional Temperature Rise	
Subitem a, item 5	15°C (27°F)	
Subitem a, item 10	5°C (9°F)	
Subitem a, item 12	20°C (36°F)	
Subitem a, item 13	10°C (18°F)	

(Continued)

Table 37.1 (Cont'd)

- ^b For an automatic appliance, the maximum acceptable temperature rises may be more than the values specified in this table for short intervals during the cycle provided an analysis indicates that the insulation systems will not be adversely affected by the higher temperature. See 37.8 and 37.9.
- ^c This is the diameter measured in the plane of the laminations of the circle circumscribing the stator frame, excluding lugs, fins, boxes, etc., used solely for motor mounting, cooling, assembly, or connection.
- ^d Phenolic composition and other insulation that has been investigated and found acceptable for use at higher temperatures may be used at those temperatures.
- ^e For an electrolytic capacitor that is physically integral with or attached to a motor, the maximum acceptable temperature rise on insulating material integral with the capacitor enclosure may be not more than 65°C (117°F).
- ^f A capacitor that operates at a temperature rise of more than 65°C (117°F) may be judged on the basis of its marked temperature limit.
- ^g These limitations do not apply to compounds and components that have been investigated and found to be acceptable for use at higher temperatures.

Table 37.1 revised February 7, 1996

37.8 For a motor employing a Class 105 or Class 130 insulation system, the conditions under which the analysis mentioned in Note b of Table 37.1 may be undertaken are:

- a) The appliance or combination washer-dryer normally follows a predetermined duty cycle automatically scheduled by the appliance control; it is not intended that the user govern the behavior of the appliance, other than to de-energize it, after the normal cycle of operation has been initiated.
- b) No temperature rise is more than 115°C (207°F) for a Class 105 insulation system or 140°C (284°F) for a Class 130 insulation system regardless of the duration of such temperature.
- c) The properties of the insulation used are known over a wide range of temperatures.

37.8 revised February 7, 1996

37.9 With reference to Note b of Table 37.1, for a motor employing a Class 105 or Class 130 insulation system, the analysis to determine whether insulation systems will be adversely affected by higher temperatures is to be conducted as follows:

- a) The values of motor winding temperatures obtained during one complete cycle of operation are to be plotted using the temperatures as ordinates and the times as abscissas, and the curve is to be drawn.

- b) The axis of abscissas is to be divided into intervals by erecting ordinates at equally spaced points. The number of such points is to be adequate to represent clearly all significant variations represented by the curve.
- c) From the curve, the maximum value of temperature for each interval is to be determined; and from each maximum-temperature value, the maximum-temperature rise for each interval is to be determined by subtracting the ambient temperature.
- d) For each maximum-temperature rise, the value of expected percent of normal life is to be determined from Figure 37.1.
- e) Each value of expected percent of normal life is to be divided by 100, and the reciprocal of this quotient is to be taken.
- f) The sum of the reciprocals is to be divided by the number of intervals obtained in (b). If the result is less than unity, the insulation systems can be expected to have a life greater than normal, and are not considered to be adversely affected by the higher temperature. If the result is more than unity, the insulation systems are considered to be adversely affected by the higher temperature.

37.9 revised February 7, 1996

Figure 37.1
Expected life of insulation vs. temperature rise

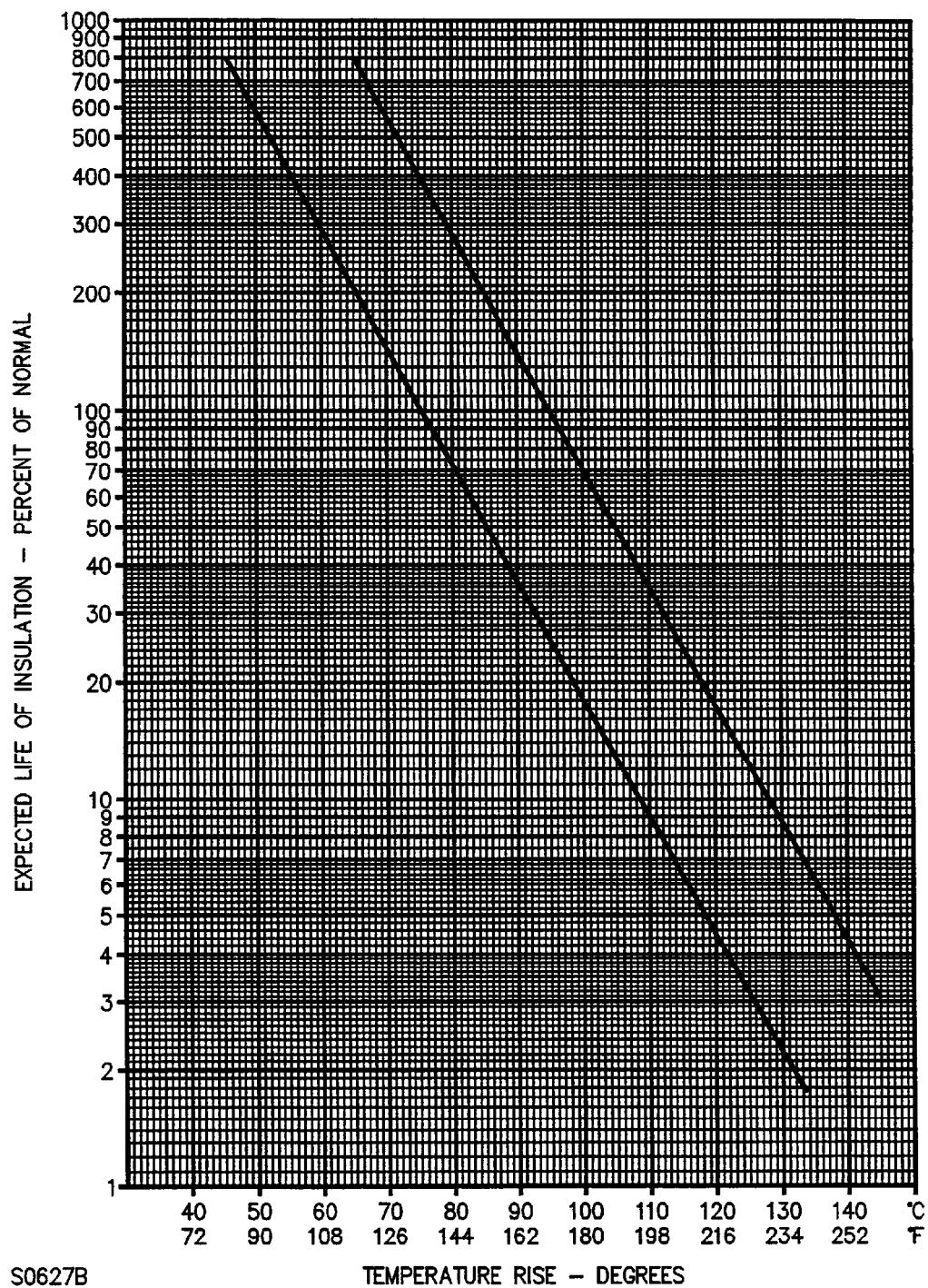


Figure 37.1 revised February 7, 1996

37.10 Thermocouples are to consist of wires not larger than 24 AWG (0.21 mm²). However, when thermocouples are used in the determination of temperatures in connection with the heating of electrical devices, it is common practice to employ thermocouples consisting of No. 30 AWG (0.05 mm²) iron and constantan wires and a potentiometer-type indicating instrument; and such equipment is to be used whenever referee temperature measurements by thermocouples are necessary.

37.11 A wall-insert or recessed appliance is to be mounted in an enclosure constructed of nominal 3/8-inch-thick plywood painted black; and is to consist of a bottom, a back, two sides, and a top. However, the top is to be omitted for the test on a recessed appliance if its construction is such that a counter top could not be used. Each of these areas is to be brought into an intimate contact with the corresponding surface of the appliance as the configuration of the appliance will permit. Temperatures are to be measured at points on each of these enclosing surfaces.

37.12 An appliance intended to be operated in cycles is to be operated for successive operations of the machine through the complete cycle dictated by the control. A 4-minute interval is to be allowed between successive cycles to permit rearrangement of the clothes load. Hot water is to be supplied to the appliance at a temperature of 82°C (180°F), and both hot and cold water are to be supplied to the appliance at a pressure of 40 – 60 pounds per square inch (276 – 414 kilopascals). If the appliance is intended to be drained to an opening above floor level, the outlet of the hose from the drain pump is to be 36 inches (914 mm) above the floor on which the appliance rests. With the concurrence of those concerned, laundry detergent in accordance with the operating instructions may be added to the appliance at the beginning of each cycle.

37.12 revised February 7, 1996

37.13 An appliance intended to be operated continuously, including during automatic loading of clothes, is to be operated continuously at a duty cycle representative of normal use.

37.13 added February 7, 1996

38 Switches

38.1 A switch or other device that controls a motor and that has not been investigated for the purpose for which it is used shall be tested as described in 38.2. As a result of the test, there shall be no electrical or mechanical malfunction or breakdown of the switch or other device, nor welding or undue pitting or burning of the contacts. The fuse in the grounding connection shall not open.

38.2 In a test to determine whether a switch or other control device complies with the requirement in 38.1, the appliance is to be connected to a grounded supply circuit as specified in 31.2. The rotor of the motor is to be locked. During the test, exposed dead metal parts of the appliance are to be connected to ground through a 3-ampere plug fuse, and the connection is to be such that any single-pole, current-rupturing device is in an ungrounded conductor of the supply circuit. If the appliance is intended for use on direct current, 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 switch or other device is to be operated for 50 cycles at a rate of not more than 10 cycles per minute; however, with the concurrence of those concerned, a faster rate of operation may be employed.

38.3 A switch or other device that controls a solenoid, relay coil, or the like and that has not been investigated for the purpose for which it is used shall be tested as described in 38.4. As a result of the test, there shall be no electrical or mechanical malfunction or breakdown of the switch or other device nor welding or undue pitting or burning of the contacts. The fuse in the grounding connection shall not open.

38.4 In a test to determine whether a switch or other control device complies with the requirement in 38.3, the appliance is to be connected to a supply circuit of rated frequency and 110 percent of maximum rated voltage. The load on the device under test is to be the same as that which it is intended to control in normal service. The device is to be operated for 50 cycles at a rate of not more than 10 cycles per minute; however, with the concurrence of those concerned, a faster rate of operation may be employed.

41.2 To determine whether an appliance complies with the requirements in 41.1, the appliance is to be leveled prior to the test and is to be operated through one complete cycle of normal operation. This is to be followed by an additional cycle, with the selector switches set to give the maximum flow of water at the maximum temperature. A high-sudsing detergent is to be gradually added during the fill portion of the cycle or during the first 3 minutes of agitation in whatever amount is required to cause oversudsing. Oversudsing is considered to occur when the suds overflow the stationary tub, if possible, or come up and out of the loading opening or any other opening. After conditioning, the appliance is to be tested for compliance with the requirements in 41.1.

41.3 A rubber barrier or rim seal of a washer tub is not to be removed prior to the test.

42 Overflow of Auxiliary Reservoirs

42.1 Liquid overflowing from an auxiliary reservoir — such as a reservoir for bleach, a rinse additive, or a cleaning agent — shall not wet uninsulated live parts or enameled wire, and shall not wet electrical insulation that may be adversely affected by the liquid normally used in the reservoir.

42.2 To determine whether an appliance complies with the requirement in 42.1, water is to be poured into the reservoir through an orifice 3/8 inch (9.5 mm) in diameter. The reservoir is to be filled to the level recommended by the manufacturer, if such level is plainly marked; otherwise, the reservoir is to be filled to maximum capacity. Additional water, equal to 50 percent of the volume just mentioned but not more than 1 pint (0.47 liter), is then to be poured into the reservoir. Ordinarily, determination of whether uninsulated live parts have become wet as a result of the overflow is to be by means of visual inspection but this may be supplemented by an insulation-resistance test, a dielectric voltage-withstand test, or both if necessary.

42.3 Unless all live parts are located or protected so that they will not be subject to dripping if the reservoir fails, an auxiliary reservoir shall:

- a) Be adequately resistant to corrosion from the liquid intended for use in it, and
- b) Not develop cracks as a result of aging.

43 Strain Relief

43.1 When tested as described in 43.2, a strain-relief device shall withstand for 1 minute, without displacement, a direct pull of 35 pounds (156 N) applied to the cord, with the connections within the appliance disconnected.

43.2 A 35-pound (16 kilogram) weight is to be suspended on the cord and supported by the appliance so that the strain-relief device will be stressed from any angle that the construction of the appliance permits. The strain relief is not acceptable if there is movement of the cord, at the point of disconnection of the conductors, to indicate that stress would have resulted on the connections.

44 Permanence of Marking

44.1 A pressure-sensitive label or a label secured by cement or adhesive shall comply with the applicable requirements for indoor use labels exposed to high humidity and occasionally to water specified in the Standard for Marking and Labeling Systems, UL 969.

44.1.1 revised and relocated as 44.1 February 7, 1996

44.1.1 **Revised and relocated as 44.1 February 7, 1996**

44.2 If the labels are exposed in service to solutions, such as fabric softeners, bleach additives, detergents, or the like, three samples of the label applied to test surfaces as intended are to be conditioned for 24 hours in a controlled atmosphere maintained at $23 \pm 2^{\circ}\text{C}$ ($73 \pm 4^{\circ}\text{F}$) and a relative humidity of 50 ± 5 percent. The samples are then to be immersed for 48 hours in a solution representative of service and maintained at the temperature the solution would attain in service, but not less than $23 \pm 2^{\circ}\text{C}$ ($73 \pm 4^{\circ}\text{F}$). Following the immersion, the labels are to be investigated in the same manner as labels subjected to the water immersion test described in UL 969.

44.5.1 revised and relocated as 44.2 February 7, 1996

44.2.1 **Deleted February 7, 1996**

Table 44.1
Temperature, oven aging

Table 44.1 deleted February 7, 1996

44.3 **Deleted February 7, 1996**

44.3.1 **Deleted February 7, 1996**

44.4 **Deleted February 7, 1996**

44.4.1 **Deleted February 7, 1996**

44.5 **Deleted February 7, 1996**

44.5.1 **Revised and relocated as 44.2 February 7, 1996**