

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

UL Standard for Safety
for
Switches for Use in Hazardous (Classified) Locations, UL 894

Seventh Edition, Dated June 28, 1993

Revisions: This Standard contains revisions through and including July 17, 1996.

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

The new requirements are substantially in accordance with UL's Bulletin on this subject dated March 22, 1996. The bulletin is now obsolete and may be discarded.

The revisions dated July 17, 1996 include a reprinted title page (page 1) for this Standard.

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 (page 1), this UL Standard for Safety has been adopted by the Department of Defense.

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.

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.

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, Recognition and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

Copyright 1996 Underwriters Laboratories Inc.

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

Page	Date
tr1 – tr4	July 17, 1996
1	June 28, 1993 (Reprinted: July 17, 1996)
2, 3	July 17, 1996
4	June 28, 1993
5, 6, 6A, 6B	July 17, 1996
7	July 31, 1995
8, 9	June 28, 1993
10	July 31, 1995
11	June 28, 1993
12	July 31, 1995

July 17, 1996 – UL 894

tr3

13	June 28, 1993
14, 14A, 14B, 15	July 31, 1995
16	June 28, 1993
17, 18, 18A, 18B	July 31, 1995
19	July 17, 1996
20 – 25	June 28, 1993
26	July 31, 1995
27	June 28, 1993
28 – 30	July 17, 1996

No Text on This Page

JUNE 28, 1993
(Title Page Reprinted: July 17, 1996)



1

UL 894**Standard for****Switches For Use In Hazardous (Classified) Locations**

The first and second editions were titled Snap Switches For Use In Hazardous Locations. The third through fifth editions were titled Switches For Use In Hazardous Locations, Class I, Groups A, B, C, & D, Class II, Groups E, F, & G.

First Edition – April, 1954
Second Edition – October, 1969
Third Edition – April, 1972
Fourth Edition – December, 1972
Fifth Edition – December, 1977
Sixth Edition – September, 1986

Seventh Edition**June 28, 1993**

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated June 28, 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 C33.29–1966, January 21, 1966
Approved as ANSI/C33.29–1972, December 22, 1972
Approved as ANSI/UL 894–1977, July 18, 1977
Approved as ANSI/UL 894–1985, November 21, 1985
Approved as ANSI/UL 894–1992, January 23, 1992

The Department of Defense (DoD) has adopted UL 894 on February 18, 1989. 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.

ISBN 1-55989-285-4**COPYRIGHT © 1977, 1996 UNDERWRITERS LABORATORIES INC.**

No Text on This Page

CONTENTS**FOREWORD****INTRODUCTION**

1 Scope	5
2 General	5
2A Class I, Zone, and Group Equivalency	6
3 Components	6
4 Enclosure Types	6

CONSTRUCTION

5 Enclosure Material	6A
6 Enclosure Thickness	7
7 Joints in Enclosure	8
8 Holes in Enclosure	15
9 Drain and Breather Plugs in Enclosure	16
10 Shaft Openings	16
11 Supply Connections	17
12 Conduit Seal	19
13 Mounting Of Switch Mechanism	19
14 Terminals And Leads	19
15 Spacings	19
16 Insulating Barrier or Liner	19
17 Protection Against Corrosion	20
18 Materials Applied to Joint Surfaces	20

PERFORMANCE

19 Explosion Tests	21
20 Hydrostatic Pressure Test	24
21 Leakage Test on Factory-Installed Conduit Seals	24
22 Dust-Penetration Test	25
23 Secureness Test of Conduit Hubs	26
24 Diaphragm Endurance Test	26
25 Rust-Resistance Test	26

RATINGS

26 General	26
------------------	----

MARKING

27 Details	27
------------------	----

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 switches for installation and use in hazardous (classified) locations Class I, Division 1, Groups A, B, C, and D, and Class II, Division 1, Groups E, F, and G, in accordance with the National Electrical Code, NFPA 70.

1.1.1 These requirements also cover explosion-proof electrical equipment for installation and use in Class I, Zone 1, Groups IIA, IIB, IIB plus Hydrogen, and IIC hazardous (classified) locations.

1.1.1 added July 17, 1996

1.2 These requirements cover snap and similar switches rated 60 amperes or less at 250 volts or less; 30 amperes or less at 600 volts or less; and 2 horsepower or less at 600 volts or less.

1.3 These requirements do not cover knife, enclosed, clock-operated, or magnetically-operated switches, or industrial control equipment such as auxiliary devices and magnetic or manual motor controllers.

1.4 These requirements apply to switches for hazardous locations under the following atmospheric conditions:

- a) An ambient temperature between minus 25°C (minus 13°F) and plus 40°C (plus 104°F).
- b) An oxygen concentration of not greater than 21 percent by volume, and
- c) A nominal barometric pressure of one atmosphere.

1.4 revised July 31, 1995

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

1.5 added July 31, 1995

2 General

2.1 A switch for use in hazardous locations shall also comply with the applicable requirements for similar switches for use in ordinary locations.

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

2A Class I, Zone, and Group Equivalency

2A.1 Class I, Zone 1, Group IIA

2A.1.1 Explosion-proof electrical equipment intended to be marked in accordance with 27.1.1 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group D hazardous (classified) locations.

2A.1.1 added July 17, 1996

2A.2 Class I, Zone 1, Group IIB

2A.2.1 Explosion-proof electrical equipment intended to be marked in accordance with 27.1.2 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group C hazardous (classified) locations.

2A.2.1 added July 17, 1996

2A.3 Class I, Zone 1, Group IIB plus Hydrogen

2A.3.1 Explosion-proof electrical equipment intended to be marked in accordance with 27.1.3 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group B hazardous (classified) locations.

2A.3.1 added July 17, 1996

2A.4 Class I, Zone 1, Group IIC

2A.4.1 Explosion-proof electrical equipment intended to be marked in accordance with 27.1.4 shall comply with all the requirements for explosion-proof electrical equipment for use in both Class I, Group A and Class I, Group B hazardous (classified) locations.

2A.4.1 added July 17, 1996

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component.

3.2 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.

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

3.4 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.

4 Enclosure Types

4.1 An enclosure shall comply with the applicable requirements specified in Table 4.1.

Table 4.1
Enclosure types for hazardous locations

Type no.	Application	Requirements
7	Class I, Division 1, Group A, B, C, or D - Indoor Hazardous Locations - Air-Break Equipment	4.1, 4.2, 5.1 - 5.3, 6.1 - 6.4, 7.1.1 - 7.4.2, 8.1.1 - 8.1.4, 9.1 - 9.4, 10.1.1 - 10.2.2, 11.1.1 - 11.1.10, 12.1 - 12.3, 13.1, 14.1, 15.1, 15.2, 16.1 - 16.4, 17.1, 17.2, 18.1, 18.2, 19.1 - 19.16, 20.1 - 20.4, 21.1, 21.2, 23.1, 24.1, 25.1, 25.2, 26.1 - 26.9, 27.1 - 27.11,
9	Class II, Division 1, Group E, F, or G - Indoor Hazardous Locations - Air-Break Equipment	4.1, 4.3, 5.1, 5.3, 6.1 - 6.4, 7.1.1 - 7.1.5, 7.5.1 - 7.5.6, 8.2.1 - 8.2.4, 9.1 - 9.3, 9.5, 9.6, 10.1.1, 10.3.1, 11.2.1 - 11.2.4, 12.1 - 12.3, 13.1, 14.1, 15.1, 15.2, 16.1 - 16.4, 17.1, 17.2, 18.1, 18.2, 22.1 - 22.6, 23.1, 24.1, 25.1, 25.2, 26.1 - 26.9, 27.1 - 27.10

Table 4.1 revised July 31, 1995

4.2 An enclosure that is intended for use in environmental conditions other than those defined in Table 4.1, and that has a marked enclosure type designation, shall also comply with the applicable requirements for each enclosure type, as specified in the Standard for Enclosures for Electrical Equipment, UL 50; for example, Type 3, 4X, or 6.

4.3 A Type 3, 3R, 3S, 4, 4X, 6, or 6P enclosure may also be marked "Raintight" if no water enters the enclosure at a point higher than the lowest live part. Compliance with these requirements shall be determined by the applicable tests in the Standard for Enclosures for Electrical Equipment, UL 50.

CONSTRUCTION

5 Enclosure Material

5.1 The enclosure housing the electrical components shall be made of iron, steel, copper, brass, bronze, aluminum or its alloys containing not less than 80 percent aluminum, or an acceptable nonmetallic material. A metal such as zinc or magnesium, or their alloys, is not acceptable.

5.2 Copper shall not be used for an enclosure of a device for use in Class I, Group A locations. A copper alloy shall not be used for an enclosure unless such alloy is coated with tin, nickel, or other suitable coating, or unless the copper content of the alloy is not more than 30 percent.

No Text on This Page



Underwriters Laboratories Inc.®

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

July 31, 1995

Revision pages for

Standard for

Switches For Use In Hazardous (Classified) Locations

UL 894, Seventh Edition

Attached to this transmittal notice is a revision of the Seventh edition of UL 894.

A CHANGE ON A PAGE DATED JULY 31, 1995 IS INDICATED BY A SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM, PRECEDED AND FOLLOWED BY AN ASTERISK.

THESE NEW AND REVISED REQUIREMENTS ARE NOW IN EFFECT EXCEPT FOR PARAGRAPHS 11.1.2, 11.1.8, 11.2.1.2, 11.2.2, 11.2.3, 27.14, TABLE 11.2, AND FIGURE 11.1, WHICH BECOME EFFECTIVE AUGUST 1, 1997 AS INDICATED IN THE SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM. TO RETAIN THE REQUIREMENTS IN EFFECT UNTIL AUGUST 1, 1997, DO NOT DISCARD THE PREVIOUS PAGES CONTAINING THE REQUIREMENTS SPECIFIED ABOVE UNTIL THIS FUTURE EFFECTIVE DATE.

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

The new and revised requirements are substantially in accordance with UL's bulletins on this subject dated October 28, 1994 and May 11, 1995. These bulletins are now obsolete and may be discarded.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 894-1992.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the Department of Defense approved text of UL 894.

(Continued)

July 31, 1995 – UL 894

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	June 28, 1993 (Reprinted: July 31, 1995)
2	–
3, 4	June 28, 1993
5, 6, 6A, 7	July 31, 1995
8, 9	June 28, 1993
10	July 31, 1995
11	June 28, 1993
12	July 31, 1995
13	June 28, 1993
14, 14A, 15	July 31, 1995
16	June 28, 1993
17, 18, 18A, 18B	July 31, 1995
19 – 25	June 28, 1993
26	July 31, 1995
27, 28	June 28, 1993
29	July 31, 1995

JUNE 28, 1993
(Title Page Reprinted: July 31, 1995)



1

UL 894

Standard for

Switches For Use In Hazardous (Classified) Locations

The first and second editions were titled Snap Switches For Use In Hazardous Locations. The third through fifth editions were titled Switches For Use In Hazardous Locations, Class I, Groups A, B, C, & D, Class II, Groups E, F, & G.

First Edition – April, 1954
Second Edition – October, 1969
Third Edition – April, 1972
Fourth Edition – December, 1972
Fifth Edition – December, 1977
Sixth Edition – September, 1986

Seventh Edition

June 28, 1993

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated June 28, 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 C33.29 – 1966, January 21, 1966
Approved as ANSI/C33.29 – 1972, December 22, 1972
Approved as ANSI/UL 894 – 1977, July 18, 1977
Approved as ANSI/UL 894 – 1985, November 21, 1985
Approved as ANSI/UL 894 – 1992, January 23, 1992

The Department of Defense (DoD) has adopted UL 894 on February 18, 1989. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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

ISBN 1-55989-285-4

COPYRIGHT © 1977, 1995 UNDERWRITERS LABORATORIES INC.

INTRODUCTION

1 Scope

1.1 These requirements cover switches for installation and use in hazardous (classified) locations Class I, Division 1, Groups A, B, C, and D, and Class II, Division 1, Groups E, F, and G, in accordance with the National Electrical Code, NFPA 70.

1.2 These requirements cover snap and similar switches rated 60 amperes or less at 250 volts or less; 30 amperes or less at 600 volts or less; and 2 horsepower or less at 600 volts or less.

1.3 These requirements do not cover knife, enclosed, clock-operated, or magnetically-operated switches, or industrial control equipment such as auxiliary devices and magnetic or manual motor controllers.

1.4 These requirements apply to switches for hazardous locations under the following atmospheric conditions:

- a) An ambient temperature between minus 25°C (minus 13°F) and plus 40°C (plus 104°F).
- b) An oxygen concentration of not greater than 21 percent by volume, and
- c) A nominal barometric pressure of one atmosphere.

1.4 revised July 31, 1995

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

1.5 added July 31, 1995

2 General

2.1 A switch for use in hazardous locations shall also comply with the applicable requirements for similar switches for use in ordinary locations.

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

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component.

3.2 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.

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

3.4 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.

4 Enclosure Types

4.1 An enclosure shall comply with the applicable requirements specified in Table 4.1.

Table 4.1
Enclosure types for hazardous locations

Type no.	Application	Requirements
7	Class I, Division 1, Group A, B, C, or D – Indoor Hazardous Locations – Air-Break Equipment	4.1, 4.2, 5.1 – 5.3, 6.1 – 6.4 7.1.1 – 7.4.2, 8.1.1 – 8.1.4, 9.1 – 9.4, 10.1.1 – 10.2.2, 11.1.1 – 11.1.10, 12.1 – 12.3, 13.1 14.1, 15.1, 15.2, 16.1 – 16.4, 17.1 17.2, 18.1, 18.2, 19.1 – 19.16, 20.1 – 20.4, 21.1, 21.2, 23.1, 24.1, 25.1, 25.2, 26.1 – 26.9, 27.1 – 27.11,
9	Class II, Division 1, Group E, F, or G – Indoor Hazardous Locations – Air-Break Equipment	4.1, 4.3, 5.1, 5.3, 6.1 – 6.4, 7.1.1 – 7.1.5, 7.5.1 – 7.5.6, 8.2.1 – 8.2.4, 9.1 – 9.3, 9.5, 9.6, 10.1.1, 10.3.1, 11.2.1 – 11.2.4, 12.1 – 12.3, 13.1, 14.1, 15.1, 15.2, 16.1 – 16.4, 17.1, 17.2, 18.1, 18.2, 22.1 – 22.6, 23.1, 24.1, 25.1, 25.2, 26.1 – 26.9, 27.1 – 27.10

Table 4.1 revised July 31, 1995

4.2 An enclosure that is intended for use in environmental conditions other than those defined in Table 4.1, and that has a marked enclosure type designation, shall also comply with the applicable requirements for each enclosure type, as specified in the Standard for Enclosures for Electrical Equipment, UL 50; for example, Type 3, 4X, or 6.

4.3 A Type 3, 3R, 3S, 4, 4X, 6, or 6P enclosure may also be marked "Raintight" if no water enters the enclosure at a point higher than the lowest live part. Compliance with these requirements shall be determined by the applicable tests in the Standard for Enclosures for Electrical Equipment, UL 50.

CONSTRUCTION

5 Enclosure Material

5.1 The enclosure housing the electrical components shall be made of iron, steel, copper, brass, bronze, aluminum or its alloys containing not less than 80 percent aluminum, or an acceptable nonmetallic material. A metal such as zinc or magnesium, or their alloys, is not acceptable.

5.2 Copper shall not be used for an enclosure of a device for use in Class I, Group A locations. A copper alloy shall not be used for an enclosure unless such alloy is coated with tin, nickel, or other suitable coating, or unless the copper content of the alloy is not more than 30 percent.

5.3 Among the factors that are to be taken into consideration when determining the acceptability of a nonmetallic material are:

- a) Mechanical strength,
- b) Resistance to impact,
- c) Moisture-absorptive properties,
- d) Resistance to fungus,
- e) Combustibility,
- f) Resistance to repeated explosions,
- g) Resistance to solvents as covered by the hazardous location group or groups under consideration,
- h) Resistance to accumulation of electrostatic charges, and
- i) Resistance to distortion and creep at temperatures to which the material may be subjected under all conditions of use.

All of these factors are to be considered with respect to thermal aging.

6 Enclosure Thickness

6.1 Except as noted in 6.2 and 6.3, the thickness of metal enclosure walls shall not be less than specified in Table 6.1.

Table 6.1
Thickness of metal for enclosure

Maximum external enclosure dimensions		Minimum thickness, in inches (mm)		
Maximum length or diameter in inches (mm)	Area of any one surface in square inches (m ²)	Cast brass, bronze, copper, malleable iron	Cast iron and aluminum ^a	Sheet steel
22 (559)	480 (0.310)	0.093 (2.36)	0.125 (3.18)	0.067 (1.70)
30 (762)	620 (0.400)	0.093 (2.36)	0.125 (3.18)	0.093 (2.36)
60 (1524)	1500 (0.968)	0.125 (3.18)	0.187 (4.75)	0.125 (3.18)
Over 60 (over 1524)	Over 1500 (over 0.968)	0.187 (4.75)	0.250 (6.35)	0.187 (4.75)

^a Includes sand-cast, permanent-mold, and die-cast aluminum and sheet aluminum.

Table 6.1 revised July 31, 1995

6.2 A sheet steel wall of an enclosure may be not less than 1/32 inch (0.8 mm) thick if:

- a) Either the length or the diameter of the enclosure does not exceed 22 inches (559 mm);
- b) The inside surface of the wall is completely protected from the electrical components by a lining of acceptable insulation at least 1/32 inch (0.8 mm) thick; and
- c) The lining mentioned in (b) is secured in place.

6.3 A sheet-metal diaphragm that forms part of the enclosure of an electrical component may be less than 1/32 inch (0.8 mm) thick if:

- a) A barrier of acceptable insulating material at least 1/32 inch thick is secured in place between the diaphragm and any electrical component that it encloses;
- b) The diaphragm is located or enclosed so that it will be protected against unintentional mechanical damage;
- c) The diaphragm is formed of an acceptable inherently corrosion-resistant sheet metal not less than 0.005 inch (0.127 mm) thick;
- d) The diameter of the diaphragm is not greater than 1 inch (25.4 mm); and
- e) The diaphragm assembly withstands the Explosion Tests, Section 19, Hydrostatic Pressure Test, Section 20, and Diaphragm Endurance Test, Section 24.

6.4 A machined or a threaded joint in the wall of a cast-metal enclosure shall have at least the thickness specified in Table 6.1 through the overlap.

7 Joints in Enclosure

7.1 General

7.1.1 A joint in an enclosure shall be of the metal-to-metal, metal-to-polymeric, or polymeric-to-polymeric type. The joint surfaces shall have an arithmetical average roughness of not more than 250 microinches (0.0064 mm), in accordance with the Standard for Surface Texture, ANSI/ASME B46.1-1985.

7.1.2 A polymeric-to-polymeric joint shall be a labyrinth or threaded type.

7.1.3 The width of joint is to be measured with the cover in the most unfavorable position.

7.1.4 A feeler gauge utilized to measure the clearances specified in these requirements is to be 1/8 to 1/2 inch (3.2 to 12.7 mm) wide, with a 1/2-inch-wide gauge used, if possible.

7.1.5 The free internal volume is the total internal volume of an electrical enclosure minus the volume of internal components. Potting compounds, except as used for coil encapsulation, insulation, or both, are not to be considered in the determination of the free internal volume.

7.2 Class I, Groups C and D locations

7.2.1 General

7.2.1.1 Except as noted in 7.2.1.2 – 7.2.2.1, the width of a joint and the clearance, when assembled, shall be as specified in Figure 7.1, and the width of the joint shall not be less than 3/4 inch (19.1 mm).

7.2.1.2 A rabbet joint may have a diametrical clearance at the axial section of not more than twice the clearance specified in Figure 7.1 if neither the axial nor the radial section of the joint is less than 1/16 inch (1.6 mm) wide.