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Underwriters Laboratories Inc.®



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

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

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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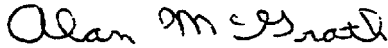
January 9, 1997

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.

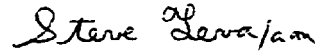
Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.



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REVIEWED BY:



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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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March 15, 1995

Revision pages for

Standard for

Refrigerant-Containing Components and Accessories, Nonelectrical

UL 207, Sixth Edition

Attached to this transmittal notice is a revision of the Sixth edition of UL 207.

A CHANGE ON A PAGE DATED MARCH 15, 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.

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 207-1994.

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: March 15, 1995)
2	—
3 – 5	March 25, 1993
6 – 11	March 15, 1995
12	March 25, 1993
13	March 15, 1995
14	March 25, 1993
15	February 25, 1994
16 – 19	March 25, 1993
20, 20A, 21	February 25, 1994

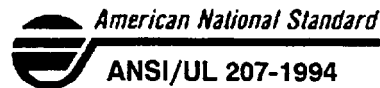


Documents

Document Sharing Hub

MARCH 25, 1993

(Title Page Reprinted: March 15, 1995)



1

UL 207**Standard for**

**Refrigerant-Containing Components and
Accessories, Nonelectrical**

First Edition – January, 1954
 Second Edition – October, 1973
 Third Edition – May, 1975
 Fourth Edition – January, 1982
 Fifth Edition – December, 1986

The First edition was titled Refrigerant-Containing Components and numbered UL 207(C).

Sixth 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 Z263.1-1975, January 22, 1975
 Approved as ANSI/UL 207-1981, December 14, 1981
 Approved as ANSI/UL 207-1981(R1986), August 15, 1986
 Approved as ANSI/UL 207-1994, November 14, 1994

The Department of Defense (DoD) has adopted UL 207 on April 30, 1976. The publication of revised pages or 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.

ISBN 1-55989-346-X**COPYRIGHT © 1975, 1995 UNDERWRITERS LABORATORIES INC.**

INTRODUCTION

1 Scope

1.1 These requirements cover nonelectrical refrigerant-containing components and accessories, intended for field installation in accordance with the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15, in refrigeration systems, air conditioning equipment, or both, charged with the refrigerants identified for use in the component or accessory. The requirements also apply to components and accessories intended for use by manufacturers in factory-assembled systems or units, in which case the component or accessory is also judged under the requirements for the individual system or unit.

1.2 These requirements do not apply to:

- a) Electric valves and electric refrigeration controllers, hermetic refrigerant motor-compressors, tubing fittings such as flare or compression type fittings, and the like, which are covered in or as part of separate, individual requirements.
- b) Electrical components of assemblies incorporating these refrigerant-containing components or accessories, and
- c) Pressure vessels bearing the ASME Code "U" symbol which are within the Scope of the ASME Boiler and Pressure Vessel Code, Section VIII.

1.3 A product that contains features, characteristics, components, materials, or systems new or different from those in use when the standard was developed, 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 level of safety for the user of the product as originally anticipated by the intent of this standard.

2 General

2.1 Components

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

2.1.2 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.

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

2.1.4 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.

2.2 Units of Measurement

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

2.3 Terminology

2.3.1 As used in this standard, the term "component" refers to a refrigerant-containing component or accessory unless otherwise specified.

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 General

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

3.1.1 revised March 15, 1995

3.2 Refrigerant-containing components

3.2.1 **ACCUMULATOR** – A storage chamber for low side liquid refrigerant; also known as surge drum, surge header. Also, a pressure vessel whose volume is used in a refrigerant circuit to reduce pulsation.

3.2.2 **COMPRESSOR, OPEN-TYPE** – A refrigerant compressor with a shaft or other moving part extending through its casing to be driven by an outside source of power thus requiring a shaft seal or equivalent rubbing contact between a fixed and moving part.

3.2.3 **CONDENSER COIL** – A condenser constructed of pipe or tubing other than a shell and tube or shell and coil type.

3.2.4 **CONDENSER, SHELL-AND-TUBE (OR SHELL-AND-COIL)** – A condenser in which a nest of tubes or pipes, or a coil of tube or pipe, is contained in a shell. The tube(s) or pipe(s) carries fluid through it while the shell is also provided with an inlet and outlet for fluid flow.

3.2.5 **CONDENSER, TUBE-IN-TUBE** – Consists of one or more assemblies of two tubes, one within the other, in which the refrigerant vapor is condensed either in the annular space or in the inner tube.

3.2.6 **CONDENSER, WATER-COOLED** – An assembly of elements by which the flows of the refrigerant vapor and water are maintained in such a heat transfer relationship that the refrigerant vapor is condensed into a liquid and the water is heated.

3.2.7 **DRIER** – A device containing a desiccant placed in the refrigerant circuit, its primary purpose being to collect and hold within the desiccant all water in the system in excess of the amount which can be tolerated in the circulating refrigerant.

3.2.8 **EVAPORATOR COIL** – An evaporator constructed of pipe or tubing other than a shell-and-tube or shell-and-coil type.

3.2.9 **FILTER** – A device intended to remove solid material from a fluid.

3.2.10 HEAT EXCHANGER (INTERCHANGER) – A device specifically designed to transfer heat between refrigerant in the high side and low side of the system.

3.2.11 LIQUID RECEIVER – A vessel permanently connected to a system by inlet and outlet pipes for the storage of liquid refrigerant.

3.2.11 revised March 15, 1995

3.2.12 MUFFLER – Intended to dampen or remove hot gas pulsations set-up by a compressor, inserted in the discharge line as close to the compressor as is practical.

3.2.13 OIL SEPARATOR – A device for separating oil and oil vapor from the refrigerant, usually installed in the compressor discharge line.

3.2.14 STRAINER – A device for withholding foreign matter from a flowing liquid or gas.

3.3 Accessories

3.3.1 FUSIBLE PLUG – A device having a predetermined-temperature fusible member for the relief of pressure.

3.3.2 LIQUID INDICATOR – A device located in the liquid line of a refrigerating system and having a sight port by which liquid flow may be observed.

3.3.3 PRESSURE-RELIEF DEVICE – A pressure actuated valve or rupture member designed to automatically relieve excessive pressure.

3.3.4 PRESSURE-RELIEF VALVE – A pressure actuated valve held closed by a spring or other means and designed to automatically relieve pressure in excess of its setting.

3.3.5 RUPTURE MEMBER – A device which will rupture at a predetermined pressure.

3.3.6 VALVE, CHARGING – A valve used to charge or add refrigerant to the system, or add oil to the compressor crankcase.

3.3.7 VALVE, CHECK – A valve allowing (fluid) flow in one direction only.

3.3.8 VALVE, STOP – A device intended to shut off the flow of refrigerant

3.4 Terminology

3.4.1 CONDENSER – That part of the system designed to liquefy refrigerant vapor by removal of heat.

3.4.2 CRITICAL PRESSURE, CRITICAL TEMPERATURE AND CRITICAL VOLUME – Terms given to the state points of a substance at which liquid and vapor have identical properties. Above the critical pressure or critical temperature there is no line of demarcation between liquid and gaseous phases.

3.4.3 DESICCANT – Any adsorbent that removes water or water vapor from the refrigerant.

3.4.4 DESIGN PRESSURE – The maximum allowable working pressure for which a specific part of a system is designed.

3.4.5 EVAPORATOR – That part of the system designed to vaporize liquid refrigerant to produce refrigeration.

3.4.6 **FIN** – An extended surface, such as metal sheets attached to tubes, intended to increase the heat transfer area.

3.4.7 **HIGH SIDE** – The parts of a refrigerating system subjected to condenser pressure.

3.4.7 revised March 15, 1995

3.4.8 **JOINT, BRAZED** – A gastight joint obtained by the joining of metal parts with alloys which melt at temperatures higher than 800°F (427°C) but less than the melting temperatures of the joined parts.

3.4.9 **JOINT, MECHANICAL** – A gastight joint obtained by the joining of metal parts through a positive holding mechanical construction.

3.4.10 **JOINT, SOLDERED** – A gastight joint obtained by the joining of metal parts with metallic mixtures or alloys which melt at temperatures not exceeding 800°F (427°C) and above 400°F (204°C).

3.4.11 **JOINT, WELDED** – A gastight joint obtained by the joining of metal parts in the plastic or molten state.

3.4.12 **LIMITED-CHARGE SYSTEM** – A system in which, with the compressor idle, the internal volume and total refrigerant charge are such that the design pressure will not be exceeded by complete evaporation of the refrigerant charge.

3.4.13 **LOW SIDE** – The parts of a refrigerating system subjected to evaporator pressure.

3.4.14 **MANIFOLD** – That portion of the refrigeration circuit in which several branches are close together. Also, a single piece in which there are several fluid paths.

3.4.15 **PIPING** – The pipe or tube mains for interconnecting the various parts of a refrigerating system. Piping includes pipe, flanges, bolting, gaskets, valves, fittings, the pressure containing parts of other components such as expansion joints, strainers, and devices which serve such purposes as mixing, separating, snubbing, distributing, metering or controlling flow, pipe supporting fixtures and structural attachments.

3.4.16 **PRESSURE, SATURATION** – The pressure at which there is stable coexistence of the vapor and liquid, or the vapor and solid phase.

3.4.17 **PRESSURE, SUCTION (BACK)** – The operating pressure measured in the suction line at the compressor inlet.

3.4.18 **PRESSURE, VAPOR** – The pressure exerted by a vapor. Sometimes synonymous with saturated vapor pressure.

3.4.19 **PRESSURE-LIMITING DEVICE** – A pressure-responsive mechanism designed to automatically stop the operation of the pressure imposing element at a predetermined pressure.

3.4.20 **REFRIGERANT** – A substance used to produce refrigeration by its expansion or vaporization.

3.4.21 **TEMPERATURE, SATURATION** – For a fluid, the boiling point corresponding to a given pressure; evaporation temperature; condensation temperature.

3.4.22 **TUBE, FINNED** – A heat transfer tube or pipe with extended surface in the form of fins, discs or ribs.

3.4.23 **TUBE, SEAMLESS** – A tube produced with an initially continuous periphery.

3.4.24 TUBE, SOFT COPPER – A seamless, soft copper tube, annealed to assure quality for bending and flaring.

3.4.25 TUBE, WELDED – A tube made from plate, sheet or strip with welded longitudinal or helical joint.

3.4.26 ULTIMATE STRENGTH – The highest stress level which the component can tolerate without rupture.

3.4.26 revised March 15, 1995

3.4.27 UNPROTECTED TUBING – Tubing which is not protected by an enclosure or suitable location so that it is exposed to crushing, abrasion, puncture or similar mechanical damage under installed conditions.

3.4.28 VESSEL, PRESSURE – Any refrigerant-containing receptacle of a refrigerating system, other than evaporators [each separate section of which does not exceed 1/2 cubic foot (0.014 m³) of refrigerant-containing volume], evaporator coils, compressors, condenser coils, controls, headers and piping.

CONSTRUCTION

4 Materials

4.1 The material used in the fabrication and assembly of a component, such as the desiccant in a drier, shall be compatible with the type of refrigerant and oil used.

4.2 Copper or brass materials shall not be used in the fabrication or assembly of a component intended to handle ammonia as a refrigerant.

4.3 Magnesium alloys shall not be used in the fabrication or assembly of a component intended to handle any of the halogenated refrigerants.

4.4 Aluminum, zinc, or magnesium alloys shall not be used in the fabrication or assembly of a component intended to handle methyl chloride refrigerant.

4.5 All pressure retaining components shall be of corrosion-resisting materials or shall be protected against external corrosion.

4.6 With reference to 4.5, components shall be constructed of corrosion-resistant material, such as copper, or shall be plated, dipped, coated, or otherwise treated to resist external corrosion. Generally, a coating of water-resistant paint is adequate for protection against external corrosion for iron or steel components. Aluminum may be used where the material is not subject to galvanic corrosion.

4.7 Tubing connections, including fittings, of dissimilar metals, such as aluminum and copper, shall be protected against moisture to minimize galvanic action.

4.8 A component made of drawn or machined brass shall be capable of withstanding, without cracking, a Mercurous-Nitrate Immersion Test. See Section 17.

5 Refrigerant Tubing

5.1 Copper or steel tubing provided to interconnect components shall have a wall thickness not less than indicated in Table 5.1. See 5.3.

5.2 Special alloys or constructions used in component, including tubing with a wall thickness less than indicated in Table 5.1 may be considered acceptable. Among the factors taken into consideration when judging the acceptability are:

- Resistance to mechanical abuse,
- Strength against internal pressure,
- Resistance to corrosion,
- Protection against refrigerant contamination, and
- Conformity with requirements of safety codes; such as the Safety Code for Mechanical Refrigeration, ANSI/ASHRAE 15-1992, as compared to tubing of the minimum wall thickness indicated.

5.2 revised March 15, 1995

5.3 In judging the protection of tubing, consideration is given to the likelihood of damage occurring during handling, packing and shipment. Shielding to prevent accidental damage from objects such as tools falling on or otherwise striking the tubing shall be provided in the form of baffles, channels, flanges, perforated metal, or similar means.

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

Table 5.1
Wall thickness for copper and steel tubing

Outside diameter, inches (mm)		Minimum wall thickness, inches ^a (mm)					
		Copper				Steel	
		Protected		Unprotected ^b			
3/16	(4.76)	0.0245	(0.62)	0.0265	(0.67)	0.025	(0.64)
1/4	(6.35)	0.0245	(0.62)	0.0265	(0.67)	0.025	(0.64)
5/16	(7.94)	0.0245	(0.62)	0.0265	(0.67)	0.025	(0.64)
3/8	(9.53)	0.0245	(0.62)	0.0265	(0.67)	0.025	(0.64)
1/2	(12.70)	0.0245	(0.62)	0.0285	(0.72)	0.025	(0.64)
5/8	(15.88)	0.0315	(0.80)	0.0315	(0.80)	0.032	(0.81)
3/4	(19.05)	0.0315	(0.80)	0.0385	(0.98)	0.032	(0.81)
7/8	(22.23)	0.0410	(1.04)	0.0410	(1.04)	0.046	(1.17)
1	(25.40)	0.0460	(1.17)	0.0460	(1.17)	—	
1-1/8	(28.58)	0.0460	(1.17)	0.0460	(1.17)	0.046	(1.17)
1-1/4	(31.75)	0.0505	(1.28)	0.0505	(1.28)	0.046	(1.17)
1-3/8	(34.93)	0.0505	(1.28)	0.0505	(1.28)	—	
1-1/2	(38.10)	0.0555	(1.41)	0.0555	(1.41)	0.062	(1.58)
1-5/8	(41.28)	0.0555	(1.41)	0.0555	(1.41)	—	
2-1/8	(53.98)	0.0640	(1.63)	0.0640	(1.63)	—	
2-5/8	(66.68)	0.0740	(1.88)	0.0740	(1.88)	—	

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

^b See 3.4.27.

Table 5.1 revised February 25, 1994