

DOCUMENT NUMBER: UL 621

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Subjects 2182 (207, 250, 303, 399, 412,
 416, 427, 465, 471, 474, 484, 541, 559, 563,
621, 984, 1963, 1995, 2170, 2171, 2172, 2205)

333 Pfingsten Road
 Northbrook, IL 60062
 January 9, 1997

TO:

Casualty Council of Underwriters Laboratories Inc.,
 Consumer Advisory Council of Underwriters Laboratories Inc.,
 Electrical Council of Underwriters Laboratories Inc.,
 Fire Council of Underwriters Laboratories Inc.,
 Subscribers to UL's Standards Service for
 Refrigerant Containing Components and Accessories, Nonelectrical, UL 207,
 Household Refrigerators and Freezers, UL 250,
 Refrigeration and Air-Conditioning Condensing, and Compressor Units, UL 303,
 Drinking Water Coolers, UL 399
 Refrigeration Unit Coolers, UL 412,
 Refrigerated Medical Equipment, UL 416,
 Refrigerating Units, UL 427,
 Central Cooling Air Conditioners, UL 465,
 Commercial Refrigerators and Freezers, UL 471,
 Dehumidifiers, UL 474,
 Room Air Conditioners, UL 484,
 Refrigerated Vending Machines, UL 541,
 Heat Pumps, UL 559
 Ice Makers, UL 563,
 Ice Cream Makers, UL 621,
 Hermetic Refrigerant Motor Compressors, UL 984
 Refrigerant Recovery/Recycling Equipment, UL 1963,
 Heating and Cooling Equipment, UL 1995,
 Field Conversion/Retrofit of Products to Change to an Alternative
 Refrigerant – Construction and Operation, UL 2170,
 Field Conversion/Retrofit of Products to Change to an Alternative
 Refrigerant – Insulating Material and Refrigerant Compatibility, UL 2171,
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 Refrigerant – Procedures and Methods, UL 2172
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 Field Conversion/Retrofit of Alternative Refrigerants in Household Refrigerators and Freezers,
 UL 2205

SUBJECT: Use of Classified Refrigerants

SUMMARY OF TOPICS

This bulletin proposes the following changes in requirements:

All of the UL refrigerant containing end-use standards would be revised to require the use of refrigerants that comply with the Standard for Refrigerants, UL 2182.

COMMENTS DUE: February 20, 1997

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Subjects 2182 (207, 250, 303, 399, 412,
416, 427, 465, 471, 474, 484, 541, 559, 563,
621, 998, 1963, 1995, 2170, 2171, 2172, 2205)

-2-

January 9, 1997

UL announces that as of July 1, 1996, refrigerants are now covered as Classified products in accordance with the Standard for Refrigerants, UL 2182. A tabulation of manufacturer's of Classified refrigerants are contained in the 1996 edition of UL's Electrical Appliance and Utilization Equipment Directory under the Category Control Number of SLGV.

Previous to July 1996 refrigerants were covered as Recognized components and a Recognition Report was developed for each Recognized refrigerant. This report contained information regarding the ignition temperature of the refrigerant. However, the new Classification Marking information does not contain the ignition temperature of the refrigerant.

UL uses this ignition temperature rating when evaluating the results of a refrigerant leak. The test requires the surface temperature to be below the ignition temperature of the refrigerant. Therefore, as part of the end-use investigations of refrigeration and air conditioning equipment, it will still be necessary to review the ignition temperature data. This data will be used to determine the results should a leak develop in proximity to a heat producing component. The Auto Ignition Test will continue to be conducted and the results will be contained in the Classification Report.

UL is proposing to revise its end-use standards covering refrigerant containing equipment to require the use of refrigerants investigated in accordance with UL 2182. These proposed revisions are included in Appendix A. In addition, all UL engineering reports for end-use refrigeration and air conditioning equipment will also be revised to reflect the use of Classified refrigerants.

The UL engineering reports will include the refrigerant manufacturer's name and the trade name of the refrigerant(s) used in testing the product. This information is needed since the trade name may differ from the ANSI/ASHRAE 34 designation and the refrigerant may not even have an ANSI/ASHRAE designation.

It is important for the end-use refrigeration and air conditioning equipment manufacturer's to:

- a) Check the specific refrigerant manufacturer's name when identifying Classified refrigerants, and
- b) Make sure the refrigerants are from a manufacturer and a location who has a UL Classification as indicated in the 1996 edition of the Electrical Appliance and Utilization Equipment Directory.

Please note that proposed requirements are of a tentative and early nature and are for review and comment only. Current requirements are to be used to judge a product until these requirements are published in final form.

PROPOSED EFFECTIVE DATE

These proposed requirements will not necessitate a review or additional testing of currently Listed or Recognized products. Therefore, UL proposes that these requirements become effective upon publication.

REQUEST FOR COMMENTS ON PROPOSALS

Please provide the following:

1. Your comments concerning the proposed requirements; and
2. Your comments concerning the proposed effective date, should the proposals be adopted.

Subjects 2182 (207, 250, 303, 399, 412,
416, 427, 465, 471, 474, 484, 541, 559, 563,
621, 998, 1963, 1995, 2170, 2171, 2172, 2205)

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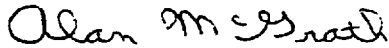
January 9, 1997

Written comments should be sent to the attention of Alan McGrath at UL's Northbrook office, 333 Pfingsten Road, Northbrook, IL 60062-2096. Please reference all correspondence to Subject 2182.

All comments should be sent by February 20, 1997.

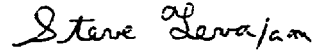
Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.

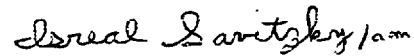


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PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX A

PROPOSED REQUIREMENTS AND PROPOSED EFFECTIVE DATES FOR

UL 207, UL 250, UL 303, UL 399, UL 412, UL 416, UL 427, UL 465, UL 471, UL 474, UL 484, UL 541, UL 559, UL 563, UL 621, UL 984, UL 1963, UL 1995, UL 2170, UL 2171, UL 2172, and UL 2205

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~. Proposed new requirements are identified by (NEW). In the case of extensively revised paragraphs, the original text is identified by (CURRENT) and is ~~lined-out~~, followed by the proposed text identified by (PROPOSED).

RATIONALE

UL is proposing to revise the following refrigerant containing end-use standards to require the use of refrigerants investigated in accordance with UL 2182. In addition, the reference to the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15 is proposed to be deleted from the text of these standards since reference is already made to ASHRAE 15 in the Scope of these standards.

IMPACT

If the following proposals are adopted, they would not require a review, retest, or modifications to presently Listed equipment for the proposals are a clarification of present practice at UL.

PROPOSALS**1. UL 207**

(NEW)

2.5 Refrigerants

2.5.1 The kind of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182.

2.5.1 added (date of publication)

2. UL 250

Since the Standard for Refrigerators, UL 250/CSA No. 63 is a binational standard, this revision will be proposed concurrently with CSA at a later date.

3. UL 303

The Standard for Refrigeration and Air-Conditioning Condensing, and Compressor Units, UL 303, is being replaced by UL 1995 in January 1998. Therefore, please see item 18.

4. UL 399

(CURRENT)

REFRIGERATION SYSTEM**22 Refrigerant**

~~22.1 The refrigerant employed shall possess sufficient chemical stability to prevent disassociation or other changes which are likely to lead to the formation of hazardous substances, see 22.2, when subjected to the maximum range of temperatures and pressures encountered in the refrigerating cycle.~~

~~22.2 The refrigerants used in a water cooler employing the direct method of refrigeration shall be practically nonflammable and shall be of a degree of toxicity that will not produce death or serious injury to guinea pigs during a 2-hour exposure to the refrigerant at a concentration of 2 1/2 percent by volume in air. Refrigerants 12, 22, 500, and 502 are commonly used refrigerants which comply with this requirement.~~

(PROPOSED)

22.1 The kind of refrigerant intended for use with the unit cooler shall comply with the Standard for Refrigerants, UL 2182.

22.1 revised (date of publication)

22.2 *Clause 22.2 deleted (date of publication)*

5. UL 412

REFRIGERATION SYSTEM

23 Refrigerant

23.1 The kind of refrigerant intended for use with the unit cooler shall comply with the Standard for Refrigerants, UL 2182. ~~conform with the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1978.~~

23.1 revised (date of publication)

6. UL 416

REFRIGERATION SYSTEM

26 Refrigerant

26.1 The kind ~~and quantity~~ of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182. ~~Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1989.~~

26.1 revised (date of publication)

7. UL 427

REFRIGERATION SYSTEM

22 General

22.1 Refrigerant

22.1.1 The kind ~~and quantity~~ of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182. ~~Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1992.~~

22.1 revised (date of publication)

8. UL 465

The Standard for Central Cooling Air Conditioners, UL 465, is being replaced by UL 1995 in January 1998. Therefore, please see item 18.

9. UL 471**REFRIGERATION SYSTEM****29 Refrigerants**

29.1 The kind and quantity of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182. Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994.

29.1 revised (date of publication)

10. UL 474**REFRIGERATION SYSTEM****18 Refrigerants**

18.1 The kind and quantity of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182. Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994.

18.1 revised (date of publication)

11. UL 484**REFRIGERATION SYSTEM****26 Refrigerant**

26.1 The kind and quantity of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182. Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994.

26.1 revised (date of publication)

12. UL 541**REFRIGERATION SYSTEM****29 Refrigerant**

29.1 The kind and quantity of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182. Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994.

29.1 revised (date of publication)

13. UL 559

The Standard for Heat Pumps, UL 559, is being replaced by UL 1995 in January 1998. Therefore, please see item 18.

14. UL 563**REFRIGERATION SYSTEM****24 Refrigerant**

24.1 The kind and quantity of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182. Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994.

24.1 revised (date of publication)

15. UL 621**REFRIGERATION SYSTEM****28 Refrigerant**

28.1 The kind and quantity of refrigerant employed in the system shall comply with the Standard for Refrigerants, UL 2182, Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994.

28.1 revised (date of publication)

16. UL 984

Since the Standard for Hermetic Refrigerant Motor Compressors, UL 984/CSA No. 140.2 is a binational standard, this revision will be proposed concurrently with CSA at a later date.

17. UL 1963**REFRIGERANT SYSTEM****25 Refrigerants**

25.1 The equipment shall operate with refrigerant that complies with the Standard for Refrigerants, UL 2182, Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1989.

25.1 revised (date of publication)

18. UL 1995

Since the Standard for Heating and Cooling Equipment, UL 1995/CSA No. 236 is a binational standard, this revision will be proposed concurrently with CSA at a later date.

19. UL 2170**5.2 Refrigerants**

5.2.1 The kind and quantity of refrigerant used in the system shall comply with the Standard for Refrigerants, UL 2182, Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1992.

5.2.1 revised (date of publication)

5.2.2 ~~The alternative refrigerants shall be nonflammable or practically nonflammable as determined by the ASTM E681-85 test method and the auto ignition temperature test method as adjusted to the methods outlined in ASHRAE 34-1992, Designation and Safety Classification of Refrigerants, at room ambient and at 100°C.~~

5.2.2 deleted (date of publication)

(Note: Clause 5.2.3 is shown for reference only. No changes are being proposed to it at this time.)

5.2.3 When a blended refrigerant with a flammable constituent is to be used as an alternative, fractionation that may occur as the result of a system leak shall be considered. This shall include consideration of both the fractionation of the blend remaining in the system and the composition of the blend leaking into the equipment or the equipment space that may involve a risk of fire or injury to persons.

20. UL 2171

Since UL 2170, 2171, and 2172 are a series of standards which are used together, the revision is covered by the revision in UL 2170.

21. UL 2172

Since UL 2170, 2171, and 2172 are a series of standards which are used together, the revision is covered by the revision in UL 2170.

22. UL 2205

Since the following clause is already contained in the proposed first edition of UL 2205, no revision will be proposed:

4.6 The alternative refrigerant shall comply with the Standard for Refrigerants, UL 2182.



Underwriters Laboratories Inc.®

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May 6, 1996

Revision pages for

Standard for

Ice Cream Makers

UL 621, Fifth Edition

Attached to this transmittal notice is a revision of the Fifth edition of UL 621.

A CHANGE ON A PAGE DATED MAY 6, 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 August 16, 1995. The bulletin is now obsolete and may be discarded.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 621-1995.

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 621.

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:

Page	Date
1	March 25, 1993 (Reprinted: May 6, 1996)
2, 3	May 6, 1996
4	March 25, 1993
5	October 4, 1995
6 – 10	March 25, 1993
11	March 26, 1993
12 – 26	March 25, 1993
27	October 4, 1995
28	March 26, 1993
29	March 25, 1993
30, 30A, 31, 31, 32A	March 26, 1993
33	March 25, 1993
34	March 26, 1993
34A	October 4, 1995

(Continued)

May 6, 1996 – UL 621

Page	Date
35 – 36	March 25, 1993
36A, 37	October 4, 1995
38 – 46	March 25, 1993
47, 48, 48A, 49	May 6, 1996
50	March 26, 1993
51	March 25, 1993
52	March 26, 1993
53 – 62	March 25, 1993
63, 64, 64A	May 6, 1996
65 – 75	March 25, 1993
76 – 78, 78A, 78B	May 6, 1996
79 – 86	March 25, 1993
A1	March 25, 1993

MARCH 25, 1993
(Title Page Reprinted: May 6, 1996)



1

UL 621

Standard for

Ice Cream Makers

First Edition – January, 1961
Second Edition – April, 1973
Third Edition – April, 1977
Fourth Edition – April, 1986

The First and Second editions were titled Ice Cream Freezers and Soda Fountain Units.

Fifth Edition

March 25, 1993

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated March 25, 1993. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

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

Approved as ANSI/UL 621-1978, August 11, 1978
Approved as ANSI/UL 621-1985, October 15, 1985
Approved as ANSI/UL 621-1992, March 20, 1992

The Department of Defense (DoD) has adopted UL 621 on February 25, 1992. 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.

25.4.2 A control circuit overcurrent protective device(s) shall:

- a) Be provided for all ungrounded conductors,
- b) Be sized in accordance with requirements in 25.3.2, and
- c) Have a voltage rating not less than the circuit in which it is used.

The device(s) shall be:

- a) A circuit breaker acceptable for branch circuit protection, or
- b) A fuse acceptable for branch circuit protection, such as a Class CC, G, H, J, K, L, R, or T cartridge fuse or Type S plug fuse. See 60.19.

Exception: If the control-circuit is tapped from a circuit supplying other loads in the ice cream maker, a device used for overcurrent protection may be of the supplementary type provided it has a short-circuit rating acceptable for the circuit in which it is used. See Table 51.1. If the supplementary type device used is a fuse, the ice cream maker shall be marked in accordance with the exception to 60.19.

SPACINGS

26 High-Voltage Circuits

26.1 The following electrical spacing requirements apply to high-voltage circuits, as defined in 3.3(a).

26.1 revised May 6, 1996

26.2 Unless specifically noted otherwise, the spacings between uninsulated live parts of opposite polarity and between an uninsulated live part and a dead metal part shall be not less than the values indicated in Table 26.1.

26.2 revised May 6, 1996

26.3 The "Through Air" and "Over Surface" spacings specified in Tables 26.1 and 26.2 at an individual component part are to be based on the total volt-ampere consumption of the load or loads that the component controls. For example, the spacings at a component that controls only the compressor motor are based on the volt-amperes of the compressor motor. Spacings at a component that controls loads in addition to the compressor motor are to be based on the sum of the volt-amperes of the loads so controlled. Spacings at a component that independently controls separate loads are to be based on the volt-amperes of the largest load. The volt-ampere values for the loads referred to above are to be determined by the marked rating of the loads. For loads that are not required to have a marked rating, the measured input is to be used in determining the volt-ampere values.

26.3 revised May 6, 1996

26.3.1 The spacings indicated in Table 26.2 are applicable only to electrical components mounted in totally enclosed nonrefrigerated and/or nonair handling compartments which are free of moisture, including that caused by condensation. At wiring terminals and for circuits over 250 volts or over 2000 volt-amperes, spacings in Table 26.1 apply.

26.3.1 added May 6, 1996

Table 26.1
Minimum spacings

Ratings		Inches (mm)					
Volt-amperes	Volts	Through air ^c		Over surface ^c		To enclosure ^b	
2000 or less	300 or less	1/8 ^a	(3.2)	1/4	(6.4)	1/4	(6.4)
2000 or less	301-600	3/8	(9.5)	1/2	(12.7)	1/2	(12.7)
More than 2000	150 or less	1/8 ^a	(3.2)	1/4	(6.4)	1/2	(12.7)
	151-300	1/4	(6.4)	3/8	(9.5)	1/2	(12.7)
	301-600	3/8	(9.5)	1/2	(12.7)	1/2	(12.7)

^a The spacings between wiring terminals of opposite polarity, or between a wiring terminal and ground shall be not less than 1/4 inch (6.4 mm), except that if short-circuiting or grounding of such terminals will not result from projecting strands of wire, spacing need not be greater than that given in the above table. Wiring terminals are those connected in the field and not factory wired.

^b Includes fittings for conduit or metal-clad cable.

^c At points other than field-wiring terminals, the spacings for heater elements only may be as indicated below provided the elements are not subject to moisture, such as may result from condensation on cooled surfaces:

1/16 inch (1.6 mm) through air and over surface for heaters rated 0 – 300 volts
1/4 inch (6.4 mm) through air and over surface for heaters rated 301 – 600 volts

Table 26.1 revised May 6, 1996

Table 26.2
Spacings in non-refrigerated and/or non-air handling compartments

Ratings		Minimum spacing in Inches (mm)					
Volt-amperes	Volts	Through air		Over surface		To enclosure ^a	
0 – 2000	0 – 125	1/16	(1.6 mm)	1/16	(1.6 mm)	1/4	(6.4 mm)
	125 – 250	3/32	(2.4 mm)	3/32	(2.4 mm)	1/4	(6.4 mm)

Note – See paragraph 26.3.1.

^a Includes fittings for conduit or metal-clad cable.

Table 26.2 added May 6, 1996

26.4 All uninsulated live parts connected to different circuits shall be spaced from one another as though they were parts of opposite polarity in accordance with the requirements indicated in ~~26.2~~ above and shall be based on the highest voltage involved.

26.4 revised May 6, 1996

26.5 With reference to 26.2 and 26.3, the "To Enclosure" spacings given in Table 26.1 are not to be applied to an individual enclosure of a component part within an outer enclosure or cabinet.

26.5 revised May 6, 1996

26.6 The above spacing requirements are not to apply to the inherent spacings of a component part of the ice cream maker, such as a hermetic motor-compressor, motor, snap switch, controller, attachment-plug cap, and the like, for which spacing requirements are given in a standard for the component. However, the electrical clearance resulting from the assembly of the components into the complete product, including clearance to dead metal or enclosures, shall be those indicated.

26.6 revised May 6, 1996

26.7 If higher than rated potential is developed in a motor circuit through the use of capacitors, the rated voltage of the system shall be employed in applying the spacings indicated in this section.

Exception: If the developed steady-state potential as determined in the Temperature and Pressure Test, Section 39, exceeds 500 volts, the developed potential is to be used in determining the spacings for the parts affected.

26.8 An insulating lining or barrier of fiber or similar material, employed where spacings would otherwise be less than the required values, shall be no less than 0.028 inch (0.7 mm) thick and shall be so located or of such material that it will not be deteriorated by arcing.

Exception No. 1: Fiber not less than 0.013 inch (0.3 mm) thick may be used in conjunction with an air spacing of no less than 50 percent of the spacing required for air alone.

Exception No. 2: Thinner material may be used if it has equivalent insulating, mechanical, and flame-resistance properties when compared with materials in thicknesses specified above.

26.8 revised May 6, 1996

26.9 The spacing between uninsulated live terminals of the components in an electric-discharge lamp circuit and a dead metal part or enclosure shall not be less than 1/2 inch (21.7 mm) if the potential is 600 volts or less and not less than 3/4 inch (19.1 mm) if the potential is 601 – 1000 volts.

26.9 added May 6, 1996

27 Low-Voltage Circuits

27.1 The following electrical spacing requirements apply to low-voltage circuits, as defined in 3.3(b).

27.1 revised May 6, 1996

27.2 A circuit derived from a source of supply classified as a high-voltage circuit, having resistance connected in series with the supply circuit as a means of limiting the voltage and current, is not considered to be a low-voltage circuit.

27.3 The spacings for low-voltage electrical components that are installed in a circuit that includes a pressure-limiting device, motor overload protective device, or other protective device, where a short or grounded circuit may result in a risk of fire, electric shock, or injury to persons shall comply with (a) - (c):

- a) The spacing between an uninsulated live part and the wall of a metal enclosure, including fittings for the connection of conduit or metal-clad cable, shall be not less than 1/8 inch (3.2 mm). See 26.5

b) The spacing between wiring terminals regardless of polarity and between the wiring terminal and a dead metal part, including the enclosure and fittings for the connection of conduit, that may be grounded when the device is installed, shall be not less than 1/4 inch (6.4 mm).

c) The spacing between uninsulated live parts regardless of polarity and between an uninsulated live part and a dead metal part, other than the enclosure, that may be grounded when the device is installed, shall be not less than 1/32 inch (0.8 mm) provided that the construction of the parts is such that spacings will be maintained.

27.3 revised May 6, 1996

27.4 The spacings in low-voltage circuits that do not contain devices such as indicated in 27.3 are not specified.

REFRIGERATION SYSTEM

28 Refrigerant

28.1 The kind and quantity of refrigerant employed in the system shall comply with the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1994.

28.1 revised May 6, 1996

29 Pumpdown Capacity

29.1 The section of an ice cream maker designed to receive the refrigerant charge during a pumpdown shall have the capacity to receive the charge without the liquid occupying more than 90 percent of the volume of the section when the temperature of the refrigerant is 90°F (32.2°C).

30 Refrigerant Tubing And Fittings

30.1 The wall thickness of copper or steel tubing used to connect refrigerant-containing components shall be not less than indicated in Table 30.1.

Exception: Capillary tubing that is protected against mechanical damage by the cabinet or assembly shall have a wall thickness not less than 0.020 inch (0.51 mm).

30.2 Tubing shall be constructed of corrosion-resistant material, such as copper, or shall be plated, dipped, coated, or equivalently treated to resist external corrosion. Aluminum may be used where the material is not subject to galvanic corrosion.

30.3 Tubing forming part of components, such as evaporators or condensers, where protection is afforded by inherent construction, shall be judged according to the requirements of the Strength Tests — Pressure Containing Components, Section 53.

30.3 revised March 26, 1993

30.4 Special alloys or constructions used in refrigerant-containing components, including tubing with a wall thickness less than indicated in 30.1, may be acceptable. Among the factors taken into consideration when judging the acceptability are its:

- a) Resistance to mechanical abuse,
- b) Strength against internal pressure,
- c) Resistance to corrosion,
- d) Protection against refrigerant contamination, and
- e) Conformity with requirements of safety codes, such as the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1978, as compared to tubing of the minimum wall thicknesses indicated in Table 30.1.

30.4 revised March 26, 1993

Table 30.1
Minimum wall thickness^a for copper and steel tubing

Outside diameter,		Copper				Steel	
		Protected within ice cream maker		Unprotected			
Inches	(mm)	Inches	(mm)	Inches	(mm)	Inches	(mm)
1/4	(6.4)	0.0245	(0.622)	0.0265	(0.673)	0.025	(0.64)
5/16	(7.9)	0.0245	(0.622)	0.0265	(0.673)	0.025	(0.64)
3/8	(9.5)	0.0245	(0.622)	0.0265	(0.673)	0.025	(0.64)
1/2	(12.7)	0.0245	(0.622)	0.0285	(0.724)	0.025	(0.64)
5/8	(15.9)	0.0315	(0.800)	0.0315	(0.800)	0.032	(0.81)
3/4	(19.1)	0.0315	(0.800)	0.0385	(0.978)	0.032	(0.81)
7/8	(22.2)	0.0410	(1.041)	0.0410	(1.041)	0.046	(1.17)
1	(25.4)	0.0460	(1.168)	0.0460	(1.168)	-	-
1-1/8	(28.6)	0.0460	(1.168)	0.0460	(1.168)	0.046	(1.17)
1-1/4	(31.8)	0.0505	(1.283)	0.0505	(1.283)	0.046	(1.17)
1-3/8	(34.9)	0.0505	(1.283)	0.0505	(1.283)	-	-
1-1/2	(38.1)	0.0555	(1.410)	0.0555	(1.410)	0.062	(1.57)
1-5/8	(41.3)	0.0555	(1.410)	0.0555	(1.410)	-	-
2-1/8	(54.0)	0.0640	(1.626)	0.0640	(1.626)	-	-
2-5/8	(66.7)	0.0740	(1.880)	0.0740	(1.880)	-	-

^a Nominal wall thickness of tubing will have to be greater than the thickness indicated to maintain the minimum wall thickness.

30.5 Tubing connections shall be made by means of flare-type fittings with steel or forged brass nuts, by soldering or brazing, or by equivalent means. Flare-type fittings shall comply with the Standard for Refrigeration Flare-Type Fittings, ANSI/SAE J513d-1973.

31 Refrigerant-Containing Parts

31.1 Parts of an ice cream maker subjected to refrigerant pressure shall withstand, without failure, the pressure indicated in the Strength Tests – Pressure Containing Components, Section 53.

39.4 The ice cream maker is to be fitted with pressure gauges on the high- and low-sides. Thermocouples are to be secured to electrical components, such as the compressor-motor enclosure, fan-motor windings, starting-relay coil, capacitors, and wiring insulation. The temperature of motor windings or of coils may be measured by the change-in-resistance method, but the primary method of temperature measurement is to be the thermocouple method. The electrical input is measured with a voltmeter and an ammeter. The temperature controller is to be adjusted to the lowest adjustable setting.

39.5 The ice cream maker is to be installed in accordance with the manufacturer's instructions and operated under the conditions specified in 39.7 – 39.10, as applicable. The test potential is to be as indicated in Table 35.1.

39.6 If the wiring to a general purpose receptacle does not comply with 11.1.10, a resistive load is to be connected to the receptacle circuit during the test and the temperature of the wiring insulation measured. The resistive load shall be as specified in 39.6(a) or (b):

- a) If a single receptacle is employed, the load shall be equal to 80 percent of the rating of the receptacle.
- b) If more than one receptacle is employed on the same circuit, the load shall be equal to 100 percent of the rating of the largest receptacle.

39.7 An ice cream maker employing an air-cooled condenser is to be placed within a room maintained at 40°C until the assembly reaches room temperature. The ice cream mix used in the test is to be maintained at the highest temperature recommended by the manufacturer. The unit is to be charged with the mix and placed in operation in accordance with the manufacturer's instructions. The product is to be withdrawn either continuously or in batches at the maximum rate recommended by the manufacturer. The unit is to be kept filled with mix by recharging as required during the test.

39.8 Electrical loads that may operate concurrently with the condensing unit are to be energized during the test. The assembly is to be operated until temperatures and pressures have stabilized. The potential is to be maintained as indicated in Table 35.1. The electrical input, the temperature of electrical components, and high- and low-side pressures are to be recorded at intervals during the test.

39.9 For the test of an ice cream maker of the water-cooled type, the condenser water flow is to be maintained at 80°F (26.7°C) inlet and 100°F (37.8°C) outlet temperatures. If 100°F outlet water cannot be attained due to design, the ice cream maker is to be tested at 80°F inlet water and 35 psig (241 kPa) nominal pressure.

39.10 Upon completion of the tests described in 39.7 – 39.9, the ice cream maker is to continue to operate with no product withdrawal until stabilized temperatures are obtained. The unit may cycle on the temperature controller.

39.11 The ice cream maker shall comply with the Dielectric Voltage-Withstand Test, Section 40, following the test.

40 Dielectric Voltage-Withstand Test

40.1 A complete ice cream maker and all electrical components shall withstand, without breakdown, a test potential of 1000 volts plus twice rated voltage applied for 1 minute, between high-voltage live parts and dead metal parts and between live parts of high- and low-voltage circuits. The test potential shall be at any frequency between 40 and 70 hertz.

Exception No. 1: The test potential for motors rated at not more than 1/2 horsepower (373 W output) shall be 1000 volts.

Exception No. 2: If the steady-state voltage developed in a motor circuit through the use of capacitor exceeds 500 V, as measured during the temperature and pressure test, the test potential for the parts affected shall be 1000 V plus twice the developed capacitor voltage.

40.1 revised May 6, 1996

40.2 *40.2 revised and combined with 40.1 May 6, 1996*

40.3 An ice cream maker employing a low-voltage circuit shall withstand, without breakdown, a test potential of 500 volts applied for 1 minute between low-voltage live parts and dead metal parts. The test potential shall be at any frequency between 40 and 70 hertz. If components specified in 27.3 are employed in the low-voltage circuit, the dielectric voltage withstand test shall also be conducted between live parts of opposite polarity.

40.3 revised May 6, 1996

40.4 With reference to 40.3, the test between low-voltage parts of opposite polarity is to be conducted on magnet coil windings of the transformer after breaking the inner coil lead where it enters the layer. This opposite polarity test may be waived on the complete assembly provided that the components have been separately subjected to this test.

40.4 revised May 6, 1996

40.5 A 500-volt-ampere or larger transformer, the output voltage of which is essentially sinusoidal and can be varied, is to be used to determine compliance with the previous paragraph. The applied potential is to be increased gradually from zero until the required test value is reached and is to be held at that value for 1 minute.

Exception: The requirement of a 500-volt-ampere or larger transformer can be waived if the high potential testing equipment maintains the specified high potential voltage at the equipment during the duration of the test.

40.5 revised May 6, 1996

40.6 If the charging current through a capacitor or capacitor-type filter connected across the line, or from line to earth ground, is large enough to make it impossible to maintain the required alternating-current test potential, the capacitors and capacitor-type filters may be tested as described in 40.7.

40.6 added May 6, 1996

40.7 The capacitors and capacitor-type filters mentioned in 40.6 are to be subjected to a direct-current test potential of 1414 volts for equipment rated 250 volts or less or 1414 volts plus 2.828 times the rated circuit voltage for equipment rated at more than 250 volts. The direct-current test potential is to be maintained for 1 minute without breakdown.

40.7 added May 6, 1996

40.8 Components providing a d.c. path in parallel with the insulation to be tested, such as discharge resistors for filter capacitors and voltage limiting devices (transient voltage suppressors), may be disconnected during the test.

40.8 added May 6, 1996

41 Condenser Fan Motor Failure Test

41.1 An ice cream maker shall not leak refrigerant nor develop pressures or temperatures in excess of those indicated in 41.1 (a) and (b), if the condenser fan motor locks or fails to start.

a) The maximum high- and low-side pressures are to be recorded as reference values for requirements of the Strength Tests – Pressure Containing Components, Section 53. An assembly employing a pressure-limiting device complying with 32.2 or 32.3, as applicable, is considered to comply with the high-side pressure requirement.

b) The maximum temperature of the compressor enclosure, of the fan motor winding (open type), or of the fan motor enclosure (enclosed type) shall not exceed 302°F (150°C). Compressors and condenser fan motors equipped with thermal protective devices as specified in 17.6 and 17.8 are considered to comply with this requirement.

41.2 A sample of the assembly is to be fitted with a pressure gauge on the high-pressure side of the refrigeration system and provided with thermocouples on the compressor enclosure and condenser fan motor winding (open type) or condenser fan motor enclosure (enclosed type). When evaluating low-side components for compliance with the strength requirements of 53.1.4, a pressure-gauge is to be fitted on the low-side of the system. The low-side pressure is to be recorded while the compressor is operating and after shutdown. If the ice cream maker is provided with means to relieve discharge pressure into the low-side of the system, the low-side pressure is to be recorded:

a) While the compressor is operating, the pressure relief means is open and the low-side pressure is increasing, and

53.1.6 With reference to the requirements of 53.1.1 and 53.1.4, sections of the refrigeration system constructed of continuous tubing or of lengths of tubing connected by soldered, brazed, or welded joints are considered as complying with these requirements, provided the tubing employed in the assembly complies with the requirements of 30.1.

53.1.7 Two samples of each refrigerant-containing component are to be tested to determine compliance with these requirements. The test medium is to be any nonhazardous liquid, such as water. The test samples are to be filled with the test medium to exclude air and are to be connected in a hydraulic pump system. The pressure is to be raised gradually until the required pressure is reached. This pressure is to be maintained for 1 minute during which time the samples shall not burst or leak. Leakage is to be determined visually, for example, by examination of the sample for release of the test medium or as evidenced by a decreasing gauge pressure.

Exception: Where gaskets are employed in components of ice cream makers containing Refrigerant 12, 22, 500, or 502, leakage at gaskets is to be acceptable provided that such leakage occurs at a pressure greater than 40 percent of the required pressure. The component shall withstand the required strength test pressure even though leakage occurs at the gaskets or seals.

53.1.8 Pressure-actuated refrigeration controllers rated for the application are exempt from the requirements of this section.

53.1.9 Parts of a product system pressurized by gas shall withstand, without failure, a pressure equal to five times the start-to-discharge pressure of the relief device. Systems consisting only of tubing or hose, or both, with or without dispensing valves, and that do not incorporate a pressure relief valve, see 6.2.3, shall withstand a pressure of five times the maximum allowable pressure marked on the equipment, except that the test pressure shall be not less than 650 psig (4.48 MPa).

53.1.10 A part that is pressurized by a pump shall withstand, without failure, a pressure equal to five times the maximum pressure that the pump can develop.

53.1.11 With reference to 53.1.10, water and product pump housings, containers, interconnecting lines, and fittings that form part of a closed pressurized system are to comply with the requirement. The parts are to be tested as described in 53.1.7. Parts that are not pressurized are exempt from this requirement.

54 Start-To-Discharge Test

54.1 Pressure-relief devices used in the pressurized product system shall be subjected to a test to determine the pressure at which the device will open and start to discharge.

Exception: Pressure-relief devices that are part of components and that have been subjected to this test are exempt from this requirement.

54.2 Three samples of the device are to be tested. Each sample is to be connected to a gas source, such as air, carbon dioxide, or nitrogen, but oxygen or any flammable gas is not to be used. The sample is to be immersed in water, and the pressure is to be gradually increased until the device starts to discharge as evidenced by the occurrence of bubbles in the water. The average of three readings for each of three representative samples is to be used to determine the start-to-discharge pressure.

55 Component Restraint Test

55.1 A slideout product storage component, such as a drawer or shelf, shall be restrained to prevent its being unintentionally pulled free of its supporting means.

55.2 The restraint specified in 55.1 is acceptable if it will prevent the product storage component from being pulled clear of the ice cream maker with the application of a statically applied load equal to 30 pounds (13.6 kg). The force is to be applied horizontally by hanging a weight from a cord running over a pulley and attached to the center of the leading edge of the component.

56 Additional Tests

56.1 The ice cream maker shall be tested in accordance with the requirements of 10.4.9.

MANUFACTURING AND PRODUCTION TESTS

57 Pressure Tests

57.1 Each ice cream maker shall be tested and proved tight at not less than the design pressure(s) marked on the ice cream makers. See 60.9.

57.2 If the final assembly is completed with flare-type fittings or telescoped tubing joints that are sealed with silver solder, brazing, or the equivalent, the pressure test on the complete system may be at the low-side design pressure provided that the high-side parts are individually tested either by the ice cream maker manufacturer or by the manufacturer of the part at not less than the high-side design pressure.

57.3 *57.3 deleted March 26, 1993*

57.4 *57.4 deleted March 26, 1993*

57.5 At least once each year, a strength test shall be conducted on refrigerant-containing or compressed gas-pressurized component of the shell type, including motor-compressor shells that have an inside diameter greater than 3 inches (76.2 mm). The test is to be conducted on at least one sample of each size and type. The sample shall comply with the requirements of Strength Tests – Pressure Containing Components, Section 53. Such tests may be conducted either by the ice cream maker manufacturer or by the manufacturer of the component.

Exception: ASME vessels bearing the Code "U" symbol need not be retested.

58 Production-Line Dielectric Voltage-Withstand Tests

58.1 Each product shall withstand without electrical breakdown, as a routine production-line test, the application of a potential at a frequency within the range of 40 – 70 hertz, or a dc potential

- 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.

58.1 revised May 6, 1996

58.1.1 The production-line test shall be conducted in the time and at the potential specified in either Condition A or Condition B of Table 58.1.

58.1.1 added May 6, 1996

Table 58.1
Production-line test conditions

Product rating	Condition A			Condition B		
	Potential, VAC ^c VDC		Time, seconds	Potential, VAC ^c VDC		Time, seconds
250 volts or less with no motor rated more than 1/2 horsepower (373 watts output)	1000	1400	60	1200	1700	1
250 volts or less with a motor rated more than 1/2 horsepower (373 watts output)	1000 + 2V ^a	1400 + 2.8V ^a	60	1200 + 2.4V ^a	1700 + 3.4V ^a	1
251 – 600 volts	1000 + 2V ^b	1400 + 2.8V ^b	60	1200 + 2.4V ^b	1700 + 3.4V ^b	1
^a Maximum marked voltage but not less than 120 volts if the maximum marked voltage is within the range 105 – 120 volts, and not less than 240 volts if the maximum marked voltage is within the range 210 – 240 volts. ^b Maximum marked voltage. ^c Where there are capacitors across the insulation under test (e.g. radio-frequency filter capacitors), it is recommended that d.c. test voltages are used.						

Table 58.1 added May 6, 1996

58.2 For equipment employing low-voltage circuits, the test is to be conducted with the low-voltage circuit connected to the cabinet, chassis, or other dead metal part so that the potential applied between the high-voltage live parts and dead metal parts will simultaneously be applied between high-voltage live parts and low-voltage circuits.

58.2 revised May 6, 1996

58.2.1 The test shall be conducted when the product is fully assembled. It is not intended that the product 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 the performance of the test need not be in place.

Exception No. 2: The test may be performed before final assembly if the test represents that for the completed product. Any component not included shall not affect the results with respect to determination of possible risk of electric shock resulting from miswiring, defective component, insufficient spacings, and the like.

58.2.1 added May 6, 1996

58.3 Solid-state and similar components that might be damaged by a secondary effect (induced voltage surge, excessive heating, and the like), of the test may be short-circuited by means of a temporary electrical jumper or the test may be conducted without the component electrically connected, providing the wiring and terminal spacings are maintained. Additionally, components providing a d.c. path in parallel with the insulation to be tested (primary to dead-metal) may be disconnected during the test. Examples of such components are discharge resistors for filter capacitors and voltage limiting devices such as transient voltage suppressors (other than capacitors).

58.3 revised May 6, 1996

58.4 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.

58.4 revised May 6, 1996

58.5 The test equipment shall have a means of indicating the test potential, an audible or visual indicator of electrical breakdown, and either a manually reset device to restore the equipment after electrical breakdown or an automatic reject feature of any unacceptable unit. When an ac test potential is applied, the test equipment shall include a transformer having an essentially sinusoidal output.

58.5 revised May 6, 1996

58.6 If the output of the test-equipment transformer is 500 volt-amperes or more, the test potential may be indicated:

- a) By a voltmeter in the primary circuit or in a tertiary-winding circuit,
- b) By a selector switch marked to indicate the test potential, or
- c) For equipment having a single test-potential output, by a marking in a readily visible location to indicate the test potential. If marking is used without an indicating voltmeter, the equipment shall include a positive means, such as an indicator lamp, to indicate that the manually reset switch has been reset following a dielectric breakdown.

58.6 added May 6, 1996

58.7 Test equipment other than that described in the preceding paragraphs may be used if found to accomplish the intended factory control.

58.7 added May 6, 1996

58.8 During the test, the primary switch is to be in the on position, both sides of the primary circuit of the product 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: A product having circuitry – resistive, high-impedance winding, or the like – not subject to excessive secondary-voltage build-up in case of electrical breakdown during the test may be tested:

- a) *With a single-pole primary switch, if used, in the off position, or*
- b) *With 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.*

58.8 added May 6, 1996

59 Production-Line Grounding Continuity Tests

59.1 The manufacturer shall test each ice cream maker that has a power supply cord to determine that there is electrical continuity between the device and the grounding blade of the attachment plug as required by 13.1.

59.2 An indicating device, such as an ohmmeter, low-voltage battery- and buzzer-combination, or the like, may be employed in the test mentioned in 59.1.

59.3 Where the internal parts referred to in 13.1 are determined in the investigation of the device to be bonded to the frame and enclosure of the ice cream maker, a test that determines the electrical continuity between the grounding blade and the frame or enclosure is sufficient for compliance with 59.1.

MARKING

60 General

60.1 Unless otherwise specifically indicated, all marking shall be permanent.

60.2 A marking required to be permanent shall be molded, die-stamped, paint-stenciled, stamped, or etched in metal that is permanently secured, or indelibly stamped on pressure-sensitive labels secured by adhesive. Pressure sensitive labels shall comply with the Standard for Marking and Labeling Systems, UL 969. Routine usage, handling, and storage of the ice cream maker is considered in the determination of the permanence of the marking.

60.3 An ice cream maker shall be marked with the following:

- a) The manufacturer's or private labeler's name or identifying symbol.
- b) A distinctive type or model designation.
- c) The electrical rating.
- d) The kind and amount of refrigerant in pounds-mass (kg x 2.2) and/or ounces (kg x 35.3).
- e) The high- and low-side design pressures. See 60.5 and 60.9.
- f) The date of manufacture of the ice cream maker.

60.4 With reference to the requirement of 60.3(f), the date of manufacture may be by month and year, or quarter and year, or equivalent. This information, that may be in code, shall be located on or near the nameplate. A date code shall be such that it does not repeat in less than 20 years.

60.5 With reference to 60.3 (d) and (e), ice cream makers may be marked with equivalent SI units in addition to the USA customary units of measure.

60.6 An ice cream maker equipped with more than one refrigeration system shall be marked to indicate the amount of refrigerant in each system. If different refrigerants are used, the kind of refrigerant and design pressures for the high- and low-pressure sides shall be shown for each system.

60.7 The kind of refrigerant shall be designated by number. The number shall be prefixed or suffixed with the word "Refrigerant" or it shall be prefixed with the letter "R" or the trade name of the refrigerant. Combinations of these marks are acceptable, except that employing the letter "R" and the word "Refrigerant" in the same marking group is not appropriate.

60.7 revised May 6, 1996

60.8 Examples for refrigerant marking are as follows: R12, Refrigerant 12, or 12 Refrigerant; (Trade Name) 12, (Trade Name) R 12, or (Trade Name) 12 Refrigerant as shown in the Number Designation and Safety Classification of Refrigerants, ANSI/ASHRAE 34-1992.

60.8 revised May 6, 1996

60.9 The high- and low-side design pressures marked on the ice cream makers shall not be less than the values recorded during the Temperature and Pressure Test, Section 36, nor less than the values in Table 60.1.

Table 60.1
Minimum design pressure

Refrigerant ^a	Minimum design pressure, psig (kPa)				
	Low-side		High-side		
			Air-cooled		Water cooled
12	85	(586)	169	(1165)	127 (876)
22	144	(993)	278	(1917)	211 (1455)
134a	88	(606)	186	(1282)	135 (930)
401A	85	(586)	182	(1255)	133 (917)
401B	93	(641)	195	(1344)	143 (986)
402A	183	(1262)	347	(2394)	265 (1828)
402B	170	(1172)	324	(2234)	247 (1703)
404A	174	(1200)	331	(2281)	253 (1745)
502	162	(1117)	300	(2067)	232 (1599)
507	180	(1242)	344	(2374)	262 (1808)
^a For other refrigerants, the minimum design pressure shall be not less than the values recorded during the Input Test (cooling mode), Section 36, nor less than the saturation pressure of the refrigerant at the following temperatures: 80°F (26.5°C) for low-sides 105°F (40.5°C) for water-cooled high-sides 125°F (51.7°C) for air cooled-high-sides					

Table 60.1 added May 6, 1996



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October 4, 1995

Revision pages for

Standard for

Ice Cream Makers

UL 621, Fifth Edition

Attached to this transmittal notice is a revision of the Fifth edition of UL 621.

A CHANGE ON A PAGE DATED OCTOBER 4, 1995 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 EXCEPT FOR PARAGRAPHS 13.16, 13.17 AND 16.19, WHICH BECOME EFFECTIVE OCTOBER 4, 1996 AS INDICATED IN THE SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM. TO RETAIN THE REQUIREMENTS IN EFFECT UNTIL OCTOBER 4, 1996, DO NOT DISCARD THE PREVIOUS PAGES CONTAINING THE REQUIREMENTS SPECIFIED ABOVE UNTIL THIS FUTURE EFFECTIVE DATE.

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 new and revised requirements are substantially in accordance with UL's bulletin on this subject dated March 20, 1995. The bulletin is now obsolete and may be discarded.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 621-1992.

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

(Continued)

October 4, 1995 – UL 621

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

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INTRODUCTION

1 Scope

1.1 These requirements cover unitary ice cream makers designed for connection to alternating current circuits rated not more than 600 volts. For the purposes of this standard, ice cream makers include equipment for preparing products such as hard ice cream, soft serve ice cream, milk shakes, and sherbets and may include means for dispensing the product directly into containers.

1.2 Ice cream makers covered by these requirements employ sealed (hermetic type) motor compressors and air-cooled or water-cooled condensers.

1.3 These ice cream makers are intended to be installed in accordance with the National Electrical Code, NFPA 70, and the Safety Code for Mechanical Refrigeration, ASHRAE 15-1978.

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 October 4, 1995

2 General

2.1 Terminology

2.1.1 The term "ice cream maker" refers to any equipment covered by this standard unless specifically noted otherwise.

2.2 Components

2.2.1 Except as indicated in 2.2.1, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

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

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

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

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

2.3 Units of measurement

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

2.4 Undated references

2.4.1 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 these requirements, the following definitions apply.

3.2 ACCESSORY — An optional electrical device or other component, intended for installation in or connection to an ice cream maker for the purpose of modifying or supplementing the functions of the ice cream maker. It may be factory installed or intended for installation by the user or service personnel.

3.3 CIRCUITS, ELECTRICAL:

a) High-Voltage — A circuit involving a potential of not more than 600 volts and having circuit characteristics in excess of those of a low-voltage circuit.

b) Low-Voltage — A circuit involving a potential of not more than 30 volts alternating current, 42.4 volts peak or direct current, and supplied by:

- 1) A primary battery,
- 2) A standard Class 2 National Electrical Code, ANSI/NFPA 70-1987, transformer, or
- 3) A combination of a transformer and fixed impedance that, as a unit, complies with all performance requirements for a Class 2 National Electrical Code, ANSI/NFPA 70-1987, transformer.

3.4 SELF-CONTAINED ICE CREAM MAKER — Unitary equipment consisting of a complete factory-assembled and factory-tested refrigerating system in which all of the refrigerant-containing parts are permanently connected at the factory.

3.5 ULTIMATE STRENGTH — The highest stress level that a refrigerant-containing component can tolerate without rupture.

3.6 UNITARY ICE CREAM MAKER — Equipment consisting of a complete factory-assembled and factory-tested refrigerating system comprising one or more assemblies that:

- a) May be shipped separately, but
- b) Are intended to be used together.

4 Installation And Operating Instructions

4.1 An ice cream maker shall be provided with installation and operating instructions. The instructions shall contain directions and information that the manufacturer considers necessary for installation, use, and user maintenance of the ice cream maker.

4.2 A copy of the manufacturer's operating and installation instructions, or equivalent information, intended to accompany each ice cream maker is to be furnished with the sample submitted for investigation. These instructions are to be used as a guide in the examination and test of the ice cream maker. For this purpose, a printed edition is not required.

Table 11.1
Typical wiring material

Group	Type of wire, cord, or cable ^a	Wire size		Insulation thickness	
		No. AWG	mm ²	Inch	mm
A	Thermoplastic appliance wiring material ^b , with insulation thickness shown at the right corresponding to wire sizes indicated, or Type AC, ACT, FFH-2, TF, TFF, TFN, TFFN, SF-2, SFF-2, RH, RHH, RHW, THW, XHHW, MTW, RUW, THW-MTW, THWN, PF, PGF, PFF, PGFF, TW	10 and smaller	5.3	2/64	0.8
		8	8.4	3/64	1.2
		6	13.3	4/64	1.6
		4	21.2	4/64	1.6
		3	26.7	4/64	1.6
		2	33.6	4/64	1.6
		1	42.4	5/64	2.0
		1/0	54.0	5/64	2.0
		2/0	67.0	5/64	2.0
		3/0	85.0	5/64	2.0
		4/0	107.2	5/64	2.0
B	Appliance wiring material ^b having thermoplastic, or neoprene insulation, with insulation thickness shown at right corresponding to the wire sizes indicated, or Type S, SE, SO, SOO, ST, STO, STOO, SJ, SJE, SJO, SJOO, SJT, SJTO, SJTOO, SP-3, SPE-3, SPT-3	18	0.82	4/64	1.6
		16	1.3	4/64	1.6
		14	2.1	5/64	2.0
		12	3.3	5/64	2.0
		10	5.3	5/64	2.0
		8	8.4	6/64	2.4
		6	13.3	8/64	3.2
		4	21.2	9/64	3.6
		2	33.6	10/64	4.0
C	Thermoset appliance wiring material ^b with insulation thickness shown at the right corresponding to wire sizes indicated, or Type S, SJ, SP-3	Same as for Group B			

^a The designated cord or cable or types of wire other than appliance wiring material may be used without regard to the values specified in this table.

^b Appliance wiring material acceptable for refrigeration use.

Table 11.1 revised October 4, 1995

11.1.12 If damage to low-voltage wiring may cause malfunctioning of:

- a) A pressure-limiting device,
- b) A motor overload protective device, or
- c) Any other protective device that may result in a risk of fire, electric shock, or injury to persons, such wiring shall be enclosed as indicated in 11.2.1 or shall be Type SPT-2 or SP-2 cord or one of the types indicated in Group B or C of Table 11.1. Wires of types indicated in Group A of Table 11.1 or wires having equivalent characteristics may be used if such wiring is located in a cavity or compartment of the ice cream maker and is shielded from damage.

11.1.13 All splices and connections shall be mechanically secured and electrically bonded. A soldered connection shall be made mechanically secure before being soldered.

11.1.14 Splices shall be located within the ice cream maker enclosure. They shall be secured in position or located in a separate enclosure so that they are not subject to flexing, motion, or vibration due to air movement, and the like. Strain relief shall be provided on the conductors if the wiring is likely to be removed during servicing operations, such as replacing fuses, resetting manual-reset devices, or oiling motors.

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

11.1.16 Splicing devices, such as fixture-type splicing connectors and pressure wire connectors, may be employed if they provide mechanical security and employ insulation rated for the voltage to which they are subjected. Among the factors that are taken into consideration when judging the acceptability of splice insulation consisting of coated fabric, thermoplastic, or other type of tubing are electrical, mechanical, and flame-resistance properties. Thermoplastic tape wrapped over a sharp edge is not acceptable.

11.1.17 Quick-connecting assemblies shall form a secure electrical connection, such as by detents in the mating parts, and shall be capable of carrying the current involved.

11.1.18 Wire binding screws shall thread into metal. At terminals, stranded conductors shall be secured by soldered or pressure-type terminal connectors or the conductors shall be soldered or otherwise assembled to prevent loose strands after assembly. Soldered connections shall be made mechanically secure before being soldered.

11.1.19 Open-slot type connectors shall not be used unless they are constructed to prevent disconnection resulting from loosening of the clamping means. If required spacings may be reduced below the minimum acceptable values by movement of the connector, the shanks of terminal connectors shall be protected by electrical insulation secured in position and not less than 0.028 inch (0.71 mm) thick, except as permitted by 26.8.

11.1.20 Holes for passage of wires and cords through walls, panels, or barriers shall have smooth, rounded surfaces or be provided with smooth, rounded bushings. Bushings shall be fabricated from materials such as ceramic, phenolic, cold-molded composition, or fiber.

11.1.21 A wiring enclosure formed between the cabinet shell, liner, molding, trim strips, or the like is to be constructed of metal or of nonmetallic material and shall provide a smooth wireway with no sharp edges or sharp projecting screws that might damage the wire insulation.

11.2 Permanently connected ice cream makers

11.2.1 Wiring shall be of the type indicated in Group A of Table 11.1, and enclosed by means such as conduit, electrical metallic tubing, metal raceways, or control boxes. Fittings shall be constructed for use with the type of wiring enclosure employed in the application. See also 11.1.7 and 11.2.2.

11.2.2 Cords or appliance wiring material of a type indicated in Group A or B of Table 11.1, may be employed in lieu of the enclosed wiring, provided that the wiring is enclosed by the cabinet to reduce the risk of damage of wiring, ignition of flammable material, or emission of flame or molten metal through openings in the cabinet.

Exception: Cord wiring that is not enclosed by the cabinet is acceptable under the provisions of 11.1.8 and 11.1.9.

11.2.2 revised March 26, 1993

13.16 A secondary circuit of less than 50 volts that is supplied by a transformer having a primary connected to a source of more than 150 volts to ground shall be bonded for grounding.

Added 13.16 effective October 4, 1996

13.17 With reference to 13.16, the size of the bonding conductor used to bond the secondary circuit conductor that is to be grounded shall be in accordance with 13.13. If one of the secondary circuit conductors is white or natural gray in color and located in a field wiring compartment, the white or neutral gray conductor shall be the one that is grounded.

Added 13.17 effective October 4, 1996

16.12 A switch is acceptable for use with tungsten-filament lamp loads if it has a "T" or "L" rating equal to the tungsten-filament lamp load. A general-use alternating current (ac) snap switch, a circuit breaker, or a nonautomatic circuit interrupter are considered acceptable for controlling tungsten-filament lamps at their full ampacity. A switch having an ac ampacity of six times or more of the tungsten-filament lamp load is also acceptable for use with that tungsten-filament lamp load without additional test.

16.13 The load controlled by a switch connected in an incandescent lighting system is to be determined by the size and number of lampholders controlled as specified: each intermediate-base lampholder is considered as a 25-watt load, a medium-base lampholder as a 60-watt load, and a mogul-base lampholder as a 500-watt load.

16.14 A switching device that may be called upon to break a motor load under locked-rotor conditions shall have a current interrupting capacity not less than the locked-rotor current of the motor.

16.15 If a switching device controls a compressor motor and fan motor and/or other load, it shall have a current interrupting capacity not less than the locked-rotor load of the compressor motor plus the full load of the fan motor and/or other load.

16.16 Motor controllers shall be arranged so that they will simultaneously open a sufficient number of ungrounded conductors to interrupt current flow to the motor.

Exception: This requirement does not apply to crankcase heating arrangements where the circuit is arranged to permit current flow through a capacitor in series with the start winding of single-phase motors with the motor not operating.

16.17 Coil windings of switching devices shall be impregnated, dipped, varnished, or equivalently treated to resist absorption of moisture.

16.18 Switching devices shall be housed within an enclosure that will protect coils and contacts against mechanical damage, dirt, and moisture. The enclosure of the switching device may be provided by its method of mounting within the ice cream maker enclosure, by inherent construction of the component, or by means of a separate enclosure.

16.19 A circuit breaker shall be connected to open all ungrounded conductors of the circuit. Multipole circuit breakers shall be the common trip type.

Exception: Single-pole circuit breakers with handle ties, the combination of which complies with the applicable requirements in the Standard for Molded-Case Circuit Breakers and Circuit-Breaker Enclosures, UL 489, may be used as the protection for each ungrounded conductor supplying line-to-line connected loads of a product rated for connection to a circuit of a grounded system.

Added 16.19 effective October 4, 1996

17 Motors And Motor Overload Protection

17.1 All motors shall be protected against overload by thermal or overcurrent protective devices. See also 17.9.

17.2 For a motor other than a hermetic motor-compressor, acceptable overload protection is provided by a separate device that is responsive to motor current and is rated or set to trip at no more than the percentage of the motor nameplate full-load current rating shown in column A of the following table. See 17.3.

	Maximum percent protection	
	A	B
Motor with a marked service factor no less than 1.15	125	140
Motor with a marked temperature rise no more than 40°C	125	140
Any other motor	115	130

17.3 For an overload relay, where the percentage protection indicated in column A in 17.2 does not correspond to the percentage value resulting from selection of a standard size relay, the next higher size of relay may be used, provided that it provides protection no greater than the percentage protection indicated in column B.

17.4 A hermetic motor-compressor complies with the requirements of 17.1 if the protection complies with (a), (b), (c), or (d) below:

- a) A separate overload relay that is responsive to motor-compressor current and will trip at no more than 140 percent of the rated-load current of the motor-compressor marked on the ice cream maker nameplate.
- b) A thermal protector integral with the motor-compressor that:
 - 1) Complies with the Standard for Hermetic Refrigerant Motor-Compressors, UL 984, and
 - 2) Will not permit a continuous current in excess of 156 percent of the rated-load current of the motor-compressor (or 156 percent of the branch-circuit selection current, if the latter value is marked). The values of rated-load current and branch-circuit selection current referred to are the values marked on the ice cream maker nameplate. See 61.14.

Exception: The limitation of 17.4(b) (2) does not apply to units as described in 17.6. See 52.1.

c) A fuse or circuit breaker responding to motor current and rated at no more than 125 percent of the rated-load current of the motor-compressor marked on the ice cream maker nameplate. The ice cream maker shall start and operate as intended with the fuse or circuit breaker provided.

d) A protective system that:

- 1) Complies with the Standard for Hermetic Refrigerant Motor-Compressors, UL 984, and
- 2) Will not permit a continuous current in excess of 156 percent of the rated load current of the motor-compressor (or 156 percent of the branch-circuit-selection current if the latter value is marked). The values of rated-load current and branch-circuit-selection current referred to are the values marked on the ice cream maker nameplate. See 61.14.

Exception: The limitation of 17.4(d) (2) does not apply to units as described in 17.6. See 52.1.

17.5 For a cord-connected ice cream maker or a permanently connected ice cream maker marked with a single-ampere rating, the rated-load current of the motor-compressor is the current drawn by the motor-compressor during the Temperature and Pressure Test, Section 39.

17.6 An ice cream maker employing a hermetic compressor equipped with a thermal-protective device is not required to comply with the 156 percent limitation specified in 17.4 (d) (2) if the equipment is intended for connection to a 15 or 20-ampere, 120-volt, or 15-ampere, 208 or 240-volt, single phase branch circuit.

17.7 All components of the "protective system" mentioned in 17.4(d) shall be provided as part of the ice cream maker.

**Underwriters Laboratories Inc.®**A not-for-profit organization dedicated to public safety
and committed to quality service**April 18, 1995****Revision pages for****Standard for****Ice Cream Makers****UL 621, Fifth Edition**

Attached to this transmittal notice is a reprinted title page for the Fifth edition of UL 621.

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 621.

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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UL 621

Standard for

Ice Cream Makers

First Edition – January, 1961
Second Edition – April, 1973
Third Edition – April, 1977
Fourth Edition – April, 1986

The First and Second editions were titled Ice Cream Freezers and Soda Fountain Units.

Fifth Edition

March 25, 1993

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated March 25, 1993. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

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

Approved as ANSI/UL 621-1978, August 11, 1978
Approved as ANSI/UL 621-1985, October 15, 1985
Approved as ANSI/UL 621-1992, March 20, 1992

The Department of Defense (DoD) has adopted UL 621 on February 25, 1992. 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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**Underwriters Laboratories Inc.®**

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March 26, 1993**Revision pages for****Standard for****Ice Cream Makers****UL 621, Fifth Edition**

Attached to this transmittal notice is a revision of the Fifth edition of UL 621.

A CHANGE ON A PAGE DATED MARCH 26, 1993 IS INDICATED BY A SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM, PRECEDED AND FOLLOWED BY AN ASTERISK.

THESE REVISED REQUIREMENTS ARE NOW IN EFFECT.

The revised requirements are substantially in accordance with UL's bulletins on this subject dated April 8, 1992 and UL's adoption bulletin dated September 30, 1992. These bulletins are now obsolete and may be discarded.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 621-1992.

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Table 7.1
Minimum acceptable distance from an
opening to a part that may involve a risk of electric
shock or injury to persons

Minor dimension ^a of opening		Minimum distance from opening to part	
Inches	(mm) ^b	Inches	(mm) ^b
3/4 ^c	(19.1)	4-1/2	(114.0)
1 ^c	(25.4)	6-1/2	(165.0)
1-1/4	(31.8)	8-1/2	(190.0)
1-1/2	(38.1)	10-1/2	(267.0)
2 ^e	(50.8)	14-1/2	(368.0)
2-1/4 ^d	(57.2)	16-1/2	(419.0)
2-1/2 ^d	(63.5)	18-1/2	(470.0)
2-3/4 ^d	(69.9)	20-1/2	(521.0)
3 ^d	(76.2)	22-1/2	(572.0)
Over 2 ^e	(over 50.8)	30	(762.0)

^a See 7.5.

^b For an opening between two of the values shown, the distance from the opening to the part shall be not less than that found by interpolation between the corresponding values shown in the applicable column.

^c Any dimensions less than 1 inch applies to a motor only.

^d These values apply to openings at the base of the ice cream makers where the upper edge of the opening is less than 8 inches (203 mm) above the floor. The ice cream maker shall be in its intended operating position.

^e More than 2 inches, but not more than 3 inches (152.0 mm).

7.2 With respect to a part or wire as mentioned in 7.1, in an integral enclosure of a motor as mentioned in exception No. 1 of 7.1:

- a) An opening that has a minor dimension (see 7.5) less than 3/4 inch (19.1 mm) is acceptable if:
 - 1) A moving part cannot be contacted by the probe illustrated in Figure 7.2;
 - 2) Film-coated wire cannot be contacted by the probe illustrated in Figure 7.3;
 - 3) In a directly accessible motor (see 7.6), an uninsulated live part cannot be contacted by the probe illustrated in Figure 7.4; and
 - 4) In an indirectly accessible motor (see 7.6), an uninsulated live part cannot be contacted by the probe illustrated in Figure 7.2.
- b) An opening that has a minor dimension of 3/4 inch or more is acceptable if a part or wire is spaced from the opening as specified in Table 7.1.

7.2 revised March 26, 1993