

UL 412

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Refrigeration Unit Coolers

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UL Standard for Safety for Refrigeration Unit Coolers, UL 412

Fourth Edition, Dated April 26, 2004

Revisions: This Standard contains revisions through and including February 2, 2007.

Summary of Topics

These editorial revisions to ANSI/UL 412 replace all references to UL 1020, the Standard for Thermal Cutoffs for Use in Electrical Appliances and Components, with reference to UL 60691, the Standard for Thermal-Links – Requirements and Application Guide. UL 1020 was withdrawn and superseded by UL 60691.

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

The revisions dated February 2, 2007 include a reprinted title page (page1) for this Standard.

The revisions dated February 2, 2007 editorially replace all references to UL 1020 with the reference to UL 60691.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

As indicated on the title page (page1), this UL Standard for Safety has been adopted by the Department of Defense.

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

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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:

Page	Date
1	February 2, 2007
2-37	April 26, 2004
38	February 2, 2007
39-80	April 26, 2004
A1-A2	February 2, 2007

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1

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Standard for Refrigeration Unit Coolers

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April 26, 2004

The most recent designation of ANSI/UL 412 as an American National Standard (ANSI) occurred on July 29, 2003. The ANSI approval for this standard does not include the Cover Page, transmittal pages, Title Page, Foreword, or Appendix.

This ANSI/UL Standard for Safety, which consists of the Fourth edition with revisions through February 2, 2007, is under continuous maintenance, whereby each revision is ANSI approved upon publication.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc. and is not part of the ANSI Standard.

The Department of Defense (DoD) has adopted UL 412 on April 9, 1992. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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CONTENTS

INTRODUCTION

1 Scope	6
2 General	6
2.1 Components	6
2.2 Units of measurement	7
2.3 Undated reference	7
3 Glossary	7
4 Installation and Operating Instructions	9

CONSTRUCTION

5 General	9
6 Nonmetallic Material Classification	10
7 Ignition Sources	10
8 Nonmetallic Material Application and Location	12
9 Assembly	15
9.1 Mechanical protection	15
9.2 Accessibility of Live Parts from Openings in the Outer Cabinet	18
9.3 Mounting of parts	21
10 Accessories	22
11 Enclosures	23
11.1 General	23
11.2 Doors and covers	24
12 Barriers	26
13 Field-Supply Connections	26
13.1 General	26
13.2 Grounding	28
14 Internal Wiring and Wiring Methods	29
15 Separation of Circuits	33
16 Bonding for Grounding	34

ELECTRICAL COMPONENTS

17 Capacitors	36
18 Current-Carrying Parts	37
19 Electric Defrost Heaters	37
19.1 Heater elements	37
19.2 Heater temperature limiting control	38
20 Insulating Material	38
21 Motors and Motor Overload Protection	39
22 Switches and Controllers	43
23 Transformers	44
24 Valves and Solenoids	44

SPACINGS

25 High-Voltage Circuits	44
26 Extra-Low Voltage Circuits	47

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REFRIGERATION SYSTEM

27 Refrigerant	47
28 Refrigerant Tubing and Fittings	48
29 Refrigerant-Containing Parts	49
30 Required Discharge Capacity	50
31 Relief Valves	50
32 Fusible Plugs or Rupture Members	51

PERFORMANCE

33 General	51
33.1 Test voltage	51
33.2 Temperature measurements	51
34 Tests on Nonmetallic Materials	52
35 Input Test	53
36 Temperature Test – Cooling Mode	53
37 Electrical Defrost Test	55
38 Dielectric Voltage Withstand Test	56
39 Evaporator Fan Motor Failure Test	57
40 Overflow Test	57
41 Static Loading Test	58
42 Defrost Heater Control Tests	58
42.1 Endurance test	58
42.2 Calibration test	59
43 Burnout Test	59
43.1 Burnout defrost heater	59
43.2 Other components	60
44 Burnout Test – Impedance Protected Motors	60
44.1 Nonmetallic Materials Evaluation	60
45 Overvoltage and Undervoltage Tests	61
46 Current Overload Test – Bonding Conductors and Connections	61
47 Limited Short-Circuit Test	62
47.1 General	62
47.2 Motor overload protective devices	63
47.3 Bonding conductors and connections	64
47.4 Motor circuit conductors and connections	64
48 Accelerated Aging Test – Electric Heaters	64
49 Reliability Test – Heater Terminations	65
50 Insulation Resistance Test	65
50.1 Electric heaters	65
50.2 Thermal and/or acoustical insulating material	65
51 Strength Tests – Pressure Containing Components	66
52 Rupture Member Test	66
53 Fusible Plug Test	66
54 Marking Label Adhesion Tests	67
55 Fastener Strength Test	67
56 Strain Relief Test	68

MANUFACTURING AND PRODUCTION TESTS

57 Pressure Test	68
58 Production Line Dielectric Voltage Withstand Tests	69

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MARKING

59 General	71
60 Refrigerant Markings	74
61 Electrical Markings	75
62 Cautionary Markings	77
63 Accessory Markings	79

APPENDIX A

Standards for Components.....	A1
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INTRODUCTION

1 Scope

1.1 These requirements cover unit coolers intended for use in refrigerators, freezers, refrigerated warehouses, walk-in coolers, and the like. They are designed for connection to alternating current (ac) circuits rated not more than 600 volts.

1.2 These requirements do not apply to fan-coil units intended for comfort cooling, heating, or both, or to other air-conditioning equipment or components covered by individual requirements.

1.3 Requirements for installation of unit coolers are included in the National Electrical Code, NFPA 70, and the Safety Code for Mechanical Refrigeration, ASHRAE 15.

1.4 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 Undated reference

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

3 Glossary

3.1 For the purpose of this Standard, the following definitions apply.

3.2 ACCESSORY – An optional electrical device or other component intended for installation in or connection to a unit cooler for the purpose of modifying or supplementing the functions of the unit cooler. It may be factory installed or intended for installation by service personnel.

3.3 CIRCUITS, ELECTRICAL –

a) Extra-Low-Voltage – A circuit that has an AC potential of not more than 42.4 V peak (30 V rms), and power of 100 VA or less; or a 30 V dc circuit:

- 1) Supplied by a primary battery,
- 2) Supplied by a Class 2 transformer, or
- 3) Supplied by a combination of a transformer and fixed impedance that, as a unit, complies with all the performance requirements for a Class 2 transformer.

A circuit that is derived from a circuit that exceeds 30 V by connecting resistance or impedance, or both, in series with the supply circuit to limit the voltage and current, is not an extra-low-voltage circuit.

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

3.4 CONTROL, DEFROST CYCLE – A control that is intended to regulate a normal defrost cycle.

3.5 CONTROL, TEMPERATURE-LIMITING – A control which serves to prevent excessive temperature and is not intended to function during normal defrost cycle.

3.6 DESIGN PRESSURE – The maximum acceptable working pressure for which a unit cooler is designed.

3.7 ENCLOSURE – An enclosure is a barrier, cabinet, or both, that does any combination of the following:

- a) Renders inaccessible all or any part(s) that otherwise presents a risk of electric shock,
- b) Reduces the risk of contact with part(s) that cause injury to persons,
- c) Prevents propagation of flame due to electrical disturbances occurring within, or

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d) Reduces the risk of mechanical damage to wiring, electrical components, and refrigeration tubing.

3.8 ENCLOSURE, GROUP 1 – A unit cabinet that serves as the isolation means for an ignition source(s). Separate cabinets or control boxes located within or mounted on the unit enclosure are Group 1 enclosures if they serve as the isolation means for an ignition source(s). Barriers that serve to isolate an ignition source(s) are also Group 1 enclosures. See Table 34.1.

3.9 CABINET, GROUP 2 – A cabinet not serving as the ultimate enclosure for ignition sources, (Group 2, See Table 34.1).

3.10 FUNCTIONAL PART, GROUP 3 – A part used to maintain the intended relative physical position of fixed or moving parts, or maintain the integrity of the structure. A cabinet liner that supports an electrical component is a functional part. A "functional part" does not mean the part has been evaluated for the direct support of live parts. See Table 34.1, Group 3.

3.11 NONFUNCTIONAL PART, GROUP 4 – A part, such as thermal insulation or decorative material, that does not serve as electrical insulation or to support (direct or indirect) or enclose electrical components, maintain electric spacings, or protect against injury to persons. A nonfunctional part has an area greater than or equal to 1 ft² (0.093 m²). See Table 34.1, Group 4.

3.12 NONFUNCTIONAL PART, SMALL – A nonfunctional part as described in 3.11 and has an area of less than 1 ft² (0.093 m²). Examples are control knobs, buttons, insulating bushings, resilient mounts, clamps, and wiring straps.

3.13 ULTIMATE STRENGTH – The highest stress level which a refrigerant-containing component can tolerate without rupture.

3.14 UNIT COOLER – A direct-cooling, factory-made encased assembly, including a cooling element, fan(s) and motor(s). It may also incorporate means for defrosting of the cooling element.

3.15 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, condensers coils, controls, headers and piping.

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4 Installation and Operating Instructions

4.1 A unit cooler shall be provided with instructions containing directions and information which the manufacturer considers necessary for installation, use, and maintenance of the unit cooler.

4.2 A copy of the manufacturer's operating and installation instructions, or equivalent information intended to accompany each unit cooler, is to be furnished with the sample submitted for investigation. These instructions are to be used as a guide in the examination and test of the unit cooler. For this purpose, a printed edition is not required initially if rough draft instructions or information as to what the instructions will include are submitted for review as part of the investigation.

CONSTRUCTION

5 General

5.1 Ferrous metal parts used to support or retain electrical components in position shall be protected against corrosion by metallic or nonmetallic coatings, such as plating or painting.

Exception: This requirement does not apply to parts such as washers, screws, bolts, and the like where corrosion of such unprotected parts would not affect compliance with the requirements of this standard.

5.2 The requirements in 5.4 – Section 8 cover polymeric and wood materials used to form outer enclosures, nonfunctional or functional parts, and miscellaneous parts for indoor use only. These nonmetallic parts shall also comply with the requirements for outdoor use in the Standard for Polymeric Materials used in Electrical Equipment Evaluations, UL 746C, if the part is capable of being exposed to outdoor conditions. Table 34.1 indicates the properties to be evaluated, depending on its application.

Exception: These requirements do not apply to materials used as small nonfunctional parts, electrical insulation, or as a direct support of an uninsulated live parts. (See 3.12 and 5.3).

5.3 Nonmetallic materials that serve as electrical insulation or direct support of live parts shall comply with the requirements for electric insulation in the Standard for Polymeric Material – Use in Electrical Equipment Evaluations, UL 746C.

5.4 Wood or wood composite materials used to form the outer group 2 cabinet or a functional part including functional enclosures shall be evaluated for their flammability characteristics and shall be separated from ignition sources. See 6.1.

5.5 Wood or wood composite materials having a minimum thickness of 0.5 inch (12.7 mm) comply with the HB flammability rating.

5.6 A nonmetallic outer group 1 enclosure or group 2 cabinet having an area greater than 10 ft² (0.93 m²) shall have a flame spread index (FSI) of not more than 200 when tested in accordance with the radiant panel test method in the Standard Test Method for Surface Flammability of Materials using a Radiant Heat Energy Source, ASTM-E162.

Exception No. 1: The nonmetallic outer group 1 enclosure or group 2 cabinet shall be tested in accordance with the test for Surface Burning Characteristics of Building Materials, UL 723, to determine the flame spread index (FSI) in lieu of the radiant panel test method.

Exception No. 2: The nonmetallic outer group 1 enclosure or group 2 cabinet shall have a flammability rating of 5VA or 5VB in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

5.7 Polymeric parts shall not be molded from polymeric material that contains more than 25 percent thermoplastic regrind by weight and that has been dry blended by the molder with the same grade of virgin material, unless the material complies with these requirements.

Exception: Parts that are formed from HB or HBF materials need not comply.

6 Nonmetallic Material Classification

6.1 Materials are classified with respect to flammability characteristics that are established by the tests specified in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. Materials are assigned flammability ratings based on greatest to least resistance to flame and are identified as: 5VA, 5VB, V-0, V-1, V-2, HF-1, HF-2, HB, and HBF.

7 Ignition Sources

7.1 The items listed below are ignition sources when they are within the unit and are contacted using the probe in Figure 7.1.

- a) High-voltage uninsulated terminals,
- b) High-voltage open coils/windings,
- c) High-voltage open contacts,
- d) High-voltage wiring not employing VW-1 insulation, and
- e) High-voltage components (i.e. terminals, printed circuit board traces, open coil/windings and open contacts),

Exception No. 1: High-voltage Type S, SE, SO, SOO, ST, STO, STOO, SJ, SJE, SJO, SJOO, SJT, SJTO, and SJTOO power cords located within a Group 1, enclosure are not ignition sources.

Exception No. 2: When the jacketed Type S, SE, SO, SOO, ST, STO, STOO, SJ, SJE, SJO, SJOO, SJT, SJTO, and SJTOO power cords are stripped back less than or equal to 3 inches (76.2 mm) the conductors are not ignition sources.

Exception No. 3: Impedance protected motors employing open-coil or exposed winding constructions need not be separated as indicated in 8.1 if they comply with the Burnout Test – Impedance Protected Motors, Section 44.

Exception No. 4: Thermally protected motors having openings in their enclosures need not be separated as indicated in 8.1 if they comply with the requirements in 21.9 and 21.10.

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8 Nonmetallic Material Application and Location

8.1 A nonmetallic enclosure isolating an ignition source(s) shall be evaluated in accordance with Group 1 of Table 34.1. A nonmetallic enclosure not isolating an ignition source shall be evaluated in accordance with Group 2.

8.2 Nonmetallic functional and nonfunctional parts located within or mounted to the outer unit cabinet shall be evaluated in accordance with Groups 3 and 4 of Table 34.1.

8.3 Functional and nonfunctional parts formed from nonmetallic materials that are rated HB and HBF (not rated 5VA, 5VB, V-0, V-1, V-2, HF-1, HF-2) shall be separated from ignition sources as outlined in 8.5 and 8.6 and Figure 8.1.

8.4 An impedance protected motor employing an open-coil or exposed winding construction is not an ignition source when it complies with the Burnout Test – Impedance Protected Motors, Section 44.

8.5 A nonmetallic material located below the ignition source and within Space A of Figure 8.1 shall be isolated by means of a barrier, extending at least to the boundary surface of the space. A nonmetallic material located above the ignition source and within Space B of Figure 8.1 shall be isolated by means of a barrier, extending at least to the boundary surface of the space and so located that the distance between the nonmetallic material and ignition source is a minimum of 4 inches (102 mm). See Figure 8.1, Distance $X + Y$.

Exception: When the only ignition source is wiring not employing VW-1 insulation the distance between the nonmetallic material and the ignition source shall be a minimum of 2 inches (51 mm). See Figure 8.1, Distance $X + Y$.

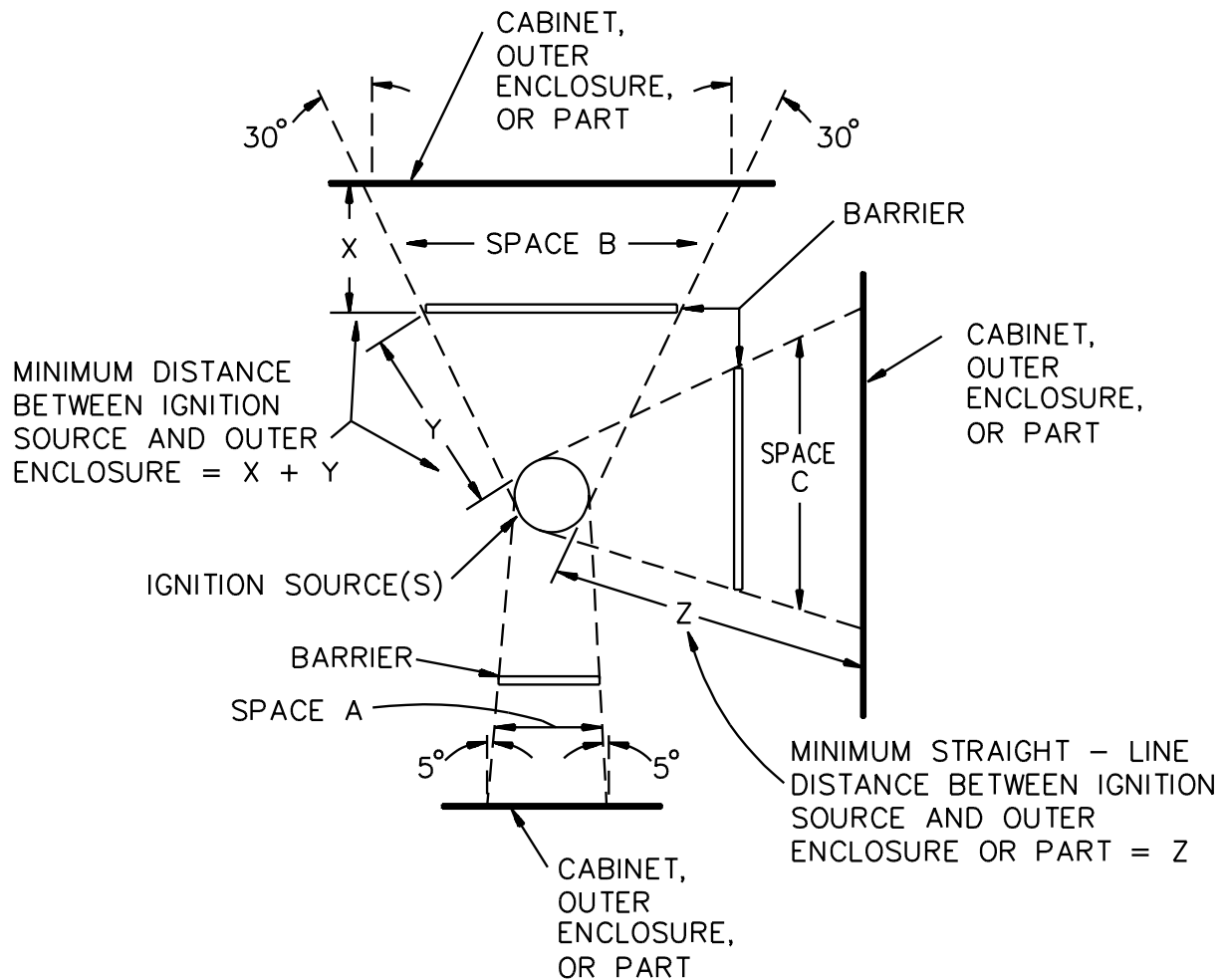
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Figure 8.1
Separation of ignition sources from nonmetallic materials



S2514C

Notes:

Space A – Represents the volume below the ignition source determined by a straight line that moves about the ignition source while remaining at the angle of 5° degrees from the vertical and is always so oriented that the volume is maximum.

Space B – Represents the volume above the ignition source determined in the same manner as Space A, except that the angle is 30° degrees from the vertical.

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8.6 A nonmetallic material located in the vertical plane as indicated in Figure 8.1, Space C, is considered isolated from the ignition source if it is separated by a distance of 4 inches (102 mm). A barrier shall be used for isolation provided the size of the barrier is such that the straight-line distance between the nonmetallic material and ignition source is a minimum of 4 inches (102 mm). See Figure 8.1, Distance Z.

Exception No. 1: When the only ignition source is wiring not employing VW-1 insulation, the distance between the nonmetallic material and the ignition source shall be a minimum of 2 inches (51 mm). See Figure 8.1, Distance Z.

Exception No. 2: A finned evaporator coil is a barrier in the vertical plane when the wiring is not accessible by a rod 1/4 inch (6.4 mm) in diameter and 2 inches (51 mm) long.

Exception No. 3: An evaporator coil is a bottom enclosure when the evaporator coil employs flat plate fins with a minimum of 12 fins per inch (12 fins per 25.4 mm) and two rows of tubing in depth.

8.7 Thermal insulation located between an outer group 1 metal enclosure or metal door and inner liner need not be tested for flammability if:

- a) All entrance and exit holes (for wiring, foaming, etc.) located within this volume are sealed and
- b) The securement of the outer group 1 enclosure surfaces is inherent in the construction or the maximum spacing between screws, spot welds, or other securement means on the outer metal enclosure does not exceed 6 inches (152.4 mm).

Exception: Holes in the outer metal enclosure need not be sealed if:

- a) *There are not more than two,*
- b) *Wiring is not routed through the hole, and*
- c) *The total area is no more than 1 inch² (645.2 mm²).*

8.8 For unsealed holes larger than 1 inch² (645.2 mm²) the thermal insulation must be rated HF-1.

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9 Assembly

9.1 Mechanical protection

9.1.1 Louvers and other openings in the enclosure shall be constructed and located to reduce the risk of unintentional contact with moving parts and hot surfaces that may cause injury. In determining compliance with this requirement, parts, such as covers, panels, or grilles used as part of the enclosure are to be removed unless tools are required for their removal.

9.1.2 The requirement of 9.1.1 does not apply to parts, such as covers, panels, or grilles which serve as guards provided:

- a) A warning marking as described in 62.2 identifies the guarded moving or hot part;
- b) The part is intended to be removed only by an attendant or serviceman; and
- c) The part is secured by four or more fasteners or a combination of two such fasteners and two hinges, two tabs, or the like. Disengagement of any one of the fasteners, hinges or tabs of a guard shall not result in exposure of moving parts or hot parts.

9.1.3 With reference to the fasteners in 9.1.2(c):

- a) Fasteners shall require manual operation such as a push, pull, or turning action to disengage. Magnetic catches and friction-type fasteners such as clips are not intended for this application.
- b) Disengagement of any one of the fasteners, hinges or tabs of a guard shall not result in exposure of moving parts or hot parts.

9.1.4 Fasteners shall be subjected to the Fastener Strength Test, Section 55, when they are used to:

- a) Secure parts required to maintain electrical spacings,
- b) Reduce the risk of unintentional contact with moving parts and hot surfaces, or
- c) Engage a nonmetallic part.

9.1.5 The rotor of a motor, a pulley, a gear, a belt, a fan blade, or other moving part shall be guarded or enclosed so that the minor dimension of any opening does not exceed the values indicated in 9.1.6 or 9.1.7.

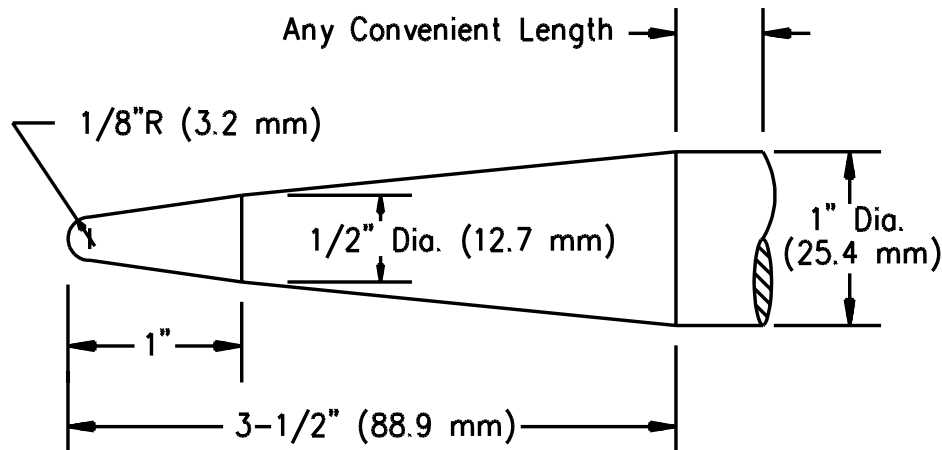
9.1.6 A fan blade employing a guard with openings having a minor dimension less than 1 inch (25.4 mm) shall be guarded such that the probe illustrated in Figure 9.1 cannot contact any part of the fan blade when inserted through openings in the guard with a force of 2.5 pounds (11.1 N).

Exception: The probe illustrated in Figure 9.1 may contact the trailing edge of a fan blade if the relationship between weight (w) in pounds, radius (r) in inches and speed (n) in revolutions per minute of the fan blade is such that K in the equation:

$$K = 6 \times 10^{-7} (wr^2n^2)$$

is less than 100.

Figure 9.1
Probe for fan blades



PA 160

9.1.7 A fan blade employing a guard with openings having a minor dimension 1 inch (25.4 mm) or larger, and any other moving part shall be guarded such that the distance from an opening to the moving part is in accordance with Table 9.1. The minor dimension shall not, in any case, exceed 3 inches (76.2 mm). For an opening having a minor dimension intermediate between two of the values shown in the table, the distance from the opening to the moving part shall not be less than that found by appropriate interpolation between the corresponding values in the right column of the table. The minor dimension of the opening is determined by the largest hemispherically tipped cylindrical probe that can be inserted through the opening with a force of 2.5 pounds (11.1 N).

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Table 9.1
Clearance from openings

Minor dimensions of opening ^{a,d}		Minimum distance from opening to moving part ^c	
Inches	(mm)	Inches	(mm)
1/4	(6.4)	3/8	(9.5)
3/8	(9.5)	1-1/4	(31.8)
1/2	(12.7)	2	(50.8)
3/4	(19.1)	3-5/8	(92.1)
1	(25.4)	5-1/4	(133.4)
1-1/2	(38.1)	8-3/8	(212.7)
2	(50.8)	11-5/8	(295.3)
Over 2 ^b	(Over 50.8)	30	(762.0)

^a Openings less than 1/4 inch (6.4 mm) are not to be considered.
^b But not more than 3 inches (76.2 mm). See 9.1.7.
^c Also applies to hot parts. See 9.1.9.
^d For fan blade guards that have openings with minor dimensions less than 1 inch see 9.1.7.

9.1.8 A moving part is not to be considered when judging compliance with 9.1.5, 9.1.6, and 9.1.7 if:

- a) The part is unlikely to be contacted through the opening because of the location of fixed components, including baffles, or
- b) The part is made inoperative when exposed through the use of interlocking devices.

9.1.9 When tested according to the Temperature Test – Cooling Mode, Section 36, and the Electric Defrost Test, Section 37, surfaces which exceed the temperature rises of Table 36.1(d)(2) and (d)(3) shall be guarded in accordance with 9.1.5 – 9.1.7.

Exception: The sheath of a defrost heater, which is not guarded in accordance with 9.1.3 – 9.1.8, may exceed the temperature permitted by Table 36.1(d)(2) and (d)(3) if the heater is in direct contact with the fins of the evaporator coil for the exposed length of the heater and:

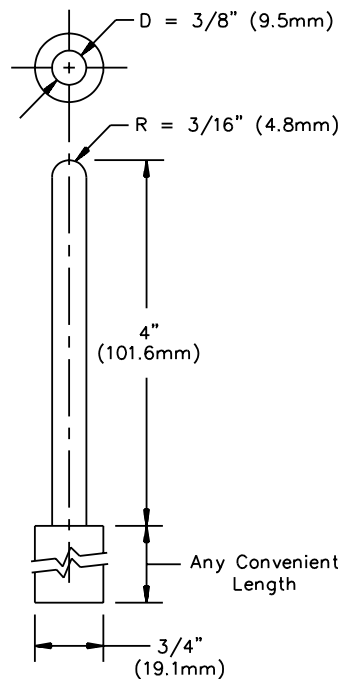
- a) The unit cooler is intended for installation such that the lowest part of the exposed defrost heater is 7 feet (2.1 m) or more above floor level and is marked in accordance with 62.5 and 62.7, or*
- b) The unit cooler is for use with a walk-in cooler or refrigerated warehouse and is marked in accordance with 62.6 and 62.7.*

9.1.10 A heater element, as installed in the complete unit cooler, shall be protected against mechanical damage. A copper or steel sheath that:

- a) Is at least 0.016 inches (0.41 mm) thick, or
- b) Cannot be contacted when the probe illustrated in Figure 9.2 is inserted with a force of 5 pounds (22.2 N),

is considered as protected against mechanical damage.

Figure 9.2
Probe



PA170A

9.2 Accessibility of Live Parts from Openings in the Outer Cabinet

9.2.1 Louvers and other openings in the enclosure shall be constructed and located to reduce the risk of accidental contact with uninsulated high-voltage live parts. Parts, such as covers, panels, or grilles used as part of the enclosure are to be removed unless tools are required for their removal or an interlock is provided.

9.2.2 If an opening in the enclosure will not permit the entrance of a 3/4 inch (19.1 mm) diameter rod, the probe illustrated in Figure 9.2 shall not touch any uninsulated live parts, and the probe illustrated in Figure 9.3 shall not touch any film coated wire when inserted through the opening. The probe shall not pass through grilles, screens, louvers, or the like, when a force of 5 pounds (22.2 N) is applied.

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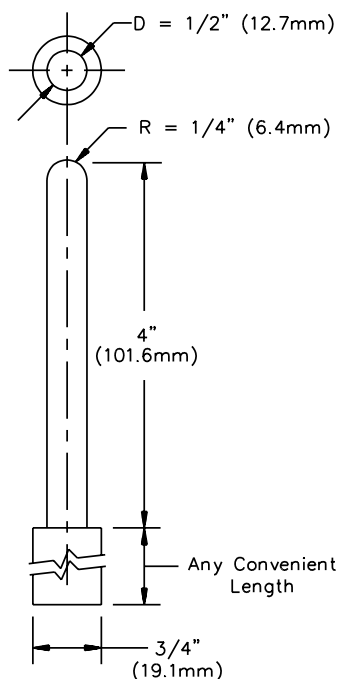
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Figure 9.3
Probe



PA170B

9.2.3 If an opening in the enclosure permits the entrance of a 3/4 inch (19.1 mm) diameter rod, the conditions described in Figure 9.4 shall be used in determining compliance with the requirements. The minor dimension of the opening shall not exceed 1 inch (25.4 mm) in any case.

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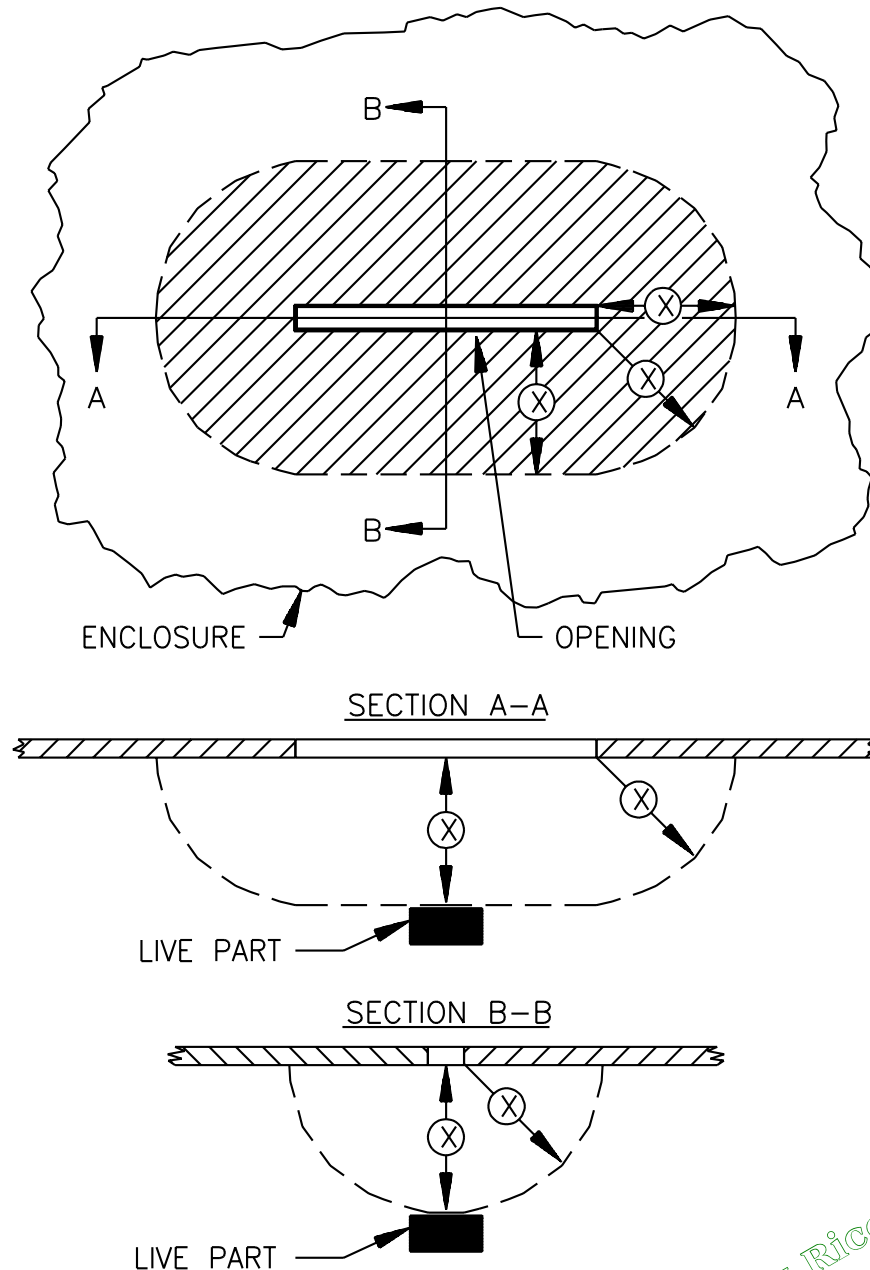
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Figure 9.4
Opening in enclosure



EC100A

The opening is acceptable if, within the enclosure, there is no uninsulated live metal part or enamel-insulated wire:

- Less than X inches (mm) from the perimeter of the opening, as well as
- Within the volume generated by projecting the perimeter X inches (mm) normal to its plane. X equals five times the diameter of the largest diameter rod which can be inserted through the opening, but not less than 4 inches (102 mm).

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9.2.4 In addition to the requirements of 9.2.1 – 9.2.3, uninsulated live parts inside the enclosure which are likely to be contacted by persons performing operations, such as replacing fuses, resetting manual-reset devices, oiling motors, or other such service operations, shall be located, guarded, or enclosed to reduce the risk of accidental contact unless tools are required to expose the live part. See 63.2.

9.2.5 A fuseholder shall be constructed, installed, or protected so that adjacent uninsulated high-voltage live parts, other than the screw shell of a plug fuseholder, cartridge fuse clips, or wiring terminals to the fuseholder, will not be exposed to contact by persons removing or replacing fuses. A barrier of vulcanized fiber or similar material employed as a guard for uninsulated high-voltage live parts shall be not less than 1/32 inch (0.8 mm) in thickness. A separation less than 4 inches (102 mm) from the insulating body of a fuse is considered to be adjacent.

9.2.6 Electrical components shall be located or enclosed to reduce the risk of wetting of uninsulated live parts by liquids due to accumulation, overflow, splashing, leakage, or defrost.

9.2.7 With regard to 9.2.6, it is assumed that drippage may occur from any portion of the evaporator. Accordingly, electrical components located beneath any portion of the evaporator including tubing, hairpin turns, return bends, fins, end plates and inlet and outlet tubes will require the use of barriers, baffles, or the like.

9.2.8 A condensate pan shall be constructed and located so that overflow due to a blocked drain will not wet uninsulated live parts or enameled wire. An overflow spout, drain hole, cutout, or the like, in the condensate pan may be acceptable for preventing dripping of water on electrical parts. The Overflow Test, Section 40, is to be conducted if it is not evident that the unit cooler complies with this requirement.

9.3 Mounting of parts

9.3.1 A switch, grounding lug, terminal board, or similar component shall be secured in position and shall be prevented from turning. See 9.3.2 – 9.3.4.

9.3.2 The requirement that a switch be prevented from turning will be waived if all of the following conditions are met:

- a) The switch is of a plunger or other type that does not tend to rotate when operated. A toggle switch is considered to be subject to forces that tend to turn the switch during the operation of the switch,
- b) The means of mounting the switch make it unlikely that operation of the switch will loosen it,
- c) The spacings are not reduced below the minimum required values if the switch rotates, and
- d) The operation of the switch is by mechanical means rather than direct contact by persons.

9.3.3 With reference to 9.3.1, the means for preventing rotation is to consist of more than friction between surfaces. A toothed lock washer that provides both spring take-up and an interference lock is acceptable as means for preventing a small stem-mounted switch or other device having a single-hole mounting means from turning.