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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,
Field Conversion/Retrofit of Products to Change to an Alternative
Refrigerant - Procedures and Methods, UL 2172
Refrigerants, UL 2182
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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**Documents**

Document Sharing Hub

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

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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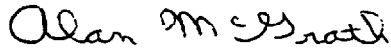
January 9, 1997

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.

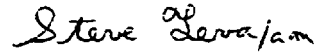
Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.

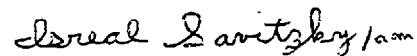


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SR:JTM

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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.

A P P E N D I X 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 15-1980.~~

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 15-1982.~~

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.®**A not-for-profit organization dedicated to public safety
and committed to quality service**August 8, 1996****Revision pages for****Standard for****Refrigerated Vending Machines****UL 541, Sixth Edition**

Attached to this distribution notice is a revision of the Sixth edition of UL 541.

A CHANGE ON A PAGE DATED AUGUST 8, 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.

The new and revised requirements are substantially in accordance with UL's bulletin on this subject dated February 21, 1996. The bulletin is now obsolete and may be discarded.

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	July 24, 1995 (Title Page Reprinted: May 3, 1996)
2, 3	May 3, 1996
4 – 39	July 24, 1995
40 – 42, 42A, 43	May 3, 1996
44 – 54	July 24, 1995
55, 56, 56A	May 3, 1996
57 – 71	May 3, 1996
72	August 8, 1996
73 – 75	July 24, 1995
76 – 78, 78A, 78B, 78C	May 3, 1996
79 – 84, A1	July 24, 1995

Underwriters Laboratories, Inc. (UL)
333 Pfingsten Road
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UL Standard for Safety
for
Refrigerated Vending Machines, UL 541

Sixth Edition, Dated July 24, 1995

Revisions: This Standard contains revisions through and including August 8, 1996.

A change is indicated by a note following the affected item. The note is preceded and followed by an asterisk.

The new and/or revised requirements are substantially in accordance with UL's Bulletin on this subject dated February 21, 1996. The bulletin is now obsolete and may be discarded.

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

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August 8, 1996 – UL 541

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Standards-on-Diskette are intended for on-line use, such as for viewing the requirements of a Standard, conducting a word search, and the like. Only one copy of the Standard may be printed from each single-user version of a Standards-on-Diskette. Only one copy of the Standard may be printed for each authorized user of a multiple-user version of a Standards-on-Diskette. An employee of an organization purchasing a Standard-on-Diskette can make a copy of the page or pages being viewed for their own fair and/or practical internal use. Because of differences in the computer/software/printer setup used by UL and those of Standards-on-Diskette purchasers, the printed copy obtained by a purchaser may not look exactly like the on-line screen view or the printed Standard.

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

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

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

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1	July 24, 1995 (Title Page Reprinted: May 3, 1996)
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79 - 84, A1	July 24, 1995

d) For a water cooled unit, three times the maximum low side pressure developed in the condenser water failure test, Section 44, including discharge pressure relieved to the low side and equalization pressure developed after compressor shutdown.

e) One and one-half times the vapor pressure of the refrigerant at 60°C (140°F).

Exception No. 1: Low side pressure vessels shall have an ultimate strength of not less than five times the highest of the following:

a) low side design pressure,

b) maximum pressure developed during the temperature and pressure test, Section 36,

c) start-to-discharge pressure of a pressure relief valve, or

d) the set pressure of a rupture member.

Exception No. 2: Low side pressure vessels protected by a fusible plug shall have an ultimate strength not less than 2-1/2 times the vapor pressure of the refrigerant at the relief temperature of the fusible plug or 2-1/2 times the critical pressure of the refrigerant, whichever is smaller.

55.5 With reference to 55.1(i) and 55.4(e), vapor pressures of R12, R22, R500 and R502 at 60°C (140°F) are 207, 337, 248, and 362 psig (1427, 2323, 1720, and 2496 kPa), respectively.

55.6 Sections of the refrigerant system constructed of continuous tubing or of lengths of tubing connected by hard-soldered, brazed, or welded joints will be considered as meeting the requirements of 55.1 — 55.4, provided the tubing employed in the assembly conforms with 30.2.1.

55.7 Two samples of each refrigerant containing part are to be tested to determine compliance with the requirements for strength. 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 maximum is reached. This pressure is to be maintained for 1 minute, during which time the sample 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 by evidence of decreasing gauge pressure.

Exception: Leakage at gaskets is acceptable in components of venders containing Refrigerant 12 or Refrigerant 22, if the leakage occurs at a pressure greater than 40 percent of the required pressure.

55.8 Pressure actuated refrigeration controllers rated for the application are exempt from the strength test requirements.

55.9 Parts of a carbonation system shall withstand, without failure, a pressure equal to five times the start-to-discharge pressure of the relief valve.

55.10 Parts that are pressurized by a pump shall withstand, without failure, a pressure equal to five times the maximum pressure that the pump can develop.

55.11 Water and product pump housings, containers, interconnecting lines, and fittings which form part of a closed pressurized system shall comply with the requirement of 55.10. Parts which are not pressurized are exempt from this requirement.

55.12 The parts are to be tested as described in 55.7.

56 Accelerated Aging Tests on Gaskets and Adhesives

56.1 56.2 – 56.6 apply to gaskets required as seals for electrical enclosures of venders intended for outdoor use. 56.7 applies to adhesives required to secure such gaskets to enclosures or covers.

56.2 Tensile strength and elongation are to be determined using the test methods and apparatus described in the Standard for Test Methods for Rubber Properties in Tension, ASTM D412-87.

56.3 Neoprene or rubber compounds, except foamed materials, forming gaskets shall have physical properties before and after an air oven aging for 70 hours at $100 \pm 2^\circ\text{C}$ ($212 \pm 3.6^\circ\text{F}$), as indicated in Table 56.1.

56.3 revised August 8, 1996

Table 56.1
Physical properties for gaskets

	Before test	After test
Recovery – Maximum set when 1 inch (25.4 mm) gauge marks are stretched to 2-1/2 inches (63.5 mm), held for 2 minutes, and measured 2 minutes after release	1/4 inch (6.4 mm)	–
Elongation – Minimum increase in distance	250 percent (1 to 3-1/2 inches) (25.4 – 88.9 mm)	65 percent of original
Tensile strength – minimum force at breaking point	850 psi (5.86 MPa)	75 percent of original

56.4 Foamed neoprene or rubber compounds forming gaskets are to be subjected to an air oven aging for 70 hours at $100 \pm 2^\circ\text{C}$ ($212 \pm 3.6^\circ\text{F}$). The compounds shall not harden or otherwise deteriorate to a degree which will affect their sealing properties.

56.4 revised August 8, 1996

56.5 Thermoplastic materials forming gaskets are to be subjected to a test involving exposure in an air oven at 87°C (188.6°F) for a period of 7 days. The material shall not deform or melt, or otherwise deteriorate to a degree which will affect its sealing properties.

56.6 With reference to 56.5, polyvinyl chloride gasket material shall have an ultimate tensile strength of not less than 1200 psi (8.27 MPa) and an ultimate elongation of not less than 250 percent before the air-oven test. The minimum tensile strength is to be not less than 90 percent and the elongation not less than 75 percent of the original values after the air-oven test.

**Underwriters Laboratories Inc.®**

An independent, not-for-profit organization testing for public safety

May 3, 1996**Revision pages for****Standard for****Refrigerated Vending Machines****UL 541, Sixth Edition**

Attached to this transmittal notice is a revision of the Sixth edition of UL 541.

A CHANGE ON A PAGE DATED MAY 3, 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 September 8, 1995. The bulletin is now obsolete and may be discarded.

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	July 24, 1995 (Title Page Reprinted: May 3, 1996)
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79 – 84, A1	July 24, 1995

**Documents**

Document Sharing Hub

JULY 24, 1995

(Title Page Reprinted: May 3, 1996)

1

UL 541

Standard for

Refrigerated Vending Machines

First Edition – August, 1958

Second Edition – February, 1970

Third Edition – March, 1974

Fourth Edition – July, 1979

Fifth Edition – February, 1989

Sixth Edition

July 24, 1995

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

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

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APPENDIX A

Standards for Components	A1
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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.

23.1.5 Except as noted in 23.1.6, each high-voltage transformer shall be protected by an overcurrent device(s) located in the primary circuit and rated or set as indicated in Table 23.1. See 23.2.1.

Exception: If the rated primary current of the transformer is 9 amperes or more and 125 percent of this current does not correspond to a standard rating of fuse or circuit breaker, the next higher standard rating of protective device may be used. Standard ratings of protective devices are specified in Section 240-6 of the National Electrical Code, ANSI/NFPA 70-1993.

Table 23.1
Rating of overcurrent devices

Rated primary current, amperes		Maximum rating of overcurrent device, percent of transformer primary current rating
Transformer other than an autotransformer	Autotransformer	
Less than 2	—	300 ^a
2 or more, less than 9	Less than 9	167
9 or more	9 or more	125
^a May be increased to 500 percent if transformer supplies a motor control circuit.		

23.1.6 If the circuit supplying a transformer, other than an autotransformer, is provided with overcurrent protection rated or set at not more than 250 percent of the rated primary current of the transformer, additional overcurrent protection is not required in the primary circuit provided the secondary circuit is protected at not more than 125 percent of the rated secondary current of the transformer and the overcurrent protection in the secondary circuit is provided as part of the vender.

Exception No. 1: If the rated secondary current of the transformer is 9 amperes or more and 125 percent of this current does not correspond to a standard rating of fuse or circuit breaker, the next higher standard rating of protective device may be used in the secondary circuit. Standard ratings of protective devices are specified in Section 240-6 of the National Electrical Code, ANSI/NFPA 70-1993.

Exception No. 2: If the rated secondary current of the transformer is less than 9 amperes, the overcurrent device(s) in the secondary circuit may be rated or set at not more than 167 percent of the rated secondary current.

23.1.7 A transformer that directly supplies a National Electrical Code, ANSI/NFPA 70-1993, Class 2 circuit (see 25.1) shall, in accordance with the Standard for Class 2 and Class 3 Transformers, UL 1585, either limit the output current (inherently limited transformer) or be equipped with an overcurrent device (not inherently limited transformer).

23.2 Overcurrent protective devices

23.2.1 Overcurrent protection in the primary circuit of a transformer, as described in 23.1.5, need not be provided as part of the vender if, based on the marked rating or ratings of the vender, the rating of the branch circuit overcurrent protective device or devices does not exceed the values specified in 23.1.5.

23.2.2 A required transformer overcurrent protective device(s) provided as part of the vender shall:

- a) Be provided for all ungrounded conductors,
- b) Be sized in accordance with requirements in 23.1.5 and 23.1.6, as applicable,
- c) Have a voltage rating not less than the circuit in which it is used, and
- d) Be a circuit breaker acceptable for branch circuit protection, or 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 63.21.

Exception: If a transformer supply is tapped from a circuit supplying other loads in the vender, 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 53.1. If the supplementary type device used is a fuse, the vender shall be marked in accordance with the requirements in the exception to 63.21.

24 Valves and Solenoids

24.1 If a valve must be cleaned periodically, the arrangement shall permit this operation to be performed without damage to the electrical parts of the valve or wiring.

24.2 Coil windings of electrically operated valves or solenoids shall be impregnated, dipped, varnished, or otherwise treated to resist absorption of moisture.

SPACINGS

25 High-Voltage Circuits

25.A1 The following electrical spacing requirements apply to high-voltage circuits as defined in 3.4.

25.A1 added May 3, 1996

25.1 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 25.1.

25.1 revised May 3, 1996

Table 25.1
Electrical Spacings in refrigerated and/or air-handling compartments

Ratings		Minimum spacing in inches (mm)					
Volt-amperes	Volts	Through air ^d		Over surface ^d		To enclosure ^c	
0 – 2000	0 – 300 ^a	1/8 ^b	(3.2)	1/4	(6.4)	1/4	(6.4)
More than 2000	0 – 150	1/8 ^b	(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 If over 300 volts, spacings in last line of table apply.

^b 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, the spacing need not be greater than that given in this table. Wiring terminals are those connected in the field and not factory-wired.

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

^d 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 25.1 revised May 3, 1996

25.2 The "Through Air" and "Over Surface" spacings given in Tables 25.1 and 25.2 at an individual component part are to be based on the total volt-ampere consumption of the load or loads which the component controls. For example, the spacings at a component which controls only the compressor motor are based on the volt-amperes of the compressor motor. The spacings at a component which controls loads in addition to the compressor motor are based on the sum of the volt-amperes of the loads so controlled, except that spacings at a component which independently controls separate loads are based on the volt-amperes of the larger load. The volt-ampere values for the aforementioned loads are to be determined by the marked rating of the loads, except that for loads which are not required to have a marked rating, the measured inputs is to be used in determining the volt-ampere values.

Table 25.2
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)	1/16	(1.6)	1/4	(6.4)
	125 – 250	3/32	(2.4)	3/32	(2.4)	1/4	(6.4)

NOTE – The spacings indicated 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 25.1 apply.

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

Table 25.2 revised May 3, 1996

25.3 With reference to 25.1 and 25.2, the spacings To Enclosure are not to be applied to an individual enclosure of a component part within an outer enclosure or cabinet.

25.3 revised May 3, 1996

25.4 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 above and are to be judged on the basis of the highest voltage involved.

25.4 revised May 3, 1996

25.5 The above spacing requirements do not apply to the inherent spacings of a component part of the vender, such as a hermetic motor-compressor, motor, snap switch, controller, attachment-plug, and the like, for which spacing requirements are given in a standard for the component. However, the electrical clearance resulting from the assembly of a component into the complete machine, including clearance to dead metal or enclosures, shall be as indicated herein.

25.5 revised May 3, 1996

25.6 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) in thickness and shall be so located or of such material that it will not be adversely affected by arcing.

Exception No. 1: Fiber no less than 0.013 inch (0.3 mm) in thickness 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: Material having a lesser thickness may be used if it has equivalent insulating, mechanical, and flammability properties when compared with materials in thicknesses specified above.

25.6 revised May 3, 1996

25.7 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 Tests, Section, exceeds 500 volts, the developed potential is to be used in determining spacings for the parts affected.

25.7 added May 3, 1996

25.8 The spacing between uninsulated live terminals of the components in an electric-discharge lamp circuit and a dead metal part or enclosure shall be not less than 1/2 inch (12.7 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.

25.8 added May 3, 1996

26 Low-Voltage Circuits

26.A1 The following electrical spacing requirements apply to low-voltage circuits, as defined in 3.6.

26.A1 added May 3, 1996

26.1 A circuit derived from a source of supply classified as a high-voltage circuit, by connecting resistance in series with the supply circuit as a means of limiting the voltage and current, is not considered to be a low-voltage circuit as defined in 3.6.

26.2 The spacings for low-voltage electrical components which are installed in a circuit which includes a pressure-limiting device, motor overload protective device, or other protective device, where a short or grounded circuit may result in unsafe operation of the vender shall comply with the following:

- 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).
- b) The spacing between field wiring terminals, regardless of polarity, and between the field wiring terminal and a dead metal part, including the enclosure and fittings for the connection of conduit, which may be grounded when the device is installed, shall be at least 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, which 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.

26.2 revised May 3, 1996

26.3 The spacings in low-voltage circuits which do not contain devices such as indicated in 26.2 are not specified.

CARBONATION SYSTEM

27 General

27.1 Parts of a carbonation system shall comply with the Strength Test requirements, 55.10.

27.2 A high-pressure regulator or reducing valve for a carbonation system shall be provided with a vender having such a system.

27.3 A pressure-relief valve shall be installed in the carbonation system. See 55.10.

PRODUCT LINES

28 General

28.1 Tubing, hoses, and fittings used for product lines operating under pressure shall comply with the Strength Test requirements, 55.12.

REFRIGERATION SYSTEM

29 Refrigerant

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

29.1 revised May 3, 1996

29.2 *29.2 deleted May 3, 1996*

29.3 *29.3 deleted May 3, 1996*

30 Refrigerant-Containing Parts

30.1 General

30.1.1 The parts of a vender subjected to refrigerant pressure shall withstand without failure the pressure indicated in the Strength Tests – Pressure Containing Components, Section 55.

30.1.2 The parts of a vender subjected to refrigerant pressure shall be constructed of corrosion resistant material, such as copper or stainless steel, or shall be plated, dipped, coated, or otherwise treated to resist external corrosion.

30.1.3 Pressure vessels, as referred to in this standard, are any refrigerant-containing parts other than compressors, controls, evaporators [each separate section of which does not exceed 1/2 cubic foot (0.014 m³) of refrigerant-containing volume], headers, pipe, and pipe fittings.

30.1.4 Pressure vessels over 6 inches (152 mm) inside diameter shall be constructed, tested, and stamped in accordance with the 1992 American Society of Mechanical Engineers, (ASME) Boiler and Pressure Vessel Code, Section VIII for a working pressure in compliance with the Performance section of this standard.

30.1.5 Pressure vessels bearing the ASME Code "U" symbol complying with 30.1.4 are considered acceptable without tests.

30.1.6 Pressure vessels bearing the ASME Code "UM" symbol are to be tested to determine compliance with the Strength Test – Pressure Containing Components, Section 55 requirements. The manufacturer is to submit evidence of compliance of these vessels with the 1992 ASME Boiler and Pressure Vessel Code, Section VIII.

30.2 Refrigerant tubing and fittings

30.2.1 Except as indicated in 30.2.2, copper or steel tubing used to connect refrigerant-containing components, which is protected against mechanical damage by the cabinet or assembly, shall have a wall thickness not less than 0.0245 inch (0.622 mm) for tube sizes of 1/2 inch (12.7 mm) outside diameter and less, and not less than 0.0315 inch (0.800 mm) for a tube size of 5/8 inch (16.9 mm) outside diameter.

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

30.2.3 Tubing shall be constructed of corrosion-resistant material, such as copper or stainless steel, or shall be plated, dipped, coated, or otherwise treated to resist external corrosion.

30.2.4 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 conform to the Standard for Refrigeration Tube Fittings, ANSI/SAE J513-1990.

30.2.5 Tubing forming part of components, such as evaporators or condensers, where protection is afforded by inherent construction, shall be judged by the strength test requirements specified in, Section 55.

30.2.6 Special alloys or constructions used in refrigerant containing components, including tubing with a wall thickness less than indicated in 30.2.1 may be used, subject to an investigation that considers:

- a) Resistance to mechanical abuse,
- b) Strength against internal pressure,
- c) Resistance to corrosion,
- d) Protection against refrigerant contamination, and
- e) Compliance with requirement of safety codes such as the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1992, as compared to tubing of the minimum wall thicknesses indicated in 30.2.1.

31 Pressure Limiting Devices

31.1 A pressure limiting device designed to automatically stop the operation of the compressor shall be installed on all water cooled venders, except systems containing 3 pound-mass (1.4 kg) or less of refrigerant which comply with the provision of 55.1, and on all air cooled venders with a system containing more than 20 pounds-mass (9.1 kg) of refrigerant.

31.2 The maximum cutout pressure to which a pressure limiting device may be set by the adjusting means shall not exceed 90 percent of (a), (b), or (c), whichever of the following is lowest:

- a) One-fifth of the ultimate strength of high side refrigerant containing parts.
- b) The marked design pressure of high side pressure vessels.
- c) The setting of the pressure relief device.

31.3 A pressure-limiting device on an air cooled system, which is not required by 31.1, may have a maximum cutout setting not exceeding one-third of the ultimate strength of high-side refrigerant-containing parts, provided the device conforms with 31.2(c).

31.4 There shall be no shutoff valves between the pressure limiting device and the compressor.

32 Pressure Relief

32.1 General

32.1.1 Each vender shall be so constructed that pressure due to fire will be safely relieved. Pressure relief devices, fusible plugs, soldered joints, or special terminals may be employed for this purpose. See 32.1.8 and 32.3.1.

32.1.2 A pressure relief device is a pressure-actuated valve or rupture member designed to relieve excessive pressures automatically.

36.1.8 The vender, with door or lid open, is to be placed in a room maintained at 40°C (104°F) until the assembly and contents, if any, reach room temperature.

36.1.9 For water-cooled units, condenser inlet and outlet water temperatures are to be maintained at 26.7 and 37.8°C (80 and 100°F), respectively.

36.1.10 The vender is to be started and operated with the door or lid closed. The potential is to be maintained as indicated in 33.1.1.

36.1.11 **PULLDOWN** – The unit is to be operated until temperatures on electrical components have stabilized. The temperatures, pressures, and input are to be recorded at intervals. The vender is to pull down without tripping manual reset protective devices. An automatic reset protective device may cycle provided pulldown is obtained within an 8 hour period. Pulldown will be effected when the unit runs as intended at approximately constant current input and low-side pressure.

36.1.12 **READY-TO-VEND** – The refrigeration controller is to be restored to the circuit, and the vender permitted to cycle several times by operation of this control. The maximum input during an operating cycle is to be determined.

36.2 Automatic venders

36.2.1 An automatic vender is to be additionally tested as detailed in 36.2.2 – 36.2.5.

36.2.2 **VENDING** – The vender is to be operated through 100 vending cycles, or the full capacity of the machine if the vending capacity is less than 100 cycles. For multiple-selection machines, one vending stack or shelf is to be completely emptied before proceeding to another selection when accumulating 100 vending cycles. The vender is to be operated at 10 second intervals unless a slower rate is required by the machine. The maximum temperatures and the electrical input to the vending mechanism are to be recorded.

36.2.3 **SOLD OUT** – Controls are to be placed in the sold out or empty position, and the vender is to be energized until temperatures have stabilized. The maximum temperatures and electrical input are to be recorded.

36.2.4 With reference to 36.2.2 and 36.2.3, the temperature and the electrical input of the components in the vending circuit and lighting circuit can be determined in any convenient ambient temperature. The input current determined under this condition may be added to that recorded under pulldown and ready-to-vend conditions to determine the total maximum input to the vender if such loads operate concurrently.

36.2.5 The assembly is to be subjected to the Dielectric voltage Withstand Test, Section 37, following the above tests.

37 Dielectric voltage-Withstand Test

37.1 A vender shall withstand for a period of 1 minute, without breakdown, the application of a test potential between high-voltage live parts and dead metal parts, and between live parts of high- and low-voltage circuits. The test potential shall be 1000 V plus twice rated voltage at any frequency between 40 and 70 hertz.

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

Exception No. 2: If the steady-state voltage developed in a motor circuit through the use of a 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.

37.1 revised May 3, 1996

37.2 A vender employing a low-voltage circuit shall be capable of withstanding, for 1 minute, without breakdown, a test potential of 500 volts applied between low-voltage live parts of opposite polarity and 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 26.2 are employed in the low-voltage circuit, the dielectric voltage withstand test shall also be conducted between live parts of opposite polarity.

37.2 revised May 3, 1996

37.3 With reference to 37.2, 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 the components have been separately subjected to this test condition.

37.3 revised May 3, 1996

37.4 A 500 volt-ampere or larger transformer with a regulated output voltage is to be used to determine compliance with the foregoing. 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.

37.4 revised May 3, 1996

37.5 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 37.6.

37.5 added May 3, 1996

37.6 The capacitors and capacitor-type filters mentioned in 37.5 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.

37.6 added May 3, 1996

37.7 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.

37.7 added May 3, 1996

38 Heating Test

38.1 Ballasts are to be tested in accordance with 38.2 – 38.4 if they are:

- a) Installed so that thermal insulation may cause overheating,
- b) Subject to external heat, or
- c) Mounted at more than one level with a common enclosure.

38.2 The temperature on the coil of an open-type ballast and on the enclosure of an enclosed reactor-type ballast or other control device employed in an electric-discharge lamp system shall be not higher than 90°C (194°F); the temperature on the enclosure of an automatic starter shall be not higher than 80°C (176°F); and the temperature attained on insulated conductors and splices shall not exceed the limits indicated in Table 36.1 under the test conditions described in 38.3 and 38.4.

38.3 The test is to be conducted with the ballasts installed in a complete vender, or a representative section thereof, with lighting loads connected.

38.4 The ballast and load are to be connected to a supply circuit having a power supply maintained at the voltage specified on the control equipment. The test ambient is to be approximately 25°C (77°F). Thermocouples are to be attached to open coils, ballast enclosures, and wiring. The test is to be continued until components reach constant temperatures.

39 Insulation Resistance Test

39.1 A vender employing insulating material liable to be affected adversely by moisture under conditions of use shall have an insulation resistance of not less than 50,000 ohms between live parts and interconnected dead metal parts after exposure for 24 hours to moist air having a relative humidity of 85 ±5 percent at a temperature of 32 ±2°C (90 ±4°F).

40 Rain Test

40.1 A vender intended for use in protected or outdoor locations shall be subjected to a rain exposure without creating a risk of electric shock due to current leakage or insulation breakdown.

- b) The label cannot be defaced or be removed as demonstrated by scraping across the test panel with a flat metal blade 1/16 inch (1.6 mm) thick, held at a right angle, to the test panel.
- c) The printing is legible and is not defaced by rubbing with thumb or finger pressure.

58.2 Oven-aging test

58.2.1 Three samples of the label applied to test surfaces as in the intended application are to be placed in an air oven maintained at the temperature indicated in Table 58.1 for 240 hours.

Table 58.1
Oven-aging test temperatures

Maximum temperature of surface to which applied ^a	Test temperature
60°C (140°F) or less	87°C (189°F)
80°C (176°F) or less	105°C (221°F)
100°C (212°F) or less	121°C (250°F)
125°C (257°F) or less	150°C (302°F)
150°C (302°F) or less	180°C (356°F)
Over 150°C (302°F)	b

^a As measured during temperature tests.

^b A label which is applied to a surface attaining a temperature greater than 150°C (302°F) during the temperature tests is to be oven-aged at a temperature which is representative of the temperatures attained by the vender during normal and abnormal operation.

58.3 Immersion test

58.3.1 Three samples of the label applied to test surfaces as in the intended application are to be placed in a controlled atmosphere maintained at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) with a 50 ± 5 percent relative humidity for 24 hours. The samples are then immersed in water at a temperature of $21 \pm 2^\circ\text{C}$ ($69.8 \pm 3.6^\circ\text{F}$) for 48 hours.

58.4 Standard atmosphere test

58.4.1 Three samples of the label applied to test surfaces as in the intended application are to be placed in a controlled atmosphere maintained at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) with 50 ± 5 percent relative humidity for 72 hours.

58.5 Unusual condition exposure test

58.5.1 If the labels are exposed to unusual conditions in service, such as oil, grease, cleaning solutions, soft drink syrup, or the like, three samples of the label applied to test surfaces as in the intended application are to be placed in a controlled atmosphere maintained at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$) with a 50 ± 5 percent relative humidity for 24 hours. The samples are then immersed for 48 hours in a solution representative of service use maintained at the temperature the solution would attain in service, but in no case less than $23 \pm 2^\circ\text{C}$.

MANUFACTURING AND PRODUCTION TESTS

59 Pressure Tests

59.1 Each vender shall be tested and proved tight at pressures not less than those design pressure(s) marked on the vender. See 62.8.

Exception: A method other than pressure testing at the design pressure may be employed if it can be demonstrated that the alternate test method produces results that are at least equivalent to the pressure test method.

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

59.3 The manufacturer shall periodically conduct a strength test on refrigerant-containing or carbon dioxide pressured parts of the shell type, including compressor shells which have an inside diameter greater than 3 inches (76 mm), except that ASME Code vessels bearing the Code "U" symbol need not be retested. The tests shall be conducted on at least one sample of each size and type. The sample shall not fail when subjected to pressures indicated under Strength Test, Section 55.

60 Grounding Continuity Tests

60.1 The manufacturer shall test each vender and accessory that has a power-supply cord to determine that electrical continuity exists between the device and the grounding blade of the attachment-plug.

60.2 For this test, the manufacturer is to employ a resistance indicating instrument with leads and terminals by which the grounding circuit continuity may be determined.

60.3 Where internal parts, as referred to in 9.1.1, are determined in the investigation of the device to be acceptably bonded to the frame and enclosure of the vender, a test which determines the electrical continuity between the grounding blade and the frame or enclosure is sufficient.

61 Dielectric voltage-Withstand Tests

61.1 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.

61.1 revised May 3, 1996

61.1.1 The production-line test shall be conducted in the time and at the potential specified in either Condition A or Condition B of Table 61.1.

61.1.1 added May 3, 1996

Table 61.1
Production-line test conditions

Product rating	Condition A			Condition B		
	Potential, volts ac ^c volts dc		Time, seconds	Potential, volts ac ^c volts dc		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 61.1 added May 3, 1996

61.2 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.

61.2 revised May 3, 1996

61.2.1 The test shall be conducted when the vending machine is complete – fully assembled. It is not intended that the vending machine be unwired, modified, or disassembled for the test.

Exception No. 1: Parts such as snap covers or friction-fit knobs that would interfere with 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 vending machine. Any component not included shall not affect the results with respect to determination of possible risk of electric shock resulting from miswiring, defective components, insufficient spacings, and the like.

61.2.1 added May 3, 1996

61.2.2 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).

61.2.2 added May 3, 1996

61.3 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.

61.3 revised May 3, 1996

61.4 The test equipment shall have a means of:

- a) Indicating the test potential,
- b) An audible or visual indicator of electrical breakdown, and
- c) Either a manually reset device to restore the equipment after electrical breakdown or an automatic reject feature of any noncomplying unit.

When an ac test potential is applied, the test equipment shall include a transformer having an essentially sinusoidal output.

61.4 revised May 3, 1996

61.5 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 a 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.

61.5 added May 3, 1996

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

61.6 added May 3, 1996

61.7 During the test,

- a) The primary switch is to be in the on position,
- b) Both sides of the primary circuit of the product are to be connected together and to one terminal of the test equipment, and
- c) The second test-equipment terminal is to be connected to accessible dead metal.

Exception: *A product having circuitry that is resistive, high-impedance winding, or the like and is 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.*

61.7 added May 3, 1996

MARKING**62 General**

62.1 Unless otherwise specifically indicated, every marking specified in this standard shall be permanent.

62.2 A marking that is required to be permanent shall be molded, die-stamped, paint-stenciled, stamped or etched metal that is permanently secured or indelibly stamped on pressure sensitive labels secured by adhesive that, upon investigation, (see Label Adhesion Tests, Section 58), is found to be acceptable for the application. Ordinary usage, handling and storage of the vender is to be considered in the determination of the permanence of the marking.

62.3 A marking that is required to be permanent shall be located on a part:

- a) That would require tools for removal, or
- b) That cannot be removed without impairing the operation of the vender.

62.4 A cautionary marking shall be prefixed by the word CAUTION, WARNING, or DANGER in letters no less than 1/8 inch (3.2 mm) high. The remaining letters of such marking shall be no less than 1/16 inch (1.6 mm) high.

62.5 Each vender shall be marked with the manufacturer's or private labeler's name or identifying symbol, a distinctive type or model designation, the electrical rating, the kind and amount of refrigerant in pounds or ounces, or both, and the high and low side design pressures. Venders equipped with more than one refrigeration system shall be marked to indicate the amount of refrigerant in each system.

62.6 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.

62.6 revised May 3, 1996

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

62.7 revised May 3, 1996

62.8 The high and low side design pressures marked on the vender shall not be less than the values recorded during the temperature and pressure test, Section 36, nor less than the applicable value indicated in Table 62.1. For other refrigerants, the minimum design pressure shall not be less than the values recorded during the temperature and pressure test, Section 36, nor less than the saturation pressure of the refrigerant at the following temperatures:

- a) 26.5°C (80°F) for low sides.
- b) 40.5°C (105°F) for water cooled high sides.
- c) 51.7°C (125°F) for air cooled high sides.

Table 62.1

Refrigerant	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)

Table 62.1 revised May 3, 1996

62.9 With regard to the exception to 8.3.8, venders and accessories that are provided with separate power-supply cords shall be marked with the word "CAUTION" and with the following or equivalent wording: "Risk of electric shock. More than one power-supply cord. Disconnect all power-supply cords before servicing."

62.10 If a supporting device as described in 41.3 is required for compliance with the Stability Test and the supporting device is not permanently fixed in position, the vender shall be marked "CAUTION – Door Support Device Needed For Stability. Do Not Defeat Its Function" or the equivalent. The warning marking shall be located adjacent to the supporting member so as to be readily visible when the door is opened at an angle of 90 degrees with the cabinet:

62.11 Each vender shall be permanently marked with one of the applicable following statements or its equivalent. The marking shall be located on or adjacent to the electrical rating plate of the vender.

- a) For Indoor Use Only.
- b) Suitable For Outdoor Use.
- c) Suitable For Protected Locations – See Installation Instructions a.

^a Specify location if instructions are not located adjacent to marking.

62.12 A vender that is intended for use in protected locations, shall be provided with complete instructions indicating the manufacturer's recommendations concerning the use and/or installation of any canopies, marquees, shelters, and the like, which may be necessary for the protection of the vender. The manufacturer's instructions shall be located where they are accessible without removing panels, covers, accessories, subassemblies, and the like. The instructions may be located inside the vender if they are accessible through the front door.

62.13 If a manufacturer produces venders at more than one factory, each such vender shall have a distinctive marking to identify it as the product of a particular factory.

62.14 Each vender shall be marked on or near the vender nameplate with the date of manufacture, which may be in code.

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Refrigerated Vending Machines

