

UL 844

Luminaires for Use in Hazardous (Classified) Locations

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UL Standard for Safety for Luminaires for Use in Hazardous (Classified) Locations, UL 844

Twelfth Edition, Dated January 11, 2006

Revisions: This Standard contains revisions through and including November 20, 2008.

Summary of Topics

This revision to ANSI/UL 844 includes a revision to the Hydrostatic Test Requirements.

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 following table lists the future effective dates with the corresponding reference.

Future Effective Dates	References
December 31, 2009	Paragraphs 17.1.14 – 17.1.16,
September 26, 2011	Paragraphs 1.2, 17.2.4, 17.2.5, 17.2.5.1, 40.2.2, 40.2.5, 74.3 – 74.7, 74.7.1 – 74.7.4, 74.9.1, 74.9.2, 74.21, 74.27, SA2.1, Tables 10.1, 74.1, 74.3, Section 6

The new and revised requirements are substantially in accordance with UL's Proposal(s) on this subject dated March 14, 2008 and October 10, 2008.

The revisions dated November 20, 2008 include a reprinted title page (page1) 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 (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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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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.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, Classification, and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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Page	Date
1	November 20, 2008
2-4B	September 26, 2008
5-6	January 11, 2006
7-8B	September 26, 2008
9	January 11, 2006
10	September 26, 2008
11-26	January 11, 2006
27-29	September 26, 2008
30-37	January 11, 2006
38-39	November 20, 2008
40-53	January 11, 2006
54-54B	September 26, 2008
55-69	January 11, 2006
70	November 20, 2008
71-76	September 26, 2008
77-78	January 11, 2006
SA1	September 26, 2008
SA2-SA6	January 11, 2006
SB1-SB12	January 11, 2006
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1

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Standard for Luminaires for Use in Hazardous (Classified) Locations

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The Department of Defense (DoD) has adopted UL 844 on June 6, 1989. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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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No Text on This Page

CONTENTS

INTRODUCTION

1 Scope	7
2 General	7
3 Components	7
4 Units of Measurement	8
5 Undated References	8
6 Class, Zone, and Group Equivalency	8
6.1 Class I, Zone 1, Group IIA	8
6.2 Class I, Zone 1, Group IIB	8
6.3 Class I, Zone 1, Group IIB plus hydrogen	8
6.4 Class I, Zone 1, Group IIC	8
6.5 Class I, Zone 2, Group IIA	8A
6.6 Class I, Zone 2, Group IIB	8A
6.7 Class I, Zone 2, Group IIB plus hydrogen	8A
6.8 Class I, Zone 2, Group IIC	8A
6.9 Zone 20 and 21	8A
6.10 Zone 22	8A
7 Luminaires Subject to Deposits of Combustible-Paint Residue	8B
8 Enclosure Types	9

PART I- LUMINAIRES FOR CLASS I, DIVISION 1, GROUPS A, B, C, AND D, AND CLASS II, DIVISION 1, GROUPS E, F, AND G LOCATIONS

CONSTRUCTION

9 Enclosure Material	9
10 Enclosure Thickness	10
10.1 Enclosures for Class I locations	10
10.2 Enclosures for Class II locations	10
11 Joints in Enclosures for Class I Locations	12
11.1 General	12
11.2 Luminaires for Class I, Groups C and D locations	14
11.3 Luminaires for Class I, Group B locations	21
11.4 Luminaires for Class I, Group A locations	22
12 Joints in Enclosures for Class II, Groups E, F, and G Locations	22
13 Holes in Enclosure	23
13.1 Luminaires for Class I locations	23
13.2 Luminaires for Class II locations	24
14 Shaft Openings	24
14.1 General	24
14.2 Luminaires for Class I locations	24
14.3 Luminaires for Class II locations	25
15 Guards of Luminaires for Classes I and II Locations	25
16 Nonmetallic External Parts	25
17 Supply Connections	25
17.1 Luminaires for Class I locations	25
17.2 Luminaires for Class II locations	28
17.3 Leads	29

18 Disconnecting Means	30
19 Protection Against Corrosion	30
20 Materials Applied to Joint Surfaces	30
21 Fuses	31
22 Grounding and Bonding	31
23 Porosity in Enclosure Materials	32
24 Luminaires for Wet Locations	32

PERFORMANCE

25 Temperature Test	32
26 Explosion Tests	36
27 Tests on Luminaires with Fuses	38
28 Hydrostatic Pressure Test	38
29 Dust-Penetration Test	40
30 Thermal Shock Test	40
31 Rust-Resistance Test	41
32 Test for Secureness of Conduit Hubs	41
32.1 General	41
32.2 Pullout	42
32.3 Bending	42
33 Vibration Test	43
34 Electrical Resistance Test	47
35 Non-Metallic Enclosure Materials Tests – Class I	47
35.1 General	47
35.2 Chemical compatibility by material samples	47
35.3 Chemical compatibility by complete end product tests	49
35.4 Test for Accumulation of Static Electricity	51
36 Tests on Sealing Compounds	52
37 Non-Metallic Enclosure Tests – Class II	53
38 Leakage Test on Factory-Installed Conduit Seals	53

PART II – LUMINAIRES FOR CLASS I, DIVISION 2, GROUPS A, B, C, AND D LOCATIONS

GENERAL

39 Details	53
------------------	----

CONSTRUCTION

40 Enclosure	54
40.1 General	54
40.2 Supply connections	54
40.3 Luminaires for wet locations	54A
40.4 Protection against corrosion	55
41 Arcing and Sparking Parts	55

PERFORMANCE

42 Temperature Test	55
---------------------------	----

PART III– LUMINAIRES FOR CLASS II, DIVISION 2, GROUPS F AND G AND CLASS III LOCATIONS

GENERAL

43 Details 57

No Text on This Page

CONSTRUCTION

44	Enclosure	57
45	Supply Connections	57
46	Control Devices	59
47	Protection Against Corrosion	59

PERFORMANCE

48	Temperature Test	59
49	Dusttight Enclosure Test	61
49.1	General	61

PART IV – PORTABLE LUMINAIRES**GENERAL**

50	Details	61
51	Protection of Glass Parts	61
52	Seal Between Lamp and Terminal Compartments	61
53	Supply Connections	62
53.1	Cords, plugs, and provision for connection	62
54	Terminal enclosure	62
54.1	Class I	62
54.2	Class II	63
55	Cord Clamp and Strain Relief	63
56	Attachment of Parts	63
57	Hook and Handle	63
58	Casters and Wheels	63
59	External Metal Parts	64
60	Switches	64
61	Spacings	65

PERFORMANCE

62	Temperature Test	66
63	Accelerated Aging Test of Bushing	67
64	Thread-Wear Test	67
65	Strain-Relief Test	67
66	Rough-Usage Test	68
67	Drop Test	68
68	Impact Test	68
69	Overturning Test	69
70	Stability Test	69
71	Resistance Test	69

PART V – MANUFACTURING AND PRODUCTION TESTS

72	Bonding Test on Portable Luminaires	69
73	Hydrostatic Pressure Test	70

PART VI – MARKING

74 Details	70
------------------	----

SUPPLEMENT SA - INVESTIGATION OF ELASTOMERIC GASKETS

SA1 Scope	SA1
SA2 General	SA1
SA3 Physical Properties	SA1
SA4 Accelerated Air-Oven Aging Test	SA1
SA5 Compression Set	SA3
SA5.1 General	SA3
SA5.2 Compression set determination	SA3
SA5.3 Dust penetration	SA4
SA6 Identification	SA5

SUPPLEMENT SB - ALTERNATIVE JOINTS IN ENCLOSURES

SB1 General	SB1
SB2 Cemented Joints	SB1
SB3 Joints with Flamepaths Class I, Groups A, B, C, and D	SB1
SB4 Labyrinth Joints A, B, C, and D	SB2
SB5 Threaded Joints	SB3
SB5.1 General – Class I, Groups A, B, C, and D	SB3
SB5.2 Class I, Groups A and B	SB3
SB5.3 Class I, Groups C, and D	SB4
SB6 Straight (Flat or Cylindrical), and Rabbet Joints: Class I, Groups A, B, C, and D	SB4

SUPPLEMENT SC - ALTERNATIVE EXPLOSION TESTS

SC1 Explosion Tests	SC1
---------------------------	-----

SUPPLEMENT SD - LUMINAIRES INTENDED FOR FLUSH MOUNTING IN PAINT SPRAY AREAS

SD1 Scope	SD1
SD2 Hip- or Ceiling-Mounted Luminaires Accessed from Outside a Down Draft Paint Spray Booth Only	SD1
SD3 Hip- or Ceiling-Mounted Luminaires Accessed from Inside a Down Draft Paint Spray Booth	SD2
SD4 Wall-Mounted Luminaires Accessed from Outside a Down Draft Paint Spray Booth Only	SD2
SD5 Wall-Mounted Luminaires Accessed from Inside a Down Draft Paint Spray Booth	SD3
SD6 Marking	SD3
SD7 Installation Instructions	SD4

INTRODUCTION

1 Scope

1.1 These requirements cover fixed and portable luminaires for installation and use in hazardous (classified) locations, Class I, Divisions 1 and 2, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class II, Division 2, Groups F and G; and Class III, Divisions 1 and 2, in accordance with the National Electrical Code, NFPA 70.

1.2 These requirements also cover luminaires for installation and use in Class I, Zones 1 and 2, Groups IIA, IIB, IIB plus Hydrogen, and IIC, and Zone 20, 21 and 22 hazardous (classified) locations in accordance with the National Electrical Code, NFPA 70.

Revised 1.2 effective September 26, 2011

1.3 These requirements cover luminaires for use only under the following atmospheric conditions:

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

2 General

2.1 Luminaires for use in hazardous locations shall also comply with the applicable requirements for luminaires for use in unclassified locations.

2.2 Low-pressure sodium lamps shall not be used in a luminaire for use in Division 1 hazardous locations.

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 is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required 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 rating established for the intended conditions of use.

3.4 Specific components are 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.

4 Units of Measurement

4.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

5 Undated References

5.1 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.

6 Class, Zone, and Group Equivalency

6.1 Class I, Zone 1, Group IIA

6.1.1 Luminaires intended to be marked in accordance with 74.4 shall comply with all the requirements for luminaires for use in Class I, Division 1, Group D hazardous (classified) locations.

Revised 6.1.1 effective September 26, 2011

6.2 Class I, Zone 1, Group IIB

6.2.1 Luminaires intended to be marked in accordance with 74.5 shall comply with all the requirements for luminaires for use in Class I, Division 1, Group C hazardous (classified) locations.

Revised 6.2.1 effective September 26, 2011

6.3 Class I, Zone 1, Group IIB plus hydrogen

6.3.1 Luminaires intended to be marked in accordance with 74.6 shall comply with all the requirements for luminaires for use in Class I, Division 1, Group B hazardous (classified) locations.

Revised 6.3.1 effective September 26, 2011

6.4 Class I, Zone 1, Group IIC

6.4.1 Luminaires intended to be marked in accordance with 74.7 shall comply with all the requirements for luminaires for use in both Class I, Division 1, Group A and Class I, Division 1, Group B hazardous (classified) locations.

Revised 6.4.1 effective September 26, 2011

6.5 Class I, Zone 2, Group IIA

6.5.1 Luminaires intended to be marked in accordance with 74.7.1 shall comply with all the requirements for luminaires for use in Class I, Division 2, Group D hazardous (classified) locations.

Added 6.5.1 effective September 26, 2011

6.6 Class I, Zone 2, Group IIB

6.6.1 Luminaires intended to be marked in accordance with 74.7.2 shall comply with all the requirements for luminaires for use in Class I, Division 2, Group C hazardous (classified) locations.

Added 6.6.1 effective September 26, 2011

6.7 Class I, Zone 2, Group IIB plus hydrogen

6.7.1 Luminaires intended to be marked in accordance with 74.7.3 shall comply with all the requirements for luminaires for use in Class I, Division 2, Group B hazardous (classified) locations.

Added 6.7.1 effective September 26, 2011

6.8 Class I, Zone 2, Group IIC

6.8.1 Luminaires intended to be marked in accordance with 74.7.4 shall comply with all the requirements for luminaires for use in both Class I, Division 2, Group A and Class I, Division 2, Group B hazardous (classified) locations.

Added 6.8.1 effective September 26, 2011

6.9 Zone 20 and 21

6.9.1 Luminaires intended to be marked in accordance with 74.9.1 shall comply with all the requirements for luminaires for use in Class II, Division I, Group E, F, or G hazardous (classified) locations.

Added 6.9.1 effective September 26, 2011

6.10 Zone 22

6.10.1 Luminaires intended to be marked in accordance with 74.9.2 shall comply with all the requirements for luminaires for use in Class II, Division 2, Group F or G hazardous (classified) locations.

Added 6.10.1 effective September 26, 2011

7 Luminaires Subject to Deposits of Combustible-Paint Residue

7.1 A luminaire marked in accordance with 74.19 shall comply with the requirements in 9.2, 24.1, 25.1, and 25.26 – 25.28.

8 Enclosure Types

8.1 An enclosure shall comply with the applicable requirements specified in Table 8.1.

8.2 An enclosure that is intended for use in environmental conditions other than those defined in Table 8.1, 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.

Table 8.1
Enclosure types for hazardous locations

Type number	Application	Requirements
7	Class I, Division 1, Group A, B, C, or D – Indoor Hazardous Locations – Air-Break Equipment	9.1 – 9.3, 10.1.1, 10.1.2, 11.1.1 – 11.4.3, 13.1.1 – 13.1.4, 14.1.1 – 14.2.2, 15.1, 16.1, 17.1.1 – 17.1.18, 18.1 – 21.2, 22.1 – 23.2, 25.1 – 25.21, 25.25 ^a – 28.6, 30.1 – 36.8, 74.1 – 74.15, 74.19 – 74.23, 74.26 – 74.29
9	Class II, Division 1, Group E, F, or G – Indoor Hazardous Locations – Air-Break Equipment	9.1, 9.2, 10.2.1 – 10.2.3.2, 12.1 – 12.7, 13.2.1 – 13.2.4, 14.1.1, 14.3.1, 15.1, 16.1, 17.2.1 – 20.2, 22.1 – 23.2, 25.1 – 25.28, 30.1 – 34.3, 74.1 – 74.3, 74.10, 74.11, 74.13 – 74.15, 74.21 – 74.23, 74.26 – 74.28
^a Par 25.25 is applicable only to luminaires intended and marked for use where Class I and Class II conditions may exist simultaneously.		

PART I– LUMINAIRES FOR CLASS I, DIVISION 1, GROUPS A, B, C, AND D, AND CLASS II, DIVISION 1, GROUPS E, F, AND G LOCATIONS

CONSTRUCTION

9 Enclosure Material

9.1 The enclosure housing the electrical components shall be made of iron, steel, copper (see 9.3), brass, bronze, or aluminum or its alloys containing not less than 80 percent aluminum or an acceptable nonmetallic material which complies with the requirements in 35, Non-Metallic Enclosure Materials Test. A metal such as zinc or magnesium, or their alloys, is not acceptable.

9.2 For a luminaire intended for use where subject to deposits of combustible-paint residue, all exposed metal parts likely to be struck during cleaning shall be made of bronze, brass, copper, or aluminum.

9.3 Copper shall not be used for an enclosure of a luminaire for use in Class I, Group A locations. A copper alloy shall not be used for an enclosure unless:

- a) The alloy is coated with tin, nickel, or other similar coating; or
- b) The copper content of the alloy is not over 30 percent.

10 Enclosure Thickness

10.1 Enclosures for Class I locations

10.1.1 The thickness of metal enclosure walls shall not be less than specified in Table 10.1.

10.1.2 A machined or a threaded joint in the wall of a cast-metal enclosure shall have at least the thickness specified in Table 10.1 through the overlap.

Table 10.1
Thickness of metal enclosure

Revised Table 10.1 effective September 26, 2011

External enclosure dimensions								
Diameter,		Area of any one surface,						
		Minimum thickness, inch (mm)						
inches (mm)		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	(1524)	Over 1500 (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.

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

10.2 Enclosures for Class II locations

10.2.1 Cast metal

10.2.1.1 Except as noted in 10.2.1.2, a cast-metal enclosure shall not be less than 1/8 inch (3.2 mm) thick at every point and not less than 1/4 inch (6.4 mm) thick at tapped holes for conduit.

10.2.1.2 Die-cast metal, except at threaded holes for conduit, may be:

- Not less than 3/64 inch (1.2 mm) thick for an area of 24 square inches (154.8 cm²) or less and having no dimension larger than 6 inches (152 mm). This area limitation may be obtained by the provision of reinforcing ribs subdividing a larger area,
- Not less than 5/64 inch (2.0 mm) thick for an area larger than 24 square inches or having any dimension larger than 6 inches, and
- Not less than 0.015 inch (0.38 mm) at the bottom of a circular ring having a width of not more than 3/32 inch (2.38 mm) and a diameter of not more than 1-1/2 inches (38.1 mm).

10.2.2 Sheet metal

10.2.2.1 The thickness of a sheet-metal enclosure shall not be less than that specified in Table 10.2.

10.2.2.2 The length of surface in Table 10.2 is considered to be:

- a) The diameter of a circular luminaire,
- b) The longest diameter of an elliptical luminaire,
- c) The longest side of a triangular luminaire,
- d) The diagonal of a rectangular luminaire, and
- e) The longest diagonal of a multisided luminaire.

Table 10.2
Thickness of sheet metal for Class II, Division 1 locations

Maximum length of surface involved and use to which it is put	Minimum thickness of sheet metal, inch (mm)					
	Uncoated steel		Zinc-coated steel		Copper, brass, or aluminum	
At a point where conduit connection is made	0.032	(0.81)	0.034	(0.86)	0.040	(1.02)
More than 26 inches (660 mm) long	If any wiring device is supported		0.026	(0.66)	0.029	(0.74)
	If no wiring device is supported		0.020	(0.51)	0.023	(0.58)
Not more than 26 Inches long	If any wiring device is supported		0.020	(0.51)	0.023	(0.58)
	If no wiring device is supported		0.016	(0.41)	0.019	(0.48)

10.2.3 Glass

10.2.3.1 The thickness of a flat panel of glass, smooth or otherwise, shall not be less than specified in Table 10.3. The thickness of a glass lens, glass that is curved or bent, and glass having other shapes shall also not be less than specified in Table 10.3.

10.2.3.2 The minimum thickness of fluted, ribbed, or patterned glass is to be measured from a valley to the other side, or between valleys on opposite sides.

Table 10.3
Minimum thickness of glass

Exposed area of glass				Minimum thickness of glass					
More Than		Not More Than		Flat		Curved		With Concentric Ribs	
Inch ²	(cm ²)	Inch ²	(cm ²)	Inch	(mm)	Inch	(mm)	Inch	(mm)
0	(0)	150	(968)	0.083	(2.11)	0.083	(2.11)	0.083	(2.11)
150	(968)	500	(3226)	0.10	(2.54)	0.083	(2.11)	0.083	(2.11)
500	(3226)	1100	(7097)	0.14	(3.56)	0.10	(2.54)	0.10	(2.54)

11 Joints in Enclosures for Class I Locations

11.1 General

11.1.1 Joints in an enclosure shall comply with the applicable requirements in 11.1.1 – 11.4.3 and Section 26, Explosion Tests.

Exception: This requirement does not apply to joints that comply with the requirements in Supplement SB, Alternative Joints in Enclosures, and Supplement SC, Alternative Explosion Tests.

11.1.2 A joint in an enclosure shall be of the metal-to-metal, metal-to-glass, metal-to-polymeric, polymeric-to-polymeric, polymeric-to-glass, gasketed metal-to-glass or gasketed polymeric-to-glass type. A joint surface shall have an arithmetical average roughness of not more than 250 microinches (0.0064 mm) in accordance with the Standard for Surface Texture (Surface Roughness, Waviness, and Lay), ANSI/ASME B46.1.

11.1.3 A polymeric-to-polymeric joint shall be of the labyrinth or threaded type.

11.1.4 The determination of the free internal volume shall exclude potting compounds. The free internal volume of a lamp enclosure shall be determined without the lamp installed.

11.1.5 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.

11.1.6 The width of a joint is to be measured with the mating parts in their most unfavorable position.

11.1.7 A joint shall be continuous; that is, it shall not be interrupted by an "O" ring groove or the like.

11.1.8 A gasket may be employed in a metal-to-glass or polymeric-to-glass joint if the gasket complies with the requirements in 11.1.11 – 11.1.13. The maximum clearance between the gasket and the metal, polymeric, or glass shall not be more than that specified in 11.2.1.1, 11.2.2.1 – 11.2.2.3, and 11.3.2 – 11.3.4.

11.1.9 A gasket shall not be employed in a metal-to-metal, metal-to-polymeric, or polymeric-to-polymeric joint, but may be employed adjacent to such a joint if it does not decrease the effectiveness of the joint.

11.1.10 The use of the gasket shall be limited to a joint that will not be disturbed during the installation or intended servicing of the equipment.

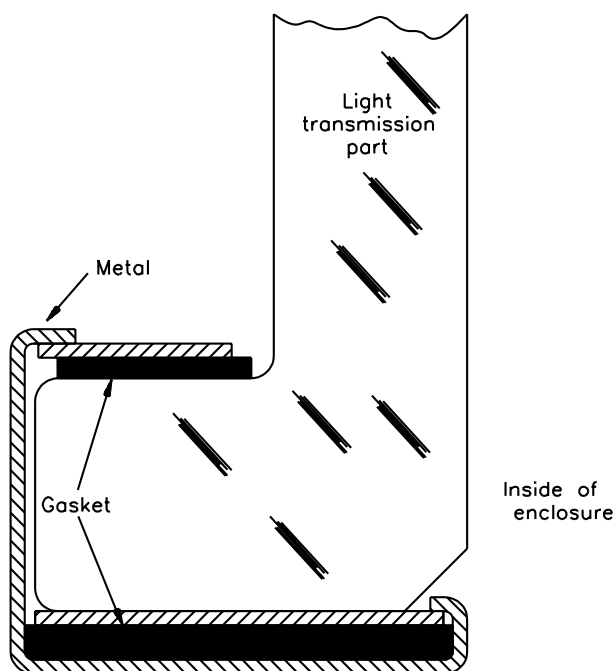
11.1.11 The requirement in 11.1.9 applies to a gasket in a metal-to-glass or polymeric-to-glass joint only; it does not apply to other types of gaskets such as those employed in an enclosure for specific environmental conditions. See 8.2.

11.1.12 A gasket shall be:

- a) A metal-covered type,
- b) Polytetrafluoroethylene, or
- c) Other material that has been investigated in accordance with Section SA4 and found acceptable for the application.

11.1.13 A metal-covered gasket between a metal or polymeric part and a glass part shall be mechanically attached to the glass. There shall be no overlapping of the metal covering of the gasket on joint surfaces. An acceptable metal-covered gasket construction is illustrated in Figure 11.1.

Figure 11.1
Metal-covered gasket construction



S2440

11.1.14 A material that readily hardens upon aging or adheres to metal surfaces, or both, is not an acceptable gasket material. The attachment of a gasket by an adhesive or a cement is not acceptable.

11.1.15 If a gasket of polytetrafluoroethylene or a material having similar characteristics is used, it shall be installed to reduce the likelihood of cold flow of the gasket material.

11.1.16 A glass part, such as a cylindrical tube for enclosing a fluorescent lamp, may be sealed with a sealing compound that complies with Section 36, Tests For Sealing Compounds, and with other tests covered in this standard, without loosening or cracking. The length of compound seal shall not be less than 5/8 inch (15.9 mm).

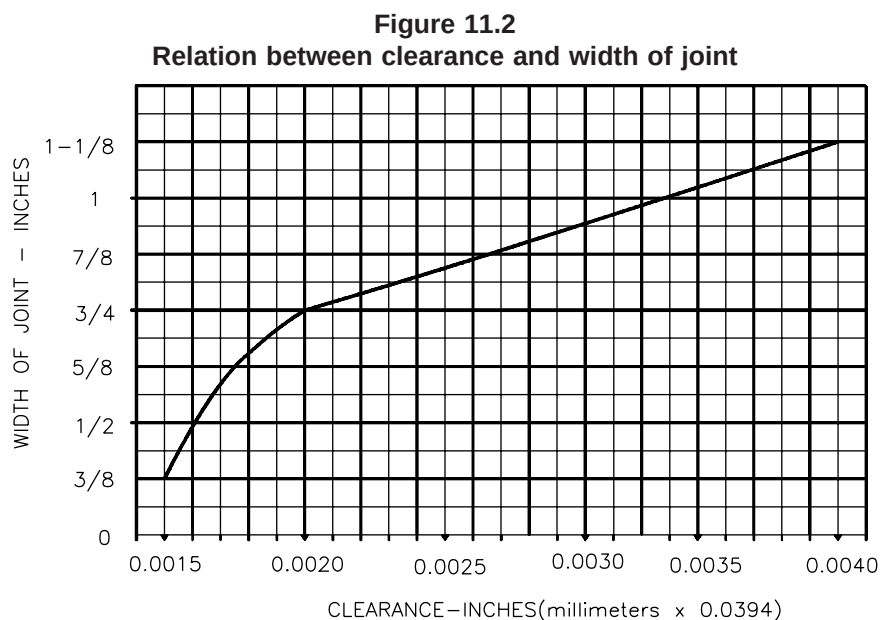
11.2 Luminaires for Class I, Groups C and D locations

11.2.1 Straight and rabbet joints – lamp enclosure

11.2.1.1 The width of a joint and the clearance shall be as shown in Figure 11.2. The joint may be a rabbet construction as illustrated in Figure 11.4 or a straight construction as illustrated in Figure 11.5. For a 3/8 inch (9.50 mm) wide joint the clearance shall be less than 0.0015 inch (0.038 mm) or such that a 0.0015 inch-thick feeler gauge will not enter the required joint width more than 1/8 inch (3.2 mm) at any point.

Exception No. 1: This requirement does not apply to a lamp enclosure having a vented section that complies with the requirements in 11.2.1.2 and 11.2.1.3.

Exception No. 2: This requirement does not apply if the lamp enclosure also serves as an enclosure for other parts. See 11.2.1.4.



S0859A

(See 11.2.1.1)

11.2.1.2 The lamp enclosure of a lighting luminaire may be provided with a venting section or sections to relieve internal explosion pressures. A joint in a vented enclosure may have a width of joint not less than 1/4 inch (6.4 mm) and a clearance of not more than 0.005 inch (0.13 mm) if the maximum explosion pressure developed during the explosion tests does not exceed 5 psig (34.5 kPa).

11.2.1.3 A venting section shall prevent the propagation of flame.

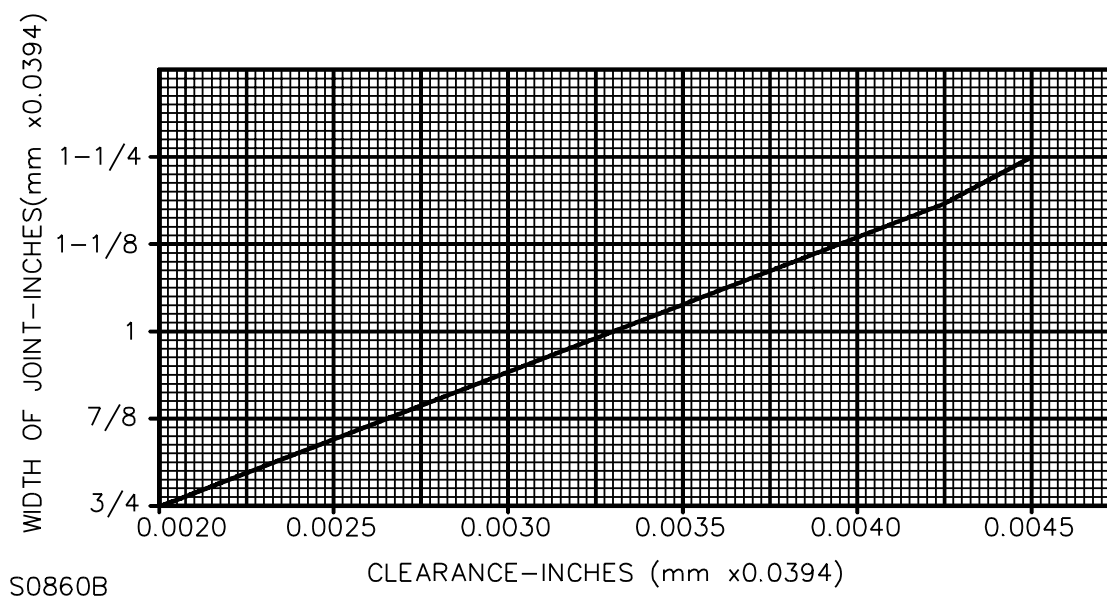
11.2.1.4 A luminaire enclosure that serves as both a lamp enclosure and an enclosure for other parts (such as a ballast, capacitor, or the like) shall comply with the requirements in 11.2.2.1. A lamp enclosure is considered separate from another adjacent enclosure in a luminaire if means are provided, such as a seal or the equivalent, to prevent propagation of flame between the enclosures.

11.2.2 Straight and rabbet joints – enclosures other than lamp enclosures

11.2.2.1 Except as noted in 11.2.2.2 and 11.2.2.3, the width of a joint and the clearance, when assembled, shall be as specified in Figure 11.3, and the width of a joint shall not be less than 3/4 inch (19.1 mm).

11.2.2.2 A rabbet joint may have a diametrical clearance at the axial section of not more than twice the clearance specified in Figure 11.3 if neither the axial nor the radial section of the joint is less than 1/16 inch (1.6 mm) wide.

Figure 11.3
Relation between clearance and width of joint



(See 11.2.2.2 and 11.2.2.3)

11.2.2.3 An enclosure having a free internal volume of 300 cubic inches (4.92 dm³) or less may have a 1/2-inch (12.7-mm) wide rabbet joint or a 3/8-inch (9.5-mm) wide flat joint if other details comply with (a) or (b), respectively.

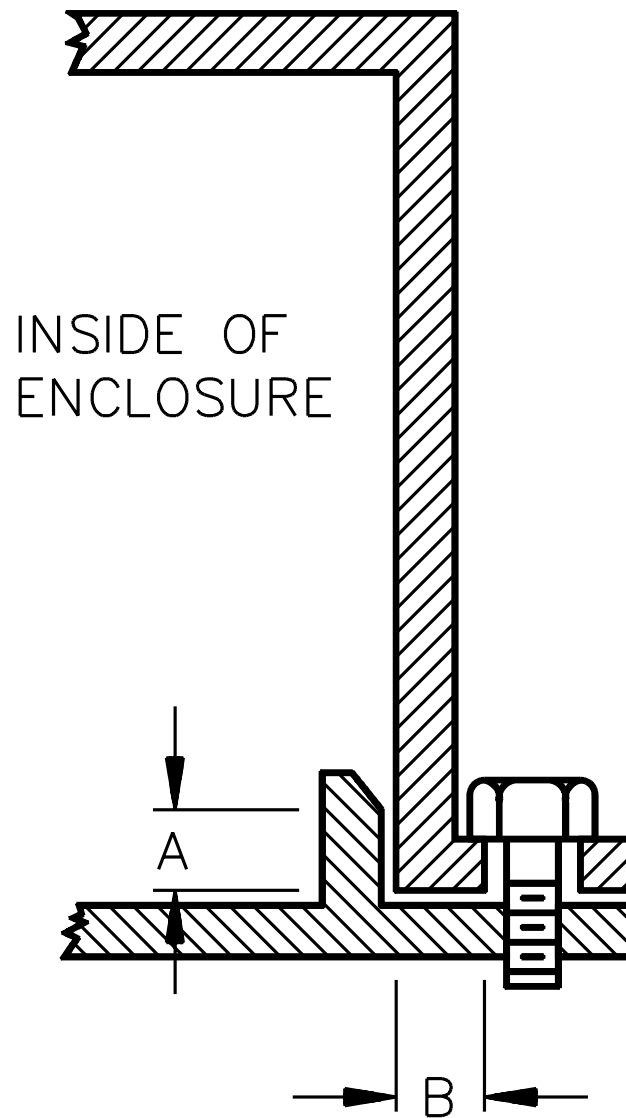
a) One-half-inch wide rabbet joint (see Figure 11.4).

- 1) Neither the axial nor the radial section of the joint is less than 3/64 inch (1.2 mm) wide, and
- 2) The diametrical clearance of the axial section and the clearance of the radial section of the joint is not more than 0.002 inch (0.05 mm), and
- 3) The joint width measured from the inside of the enclosure to the nearest edge of each bolt clearance hole and elsewhere is not less than 1/2 inch.

b) Three-eighths-inch wide flat joint (see Figure 11.5).

- 1) The clearance between the joint surfaces is less than 0.0015 inch (0.038 mm) or such that a 0.0015-inch feeler gauge will not enter the required joint width more than 1/8 inch (3.2 mm) at any point, and
- 2) The thickness of the cover at the joint width is not less than 3/8 inch unless stiffened or reinforced metal of a lesser thickness has been found to be acceptable when judged with respect to its mechanical strength and resistance to opening of the joint clearance under internal pressures, and
- 3) The joint width measured from the inside of the enclosure to the nearest edge of each bolt clearance hole and elsewhere is not less than 3/8 inch.

Figure 11.4
Rabbet joints



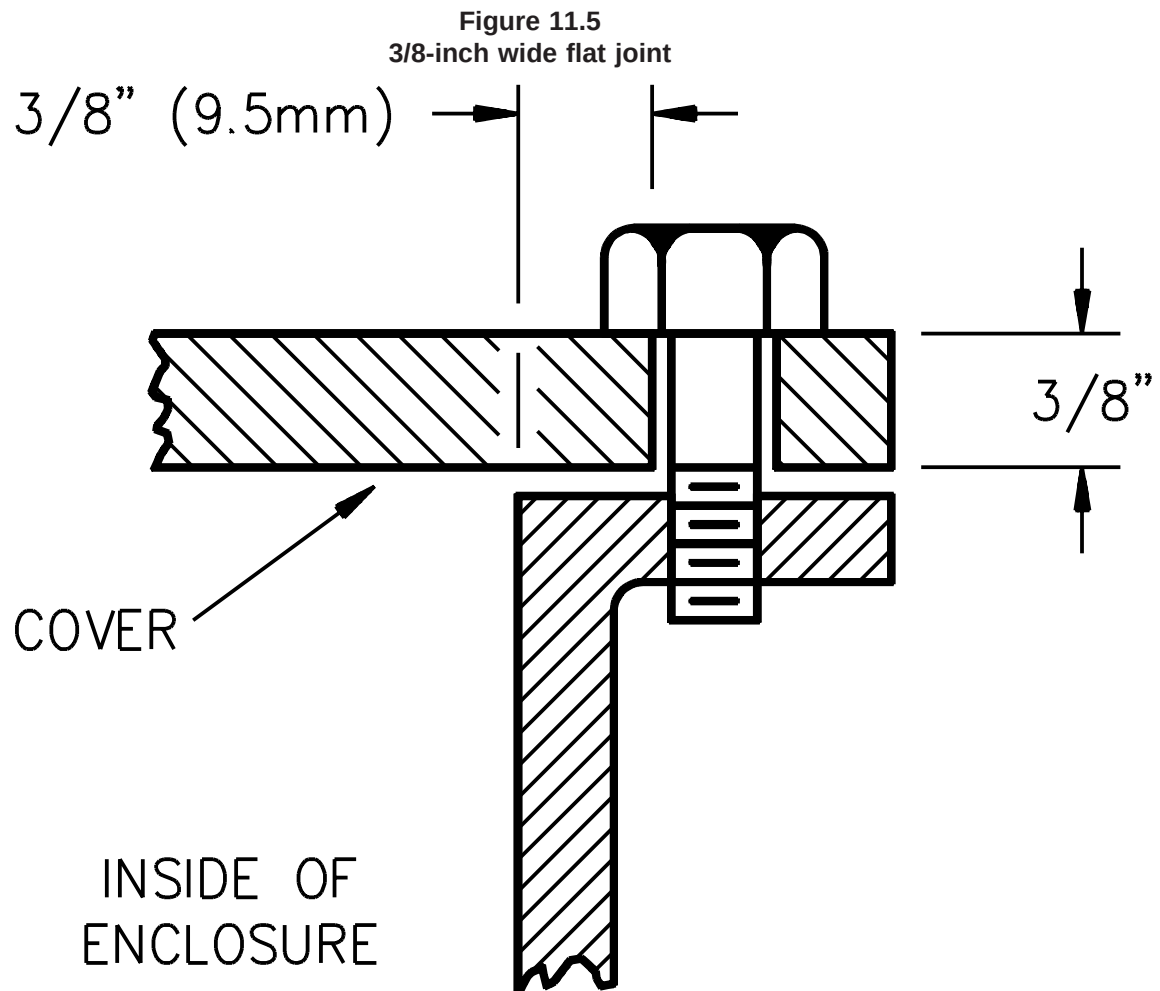
S2827A

(See 11.2.1.1, 11.2.2.3(a), and 11.3.3)

$A + B = 3/8$ inch (9.5 mm) for Class I, Groups C and D lamp enclosures.

$A + B = 1/2$ inch (12.7 mm) for Class I, Groups C and D enclosures, other than lamp enclosures, having free internal volume not more than 300 cubic inches (4.92 dm³).

$A + B = 7/8$ inch (22.2 mm) for all Class I, Group B enclosures having free internal volume not more than 100 cubic inches (1.64 dm³).



S2834

(See 11.2.2.3(b) and 11.3.2)

11.2.3 Threaded joints

11.2.3.1 The requirements in 11.2.3.2 – 11.2.3.4 apply to all enclosures.

11.2.3.2 A threaded joint shall consist of the number of fully engaged threads specified in Table 11.1, but not less than five. Threads shall not be finer than specified in Table 11.1.

Table 11.1
Thread engagement

Maximum diameter of threaded sections, Inch (mm)	Maximum acceptable number of threads per inch (25.4 mm)	Minimum acceptable number of threads engaged
No Limit	20	5
3/8 (9.5)	24	5
Over 3/8	24	6
Over 3/8	28	7
Over 3/8	32	8

11.2.3.3 The engagement between a threaded shaft and a tapped hole in an enclosure is considered to be a threaded joint.

11.2.3.4 A joint of the serrated type with a thread contour shall not have more than 20 serrations per inch (25.4 mm), and shall have at least five fully engaged and tightly clamped serrations.

11.2.4 Labyrinth joints

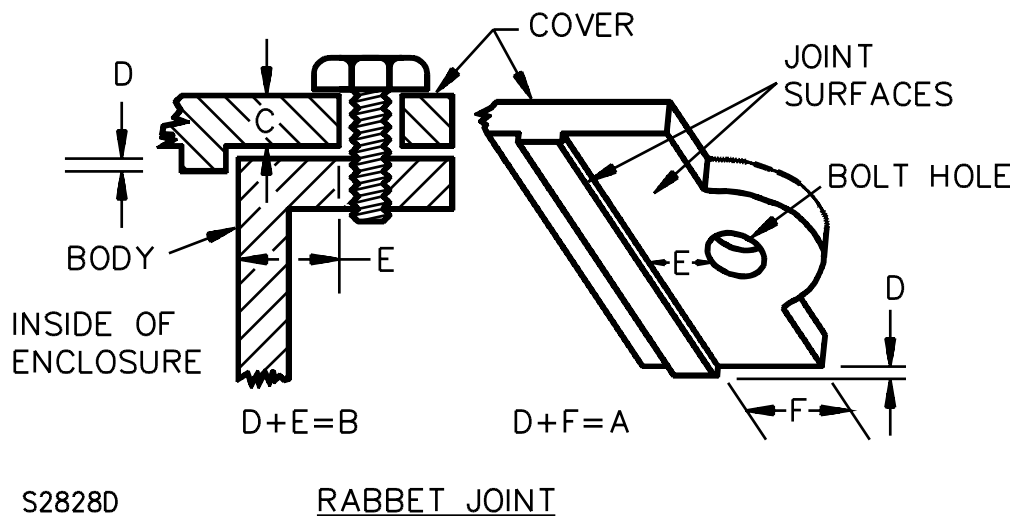
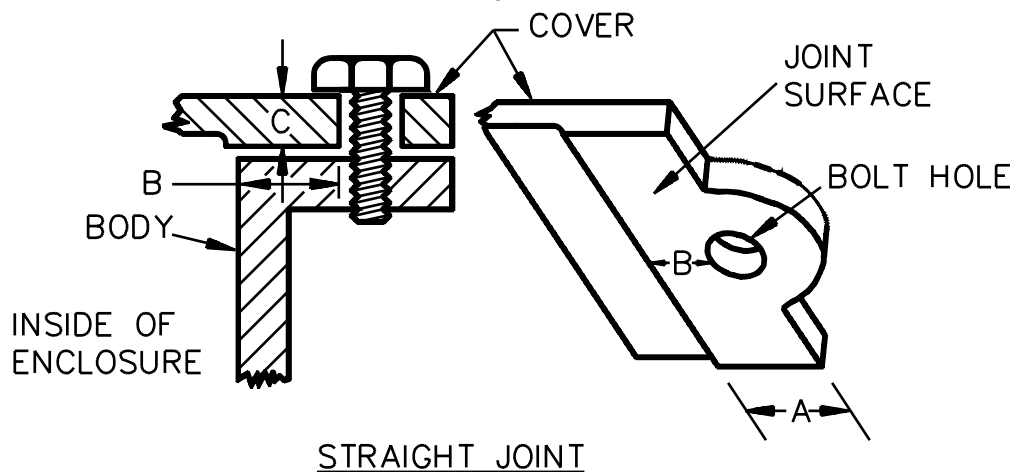
11.2.4.1 Joints of the labyrinth type shall be tested in accordance with the requirements in 25.13.

11.2.5 Bolts in joint width

11.2.5.1 The requirements in 11.2.5.2 and 11.2.5.3 apply to all enclosures.

11.2.5.2 A bolt may be located in a 3/4-inch (19.1-mm) or wider joint if the distance from the inside of the enclosure to the nearest edge of the clearance hole for the bolt is not less than 1/2 inch (12.7 mm) and the diametrical clearance between the bolt and the clearance hole is not more than 0.045 inch (1.14 mm) measured over the shank or the major diameter of the threads, for a length of not less than one-half the required width of joint specified in Figures 11.2 and 11.3. The bolt may be provided with a lock washer. If the bolts or screws for fastening a cover each engage at least five full threads in a tapped hole in the enclosure, the holes need not be bottomed. See Figure 11.6.

Figure 11.6
Bolts in joint width



(See 11.2.5.2 and 11.2.5.3)

A = Required minimum width of joint (see Figures 11.2 and 11.3)

B = Minimum distance from inside enclosure to bolt clearance hole

C = 1/2 of required minimum width of joint

D = One part of rabbet joint

E = Second part of rabbet joint to bolt clearance hole

F = Second part of rabbet joint elsewhere

11.2.5.3 The requirements in 11.2.5.2 apply, in general, to ordinary round machine screws. Screws that form their own machine-type thread and that have been investigated for securing enclosure parts may also be located in the joint width if they comply with the requirements in 11.2.5.2 except for measurement of the bolt clearance. In determining the clearance between a thread-forming screw and its clearance hole, the bolt dimension to be used is the minimum dimension of the cross section over the threads.

11.3 Luminaires for Class I, Group B locations

11.3.1 The requirements in 11.3.2 – 11.3.6 apply to lamp enclosures and enclosures other than lamp enclosures.

11.3.2 The width of a joint in an enclosure having a free internal volume of 30 cubic inches (492 cm³) or less shall not be less than 3/8 inch (9.5 mm). At a bolt hole, the width shall be measured from the inside edge to the nearest edge of the bolt clearance holes. The thickness at the joint flange shall not be less than 3/8 inch. The clearance between joint surfaces shall be less than 0.0015 inch (0.038 mm) or such that a 0.0015-inch feeler gauge will not enter the required joint width more than 1/8 inch (3.2 mm) at any point. See Figure 11.5.

11.3.3 The width of a joint in an enclosure having a free internal volume of more than 30 cubic inches (492 cm³) but not more than 100 cubic inches (1640 cm³) shall not be less than 5/8 inch (25.9 mm). At a bolt hole, the width shall be measured from the inside edge to the nearest edge of the bolt clearance hole. The clearance between joint surfaces shall be less than 0.0015 inch (0.038 mm) or such that a 0.0015-inch feeler gauge will not enter the required joint width more than 1/8 inch (3.2 mm) at any point. A rabbet joint in an enclosure shall have a total joint width of not less than 7/8 inch (22.2 mm) with neither section of the joint being less than 3/8 inch (9.5 mm) wide. The diametrical clearance at an axial section of the joint shall not be more than 0.0025 inch (0.064 mm), and the clearance at a radial or clamped section of the joint shall not be more than 0.0015 inch. See Figure 11.4.

11.3.4 The width of a joint in an enclosure having a free internal volume of more than 100 cubic inches (1640 cm³) but not more than 350 cubic inches (5740 cm³) shall not be less than 1 inch (25.4 mm). At a bolt hole, the width shall be measured from the inside edge to the nearest edge of the bolt clearance hole. The clearance between the joint surfaces shall not be more than 0.0015 inch (0.038 mm).

11.3.5 Except for a conduit connection and a joint having tapered threads, a threaded joint in an enclosure shall have at least eight fully engaged threads with a Class 1 fit, at least seven with a Class 2 fit, or at least six with a Class 3 fit. See the Standard for Unified inch Screw Threads (UN and UNR Thread Form), ANSI/ASME B1.1. A threaded joint in an enclosure having tapered threads shall fully engage at least five threads. Threads shall not be finer than 20 threads per inch (25.4 mm).

11.3.6 A joint of the serrated type with a thread contour shall not have more than 20 serrations per inch (25.4 mm) and shall have at least five fully engaged and tightly clamped serrations.

11.4 Luminaires for Class I, Group A locations

7.4.1 The requirements in 11.4.2 and 11.4.3 apply to lamp enclosures and enclosures other than lamp enclosures.

11.4.2 Except for a conduit connection and a joint having tapered threads, a threaded joint in an enclosure shall have at least eight fully engaged threads with a Class 1 fit, at least seven with a Class 2 fit, or at least six with a Class 3 fit. See the Standard for Unified inch Screw Threads (UN and UNR Thread Form), ANSI/ASME B1.1. A threaded joint in an enclosure having tapered threads shall fully engage at least five threads. Threads shall not be finer than 20 threads per inch (25.4 mm).

11.4.3 A joint of the serrated type with a thread contour shall not have more than 20 serrations per inch (25.4 mm) and shall have at least five fully engaged and tightly clamped serrations.

12 Joints in Enclosures for Class II, Groups E, F, and G Locations

12.1 A joint in an enclosure shall be of the metal-to-metal, metal-to-glass, metal-to-polymeric, polymeric-to-polymeric, or polymeric-to-glass type. A joint surface shall have an arithmetical average roughness not more than 250 microinches (0.0064 mm) in accordance with the Standard for Surface Texture (Surface Roughness, Waviness, and Lay), ANSI/ASME B46.1.

12.2 The width of a joint measured from the inside of an enclosure to the outside shall not be less than 3/16 inch (4.8 mm). The clearance between the joint surfaces shall not be more than 0.002 inch (0.50 mm) for a 3/16-inch (4.8-mm) wide joint and not more than 0.003 inch (0.08 mm) for a 1/4-inch (6.4-mm) wide joint. These specified widths shall also be provided between the inside of the enclosure and the nearest edge of each bolt hole.

Exception: A luminaire with joints having both larger clearances and greater widths than those specified may be accepted for test.

12.3 If a gasket is used in a joint, it shall be formed of polytetrafluoroethylene (also see 11.1.14) or material having similar characteristics. The gasket may be of plant-fiber sheet packing material if the surface temperature to which the gasket is exposed does not exceed 90°C (194°F). The gasket material shall be mechanically attached and protected from abuse. The width of gasket contact shall not be less than 3/16 inch (4.8 mm) at all points around the joint. A gasket that is secured in a joint not intended to be opened after the luminaire is assembled is considered mechanically attached.

Exception: The gasket may be attached by an adhesive or cement if aging tests on the construction show that the means of attachment does not deteriorate. See Supplement SA.

12.4 A material that upon aging readily hardens or adheres to metal surfaces, or both, is not an acceptable gasket material. See Supplement SA for the investigation of elastomeric gaskets.

12.5 A threaded joint shall consist of at least three threads fully engaged. A screw shall not have more than 32 threads per inch (25.4 mm).

12.6 The engagement between a threaded shaft and a tapped hole in an enclosure is considered to be a threaded joint.

12.7 A luminaire may have a combination joint consisting of two sections, such as a threaded section and a gasketed glass-to-metal section. Neither section considered alone need comply with the requirements specified in 12.2, 12.3, or 12.5. A threaded section shall have at least two threads fully engaged. A straight (flat or cylindrical) section shall have at least 1/8 inch (3.2 mm) width and not more than 0.002 inch (0.005 mm) clearance. A gasketed section shall have at least 1/8 inch width of gasket contact at all points around the joint.

13 Holes in Enclosure

13.1 Luminaires for Class I locations

13.1.1 A metal pin or a part press-fitted through the wall of an enclosure shall engage for at least 3/8 inch (9.5 mm). Such a part shall be secured against removal by welding, peening, or the equivalent.

13.1.2 Holes in an enclosure for securing a part shall:

- a) Be bottomed,
- b) Be closed by welding of the part in place, or
- c) Have the screws securing the part engaged for at least five full threads and the screws shall be secured against removal. If a self-tapping screw is used, it shall have a minimum of five full threads engaged when seated. A screw shall not have more than 32 threads per inch (25.4 mm).

13.1.3 Unless the attachment complies with the requirements in 13.1.1 or 13.1.2, holes in an enclosure for attachment of a nameplate shall be bottomed. The remaining thickness at the bottomed hole shall be sufficient to withstand the Hydrostatic Pressure Test, Section 28, but shall not be less than 1/16 inch (1.6 mm).

13.1.4 A tapped hole shall not be provided in a sintered-metal part that is employed as a venting section of an enclosure.

13.2 Luminaires for Class II locations

13.2.1 A metal pin or a part press-fitted through the wall of an electrical enclosure shall engage for at least 3/16 inch (4.8 mm). Such a part shall be secured against removal by welding, peening, or the equivalent.

13.2.2 Holes in an enclosure for securing a part shall:

- a) Be bottomed,
- b) Be closed by welding of the part in place, or
- c) Have the screws securing the part engaged for at least three full threads and the screws shall be secured against removal. If a self-tapping screw is used, it shall have a minimum of three full threads engaged when seated. A screw shall not have more than 32 threads per inch (25.4 mm).

13.2.3 Unless the attachment complies with the requirements in 13.2.1 or 13.2.2, holes in an enclosure for attachment of a nameplate shall be bottomed. The remaining thickness at the bottomed hole shall not be less than 1/16 inch (1.6 mm).

13.2.4 A tapped hole shall not be provided in a sintered-metal part that is employed as a venting section of an enclosure.

14 Shaft Openings

14.1 General

14.1.1 A shaft opening in an enclosure shall be of the metal-to-metal type for Class I locations and of the metal-to-metal or metal-to-polymeric type for Class II locations. See 11.1.1 for roughness requirements of the metal surfaces forming the path.

14.2 Luminaires for Class I locations

14.2.1 Except as noted in 14.2.2, a shaft opening in an enclosure shall have a length of path of not less than 1 inch (25.4 mm). The diametrical clearance between the shaft and its opening in the enclosure shall be as specified in Figure 11.3. The diametrical clearance of a path longer than 1-1/4 inches (31.8 mm) shall not be more than 0.0045 inch (0.114 mm).

14.2.2 A shaft opening in an enclosure provided with a venting section (see 11.2.1.2) shall have a length of path not less than 1/4 inch (6.4 mm) with a diametrical clearance of not more than 0.005 inch (0.13 mm) if the maximum explosion pressure developed during explosion tests does not exceed 5 psig (34.5 kPa).

14.3 Luminaires for Class II locations

14.3.1 A shaft opening in an enclosure shall have a length of path of not less than 1/2 inch (12.7 mm). The diametrical clearance between the shaft and the shaft opening shall not be more than 0.005 inch (0.13 mm) for a 1/2-inch (12.7-mm) length of path, 0.008 inch (0.20 mm) for a 1-inch (25.4-mm) length of path, and 0.011 inch (0.28 mm) for a 1-1/2-inch (38.1-mm) length of path, with intermediate values proportional.

15 Guards of Luminaires for Classes I and II Locations

15.1 A guard, if used, shall be attached to the luminaire so that its position is maintained.

16 Nonmetallic External Parts

16.1 A nonmetallic external part, such as a guard or a reflector, shall be subjected to the Test for Accumulation of Static Electricity, Section 35.4.

17 Supply Connections

17.1 Luminaires for Class I locations

17.1.1 A luminaire shall have provision for connection to threaded rigid metal conduit or other wiring methods in accordance with Article 501 in the National Electrical Code, NFPA 70.

17.1.2 Except as noted in 17.1.3, the conduit hub of a luminaire intended to be supported by conduit shall be provided with a setscrew to secure the luminaire to the conduit. The setscrew shall be located to the outside of five full threads of the supply opening.

17.1.3 The requirement in 17.1.2 applies to a luminaire, such as the pendent type, that has one conduit hub and can turn on the supporting conduit. It does not apply to a luminaire, such as a fluorescent type, that is suspended at two or more points and that cannot turn on the supporting conduit.

17.1.4 An outlet or terminal box in which connections to the power-supply circuit will be made shall be located so that, after the luminaire has been installed as intended, the connections will be readily accessible for inspection without the disconnection of any portion of the wiring.

17.1.5 The leads or conductors shall be securely held and tightly sealed where they pass into the lamp chamber. If a sealing compound or cement is used, it shall comply with the Tests On Sealing Compounds, Section 36 and be at least 5/8 inch (15.9 mm) deep. The sealing compound shall neither flow nor creep at the operating temperature of the lighting unit. A sealing compound that softens upon the application of heat shall have a softening point of not less than 93°C (200°F).

17.1.6 The softening point of a sealing compound is to be determined in accordance with the Standard Test Method for Softening Point By Ring-and-Ball Apparatus, ASTM E28.

17.1.7 A seal provided between the lamp enclosure and the wiring compartment shall comply with the Tests On Sealing Compounds, Section 36.

17.1.8 A conduit opening shall be provided with at least five full threads.

17.1.9 Each conduit opening shall be provided with:

- a) A smooth and well-rounded integral conduit stop, having a throat or inner diameter as specified in Table 17.1,
- b) A smooth and well-rounded inner end as shown in Figure 17.1, or
- c) Threads not exceeding the maximum number specified in Table 17.2 for the conduit size.

Exception: The opening need not comply with this requirement if instructions are provided in accordance with 74.27.

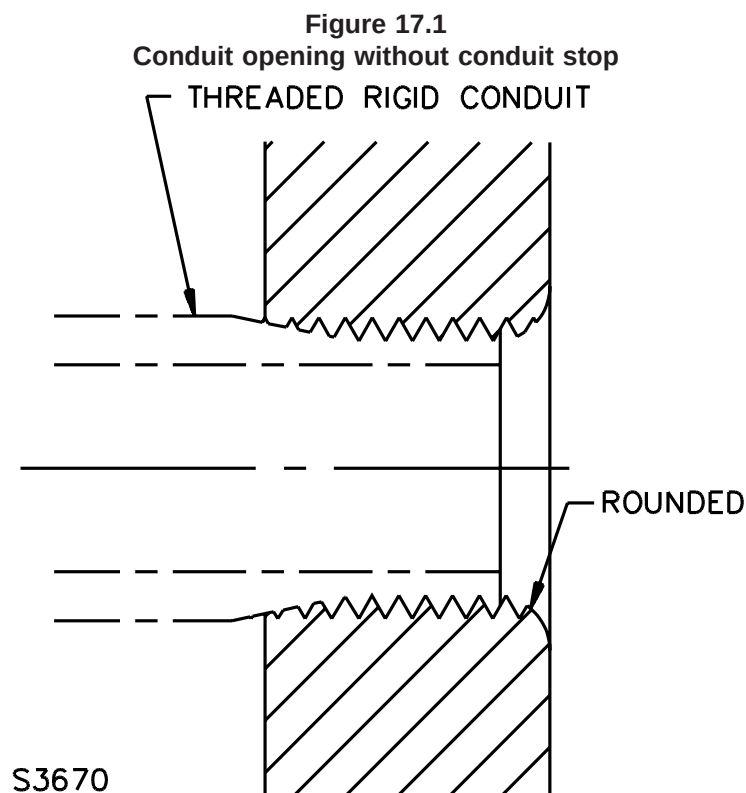


Table 17.1
Throat diameter of conduit stop

Trade size of conduit,		Throat diameter of conduit stop, Inches (mm)			
Inches	(mm O.D.)	Minimum		Maximum	
1/2	(21.3)	0.560	(14.22)	0.622	(15.80)
3/4	(26.7)	0.742	(18.85)	0.824	(20.93)
1	(33.4)	0.944	(23.98)	1.049	(26.64)
1-1/4	(42.4)	1.242	(31.55)	1.380	(35.05)
1-1/2	(48.3)	1.449	(36.80)	1.610	(40.89)

Table 17.1 Continued on Next Page

Table 17.1 Continued

Trade size of conduit,		Throat diameter of conduit stop, Inches (mm)			
Inches	(mm O.D.)	Minimum		Maximum	
2	(60.3)	1.860	(47.24)	2.067	(52.50)
2-1/2	(73.0)	2.222	(56.44)	2.469	(62.71)
3	(88.9)	2.761	(70.13)	3.068	(77.93)
3-1/2	(101.6)	3.193	(81.10)	3.548	(90.12)
4	(114.3)	3.623	(92.02)	4.026	(102.26)
5	(141.3)	4.542	(115.37)	5.047	(128.19)
6	(168.3)	5.458	(138.63)	6.065	(154.05)

Table 17.2
Number of threads in a conduit opening without an integral stop

Trade size of conduit, Inches (mm OD)		Number of threads per inch (25.4 mm)	Maximum number of threads
1/2	(21.3)	14	6
3/4	(26.7)	14	6
1	(33.4)	11-1/2	6
1-1/4	(42.2)	11-1/2	6
1-1/2	(48.3)	11-1/2	7
2	(60.3)	11-1/2	7
2-1/2	(73.0)	8	7
3	(88.9)	8	8
3-1/2	(101.6)	8	8
4	(114.3)	8	9
5	(141.3)	8	9
6	(168.3)	8	9

17.1.10 If a luminaire has a single hub and the wiring compartment of the luminaire would not be expected to be used for through wiring during installation, the throat diameter for conduit sizes greater than 1/2-inch trade size (21.3 mm OD) may be less than that specified in Table 17.1 but not less than 0.560 inch (14.22 mm).

17.1.11 If an integral conduit stop is provided in a conduit opening of an enclosure for Class I, Group A or B locations, the threads shall be tapered 3/4 inch per foot (62.5 mm/m).

17.1.12 If an integral conduit stop is provided in a conduit opening of an enclosure for Class I, Group C or D locations, the threads may be of the straight type or tapered 3/4 inch per foot (62.5 mm/m).

17.1.13 If an integral conduit stop is not provided in a conduit opening, the threads shall be tapered 3/4 inch per foot (62.5 mm/m).

17.1.14 Entries shall use a modified National Standard Pipe Taper (NPT) or National Standard Pipe Straight (NPS) thread. The pipe thread form shall comply with the Standard for Pipe Threads, ANSI/ASME B1.20.1. Entries shall not be smaller than trade size 1/2 nor larger than trade size 6 and shall provide for five full threads of engagement with a conduit or fitting gauging at L1-1. NPT threaded entries shall conform to ANSI/ASME B1.20.1 except that entries shall gauge from flush to +3-1/2 turns beyond the L-1 gauging notch in lieu of the ± 1 turns described in ANSI/ASME B1.20.1.

Revised 17.1.14 effective December 31, 2009

17.1.15 Metric threaded entries shall comply with the requirements in 11.2.3.1 – 11.2.3.4, Threaded Joints and Explosion Tests, Section 26. Means shall be provided to minimize abrasion to conductor insulation.

17.1.15 effective December 31, 2009

17.1.16 Metric threaded entries shall have a permanent marking near the supply connection opening in accordance with 74.28.

Exception: Luminaires which use a thread type other than NPT or NPS are not required to have the marking in 74.28 when they are provided with an adapter to NPT or NPS thread form. The adapter shall comply with the applicable construction and performance requirements in this Standard and the Standard for Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations UL 1203, Part VIII.

17.1.16 effective December 31, 2009

17.1.17 All openings for connection to conduit, except those necessary for installation, shall be furnished with metal plugs engaging at least five full threads.

17.1.18 A conduit hub not integrally cast with an enclosure, shall:

- a) Have a wall thickness before threading not less than that of the corresponding trade-size conduit,
- b) Not depend on friction alone to prevent it from turning, and
- c) Comply with the Tests for Secureness of Conduit Hubs, Section 32.

17.2 Luminaires for Class II locations

17.2.1 A luminaire shall have provision for connection to threaded rigid metal conduit or other wiring methods in accordance with Article 502 in the National Electrical Code, NFPA 70.

17.2.2 Except as noted in 17.2.3, the conduit hub of a luminaire intended to be supported by conduit shall be provided with a setscrew to secure the luminaire to the conduit. The setscrew shall be located to the outside of 3-1/2 threads of the supply opening.

17.2.3 The requirement in 17.2.2 applies to a luminaire, such as the pendent type, that has one conduit hub and can turn on the supporting conduit. It does not apply to a luminaire, such as a fluorescent type, that is suspended at two or more points and cannot turn on the supporting conduit.

17.2.4 Deleted effective September 26, 2011

17.2.5 Each conduit opening shall comply with the requirements in 17.1.9, 17.1.10, 17.1.13, 17.1.15, 17.1.16, and 17.1.18.

Revised 17.2.5 effective September 26, 2011