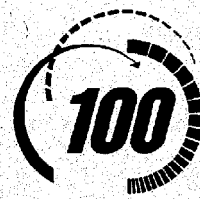


Standard for Safety

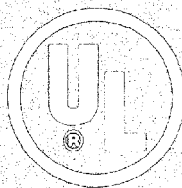
UL 680

ISBN 1-55989-995-6

Emergency Vault Ventilators and Vault-Ventilating Ports



a century of
public safety
est. 1894



Underwriters Laboratories Inc.®

Standard



Documents

Document Sharing Hub

**Underwriters Laboratories Inc.®**

Northbrook, Illinois • (847) 272-8800

Melville, New York • (516) 271-6200

Santa Clara, California • (408) 985-2400

Research Triangle Park,
North Carolina • (919) 549-1400

Camas, Washington • (360) 817-5500

Underwriters Laboratories Inc., founded in 1894, is chartered as a not-for-profit organization without capital stock, under the laws of the State of Delaware, to establish, maintain, and operate laboratories for the examination and testing of devices, systems and materials to determine their relation to hazards to life and property, and to ascertain, define and publish standards, classifications and specifications for materials, devices, products, equipment, constructions, methods, and systems affecting such hazards.

UL Standards for Safety are developed under a procedure which provides for participation and comment from the affected public as well as industry. The procedure takes into consideration a survey of known existing standards and the needs and opinions of a wide variety of interests concerned with the subject matter of the standard. Thus manufacturers, consumers, individuals associated with consumer-oriented organizations, academicians, government officials, industrial and commercial users, inspection authorities, insurance interests and others provide input to UL in the formulating of UL Standards for Safety, to keep them consonant with social and technological advances.

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



Underwriters Laboratories Inc.®

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

Underwriters Laboratories, Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety
for
Emergency Vault Ventilators and Vault-Ventilating Ports, UL 680

Seventh Edition, Dated April 29, 1996

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.

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.

UL's Standards for Safety are copyrighted by UL. Neither a printed copy of a Standard, nor the distribution diskette for a Standard-on-Diskette and the file for the Standard on the distribution diskette should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

Revisions of UL Standards for Safety are issued from time to time. A UL Standard for Safety is current only if it incorporates the most recently adopted revisions.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

UL will attempt to answer support requests concerning WordPerfect, Envoy, and Standards-on-Diskette. However, this support service is offered on a reasonable efforts basis only, and UL may not be able to resolve every support request. UL supports a Standards-on-Diskette only if it is used under the conditions and operating systems for which it is intended. UL's support policies may change from time-to-time without notification.

(Continued)

UL reserves the right to change the format, presentation, file types and formats, delivery methods and formats, and the like of both its printed and electronic Standards without prior notice.

Standards-on-Diskette purchasers agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgement (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing a Standard-on-Diskette on the purchaser's computer system.

If a single-user version Standards-on-Diskette was purchased, one copy of this Standard may be stored on the hard disk of a single personal computer, or on a single LAN file-server or the permanent storage device of a multiple-user computer in such a manner that this Standard may only be accessed by one user at a time and for which there is no possibility of multiple concurrent access. The original distribution diskette should be stored in a safe place.

If a multiple-user version Standards-on-Diskette was purchased, one copy of the Standard may be stored on a single LAN file-server, or on the permanent storage device of a multiple-user computer. The number of concurrent users shall not exceed the number of users authorized for the Standards-on-Diskette version. The original distribution diskette should be stored in a safe place.

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.

A change in an effective date is indicated by a note following the affected item, and giving both the previous effective date and the new date the requirement becomes effective.

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.

Copyright 1996 Underwriters Laboratories Inc.

APRIL 29, 1996



1

UL 680

Standard for

Emergency Vault Ventilators and Vault-Ventilating Ports

First Edition – June, 1959
Second Edition – September, 1970
Third Edition – August, 1972
Fourth Edition – September, 1977
Fifth Edition – October, 1985
Sixth Edition – September, 1991

Seventh Edition

April 29, 1996

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated April 29, 1996. 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 B135.1-1971, August 17, 1971
Approved as ANSI/UL 680-1977, June 29, 1977
Approved as ANSI/UL 680-1985, July 3, 1985
Approved as ANSI/UL 680-1991, April 26, 1991
Approved as ANSI/UL 680-1996, March 8, 1996

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 1-55989-995-6

COPYRIGHT © 1977, 1996 UNDERWRITERS LABORATORIES INC.

CONTENTS**FOREWORD****INTRODUCTION**

1 Scope	5
2 General	6
3 Instructions	6

CONSTRUCTION

4 General	6
5 Electric Shock	7
6 Frames and Enclosures	7
7 Mounting of Parts	11
8 Protection Against Corrosion	11
9 Insulating Materials	11
10 Mechanical Assembly	12
11 Current-Carrying Parts	13
12 Motors	13
13 Installation Wiring Methods	13
14 Termination of Raceways	15
15 Strain Relief	15
16 Bushings	15
17 Internal Wiring	16
18 Grounding	16
19 Electrical Components	17
20 Transformers, Coils, and Relays	17
21 Overcurrent Protection	18
22 Spacings	18

PERFORMANCE

23 Resistance to Entry Test	20
24 Starting Current Test	22
25 Input Test	22
26 Temperature Test	22
27 Voltage Variation Test	27
28 Temperature Variation Test	28
29 Humidity Test	28
30 Electric Shock Current Test	28
31 Endurance Test	31
32 Dielectric Voltage-Withstand Test	32
33 Solenoid Burnout Test	33
34 Capacitor Overvoltage Test	33
35 Locked-Rotor Test	33
36 Thermal Protector Test	34

MANUFACTURING AND PRODUCTION TESTS

37	Production-Line Dielectric Voltage-Withstand	34
38	Rating	35
39	Marking	35

APPENDIX A

Standards for Components	A1
--------------------------------	----

FOREWORD

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

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

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

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

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

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

INTRODUCTION

1 Scope

1.1 These requirements cover emergency vault ventilators and vault-ventilating ports for installation in a wall.

1.2 Emergency vault ventilators are intended to provide fresh air to persons locked in the vault by accident or during a robbery.

1.3 Vault-ventilating ports are intended for connection to an outside ventilating system that provides circulating air while the vault is open.

1.4 These requirements are intended to evaluate the integrity of electrical wiring and components and to establish burglary resistant ratings. The ratings, based on the net working time to effect entry, are as follows:

- a) Class M – 1/4 hour;
- b) Class 1 – 1/2 hour;
- c) Class 2 – 1 hour; and
- d) Class 3 – 2 hours.

1.5 When installed in a nonreinforced-concrete wall according to the manufacturer's instructions, the products covered by these requirements do not affect the burglary resistance of the vault wall.

1.6 These requirements do not cover protection against entry by attacks with a burning bar (thermal lance) or explosives.

1.7 These units are intended to be installed in accordance with the provision of the National Electrical Code, NFPA 70. However, it is intended that inspection authorities having jurisdiction be consulted before installation of electrical connections.

1.8 Products covered by these requirements are intended for installation in vaults that are used for the storage of valuables, and that are protected by special security measures that cannot be forced using normal rescue equipment, and require waiting for a time-lock or similar device to release entrapped individuals.

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

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 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 When a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

2.3 Undated references

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 Instructions

3.1 A copy or draft of the operating and installation instructions intended to accompany each product as produced is to be used as a reference in the examination and test of the product.

3.2 The instructions shall include such directions and information as deemed by the manufacturer of the product to be required for proper and safe installation, maintenance, operation, and use of the product.

3.3 The instructions shall specify that conduit used for electrical connections shall not form a direct path through the wall, and shall be offset at least once and preferably twice.

CONSTRUCTION

4 General

4.1 A ventilator or port shall be adaptable to walls of any thickness from 12 to 30 inches (300 to 760 mm).

Exception: A wall that complies with the Standard for Burglary-Resistant Vault Doors and Modular Panels, UL 608, and whose attack resistance rating is the same or greater than the ventilator or port, is not prohibited from being less than 12 inches (300 mm) thick.

4.2 A unit shall be constructed so that it is not capable of readily being rendered mechanically inoperative from outside the vault.

4.3 A vault-ventilating port shall be provided with a visual indicator that will indicate when the port is in the closed position. An emergency vault ventilator shall incorporate a visual indication that indicates the location of the unit to a person inside the vault.

4.4 Direct communication shall be provided through an emergency vault ventilator for voice communication and passage of small tools, food, and similar items, from outside the vault.

4.5 An emergency vault ventilator shall be capable of delivering not less than 10 cubic feet per minute ($4.7 \text{ dm}^3/\text{s}$) of air into the vault and expelling an equal amount of air simultaneously.

4.6 An emergency vault ventilator shall provide a minimum opening of 2 square inches (12.9 cm^2) for natural ventilation, should the electric power fail.

5 Electric Shock

5.1 Any part that is exposed only during operator servicing shall not present the risk of electric shock. See Electric Shock Current Test, Section 30.

6 Frames and Enclosures

6.1 A unit shall be provided with one or more enclosures to afford protection against accidental contact with uninsulated live parts and reduction of spacings, loosening, or displacement of electrical parts.

6.2 Operating parts, such as gear mechanisms, light-duty relays, and similar devices, shall be protected against fouling by dust or other material which affects their intended operation.

6.3 The thickness of cast metal for an enclosure shall be as indicated in Table 6.1.

Table 6.1
Cast-metal enclosures

Use, or dimensions of area involved ^a	Minimum thickness, inches (mm)			
	Cast metal of die-cast metal		Other than the die-cast type	
Area of 24 square inches (155 cm^2) or less and having no dimension greater than 6 inches (152 mm)	1/16	1.6	1/8	3.2
Area greater than 24 square inches (155 cm^2) or having any dimension greater than 6 inches (152 mm)	3/32	2.4	1/8	3.2
At a threaded conduit hole	1/4	6.4	1/4	6.4
At an unthreaded conduit hole	1/8	3.2	1/8	3.2

^a The area limitation for metal 1/16 inch (1.6 mm) in thickness shall be obtained by the provision of reinforcing ribs subdividing a larger area.

6.4 The thickness of sheet metal for an enclosure shall not be less than indicated in Tables 6.2 and 6.3. At any point where conduit or metal-clad cable is to be attached, sheet metal shall be of such thickness or shall be formed or reinforced so that it has the stiffness at least equivalent to that of an uncoated flat sheet of steel having a minimum thickness of 0.053 inch (1.35 mm).

6.5 Ventilating openings in an enclosure, including perforated holes, louvers, and openings protected by means of wire screening, expanded metal, or perforated covers, shall be of such size or shape that no opening permits passage of a rod having a diameter of 33/64 inch (13.1 mm).

Exception: When the distance between uninsulated live parts and the enclosure is greater than 4 inches (102 mm), larger openings are permitted provided that no opening permits passage of a rod having a diameter of 49/64 inch (19.4 mm).

6.6 An enclosure housing fuses or any other overload protective device and provided with ventilating openings shall provide protection against the emission of flame or molten metal.

6.7 Perforated sheet metal and sheet metal used for expanded-metal mesh shall be at least:

- a) 0.042 inch (1.07 mm) thick, [0.046 inch (1.17 mm) for zinc-coated] when the mesh openings or perforations are 1/2 square inch (323 mm²) or less in area and
- b) 0.080 inch (2.03 mm) thick, [0.084 inch (2.13 mm) for zinc-coated] for larger openings.

Exception: If the indentation of a guard or enclosure will not alter the clearance between uninsulated live parts and grounded metal so as to impair intended operation of the product or reduce spacings below the minimum values required, 0.021-inch (0.53-mm) expanded-metal mesh or perforated sheet metal [0.024-inch (0.61-mm) if zinc-coated] may be used, provided that:

- a) *The exposed mesh on any side or surface of the device so protected has an area of not more than 72 square inches (4.6 dm²) and has no dimension greater than 12 inches (305 mm) or*
- b) *The width of an opening so protected is not greater than 3-1/2 inches (89 mm).*

6.8 The wires of a screen shall not be smaller than:

- a) No. 16 AWG [0.051 inch (1.29 mm) diameter] when the screen openings are 1/2 square inch (323 mm²) or less in area; and
- b) No. 12 AWG [0.081 inch (2.05 mm) diameter] for larger screen openings.

6.9 A compartment enclosing electrical parts shall not be open to the support on which the unit rests.

Table 6.2
Minimum thickness of sheet metal for electrical enclosures
carbon steel or stainless steel

Without supporting frame ^a			With supporting frame or equivalent reinforcing ^a			Minimum thickness uncoated, Inch (mm) [MSG]		Minimum thickness metal coated, Inch (mm) [GSG]	
Maximum width, ^b Inches (cm)		Maximum length, ^c Inches (cm)	Maximum width, ^b Inches (cm)		Maximum length, Inches (cm)				
4.0	10.2	Not limited	6.25	15.9	Not limited	0.020	0.51	0.023	0.58
4.75	12.1	5.75 14.6	6.75	17.1	8.25 21.0	[24]		[24]	
6.0	15.2	Not limited	9.5	24.1	Not limited	0.026	0.66	0.029	0.74
7.0	17.8	8.75 22.2	10.0	25.4	12.5 31.8	[22]		[22]	
8.0	20.3	Not limited	12.0	30.5	Not limited	0.032	0.81	0.034	0.86
9.0	22.9	11.5 29.2	13.0	33.0	16.0 40.6	[20]		[20]	
12.5	31.8	Not limited	19.5	49.5	Not limited	0.042	1.07	0.045	1.14
14.0	35.6	18.0 45.7	21.0	53.3	25.0 63.5	[18]		[18]	
18.0	45.7	Not limited	27.0	68.6	Not limited	0.053	1.35	0.056	1.42
20.0	50.8	25.0 63.5	29.0	73.7	36.0 91.4	[16]		[16]	
22.0	55.9	Not limited	33.0	83.8	Not limited	0.060	1.52	0.063	1.60
25.0	63.5	31.0 78.7	35.0	88.9	43.0 109.2	[15]		[15]	
25.0	63.5	Not limited	39.0	99.1	Not limited	0.067	1.70	0.070	1.78
29.0	73.7	36.0 91.4	41.0	104.1	51.0 129.5	[14]		[14]	
33.0	83.8	Not limited	51.0	129.5	Not limited	0.080	2.03	0.084	2.13
38.0	96.5	47.0 119.4	54.0	137.2	66.0 167.6	[13]		[13]	
42.0	106.7	Not limited	64.0	162.6	Not limited	0.093	2.36	0.097	2.46
47.0	119.4	59.0 149.9	68.0	172.7	84.0 213.4	[12]		[12]	
52.0	132.1	Not limited	80.0	203.2	Not limited	0.108	2.74	0.111	2.82
60.0	152.4	74.0 188.0	84.0	213.4	103.0 261.6	[11]		[11]	
63.0	160.0	Not limited	97.0	246.4	Not limited	0.123	3.12	0.126	3.20
73.0	185.4	90.0 228.6	103.0	261.6	127.0 322.6	[10]		[10]	

^a A supporting frame is a structure of angle or channel or a folded rigid section of sheet metal which is rigidly attached to and has essentially the same outside dimensions as the enclosure surface and which has sufficient torsional rigidity to resist the bending moments which may be applied via the enclosure surface when it is deflected. Construction that is considered to have equivalent reinforcing may be accomplished by designs that will produce a structure which is as rigid as one built with a frame of angles or channels. Construction considered to be without supporting frame includes:

- 1) Single sheet with single formed flanges (formed edges),
- 2) A single sheet which is corrugated or ribbed, and
- 3) An enclosure surface loosely attached to a frame, for example, with spring clips.

^b The width is the smaller dimension of a rectangular sheet metal piece which is part of an enclosure. Adjacent surfaces of an enclosure may have supports in common and be made of a single sheet.

^c For panels which are not supported along one side, for example, side panels of boxes, the length of the unsupported side shall be limited to the dimensions specified unless the side in question is provided with a flange at least 1/2 inch (12.7 mm) wide.

^d Sheet metal for an enclosure intended for outdoor use shall comply with 6.7 and 6.8.