

UL 886

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Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations

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UL Standard for Safety for Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations, UL 886

Tenth Edition, Dated February 14, 1994

Revisions: This Standard contains revisions through and including November 22, 2005.

SUMMARY OF TOPICS

This revision to UL 886 is issued to remove the ANSI approval from the title page.

UL Standards for Safety are developed and maintained in the Standard Generalized Markup Language (SGML). SGML -- an international standard (ISO 8879-1986) -- is a descriptive markup language that describes a document's structure and purpose, rather than its physical appearance on a page. Due to formatting differences resulting from the use of UL's new electronic publishing system, please note that additional pages (on which no requirements have been changed) may be included in revision pages due to relocation of existing text and reformatting of the Standard.

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

The revisions dated November 22, 2005 include a reprinted title page (page1) for this Standard.

The revisions dated November 22, 2005 includes the removal of the ANSI approval from the title page.

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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.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 and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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5-7	January 30, 1997
8-11	February 14, 1994
12-12B	April 13, 1999
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UL 886

Standard for Outlet Boxes and Fittings for Use In Hazardous (Classified)

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The first through fourth editions were titled Electrical Fittings for Use in Hazardous Locations, Class I, Group D. The fifth through seventh editions were titled Outlet Boxes and Fittings for Use in Hazardous Locations, Class I, Groups A, B, C and D, and Class II, Groups E, F, and G.

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Tenth Edition

February 14, 1994

The Department of Defense (DoD) has adopted UL 886 on September 20, 1991. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

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.

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INTRODUCTION

1 Scope

1.1 These requirements cover electrical fittings and boxes for 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 electrical equipment for use in Class I, Zone 1, Groups IIA, IIB, and IIC hazardous (classified) locations.

1.1.1 added January 30, 1997

1.2 These requirements cover capped elbows, boxes, conduit fittings for draining or venting, conduit fittings for sealing, conduit unions, cord connectors, flexible-connection fittings, mineral insulated cable fittings, and fixture fittings of the adjustable, flexible, and rigid types.

1.3 These devices shall also comply with the applicable requirements for similar devices for use in ordinary locations.

1.4 These requirements apply to outlet boxes and fittings for hazardous locations under the following atmospheric conditions:

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

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 or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the 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 does not comply with this standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

1.5 revised July 14, 1995

2 General

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

2.1 revised January 30, 1997

2.2 Applicable requirements for a grounding terminal in a box that may be used for field supply connections on a dispenser for petroleum products are specified in the requirements in the Standard for Power-Operated Dispensing Devices for Petroleum Products, UL 87.

2.3 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.

2A Class I, Zone, and Group Equivalency

2A added January 30, 1997

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

2A.1.1 Electrical equipment intended to be marked in accordance with 35.18 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group D hazardous (classified) locations.

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

2A.2.1 Electrical equipment intended to be marked in accordance with 35.19 shall comply with all the requirements for explosion-proof electrical equipment for use in Class I, Group C hazardous (classified) locations.

2A.3 Class I, Zone 1, Group IIC

2A.3.1 Electrical equipment intended to be marked in accordance with 35.20 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.

3 Enclosure Types

3.1 An enclosure shall comply with the applicable requirements specified in 3.2, 3.3, and Table 3.1.

Table 3.1
Enclosure types for hazardous locations

Type No.	Application	Requirements
7	Class I, Division 1, Group A, B, C, or D – Indoor Hazardous Locations	4.1 – 4.3, 5.1 – 5.4, 6.1 – 6.4.3, 7.1.1 – 7.1.3, 8.1 – 8.3, 8.5, 9.1.1.1 – 9.1.1.9, 9.2.1, 10.1 – 10.4, 11.1, 11.2, 12.1 – 12.3, 13.1.1 – 13.2.1.3, 13.3.1 – 13.14.1, 14.1, 14.2, 15.1 – 15.3, 16.1 – 16.16, 17.1 – 17.5, 19.1 – 35.16
9	Class II, Division 1, Group E, F, or G – Indoor Hazardous Locations	4.1, 4.3, 5.1 – 5.4, 6.1.1 – 6.1.3, 6.5.1 – 6.5.5, 7.2.1 – 7.2.3, 8.1, 8.2, 8.4, 8.5, 9.1.2.1 – 9.2.1, 10.1 – 10.4, 11.1, 11.2, 12.1, 12.3, 13.1.1, 13.2.2.1 – 13.14.1, 14.1, 14.2, 15.1 – 15.3, 18.1 – 18.6, 19.1 – 35.16

3.2 An enclosure that is intended for use in environmental conditions other than those defined in Table 3.1, 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.

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

CONSTRUCTION

4 Material

4.1 A box or a fitting shall be made of ferrous materials, copper, brass, bronze, or aluminum or its alloys containing not less than 80 percent aluminum. A metal such as zinc or magnesium, or their alloys, is not acceptable.

4.2 Copper shall not be used for a box for use in Class I, Group A locations. A copper alloy shall not be used for a box unless it is coated with tin, nickel, or an equivalent coating, or unless the copper content of the alloy is limited to not more than 30 percent.

4.3 Among the factors that are to be taken into consideration when determining the acceptability of 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,

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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. See Supplement A for tests on a polymeric enclosure material.

4.3 revised January 30, 1997

5 Thickness

5.1 The minimum wall thickness of a box or fitting shall not be less than that specified in Table 5.1.

Exception No. 1: A flexible fixture fitting need not comply with this requirement.

Exception No. 2: A flexible connection fitting need not comply with this requirement.

Exception No. 3: A mineral insulated cable fitting need not comply with this requirement.

Exception No. 4: The thickness at a bottomed hole in the enclosure need not comply with this requirement. See 7.1.2, 7.1.3, 7.2.2, and 7.2.3.

5.1 revised February 15, 1994

Table 5.1
Thickness of metal for electrical enclosure

External enclosure dimensions		Minimum thickness, inch (mm)			
Length or diameter, inch (mm)	Area of any one surface, square inch (dm ²)	Cast brass, bronze, copper, malleable iron	Cast iron and aluminum ^a	Sheet steel	
22 (560)	480 (31)	0.093 (2.36)	0.125 (3.18)	0.067	(1.70)
30 (760)	620 (40)	0.093 (2.36)	0.125 (3.18)	0.093	(2.36)
60 (1525)	1500 (97)	0.125 (3.18)	0.187 (4.75)	0.125	(3.18)
Over 60 (over 1525)	Over 1500 (over 97)	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.

5.2 A flexible fitting with thin corrugated-metal walls shall have an insulating inner liner to prevent electric arcs from burning through the walls. The insulating liner shall withstand arcing when tested as described in the Arcing Test, Section 23.

5.3 The flexible-metal tubing and reinforcing braid of a flexible fitting shall be soldered, brazed, or welded to the end connectors. Soft solders in flexible fixture fittings shall withstand the Endurance Load at Elevated Temperature Test, Section 26. The depth of a soft-solder seal between each end fitting and the flexible metal tubing shall not be less than 5/8 inch (15.9 mm).

5.4 A flexible fitting shall have approximately the same inside diameter as that of the corresponding trade size of conduit. The inside diameters of an end fitting and an insulating liner shall be approximately the same.

6 Joints

6.1 General

6.1.1 A joint in a box or a fitting shall be of the metal-to-metal, metal-to-polymeric, or polymeric-to-polymeric 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, ANSI B46.1–1985.

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

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

6.2 Class I, Groups C and D locations

6.2.1 General

6.2.1.1 Except as noted in 6.2.1.3, 6.2.1.4, and 6.2.2.1 the width of a joint and the clearance, when assembled, shall be as illustrated in Figure 6.1, and the width of the joint shall not be less than 3/4 inch (19.1 mm).

6.2.1.2 A 3/4 inch (19.1 mm) or wider joint may be provided with an interruption, such as a groove for an "O" ring, if:

- a) The interruption has a cross-sectional area not greater than 0.05 square inch (32.3 mm²),
- b) The joint width from the inside of the enclosure to the inner edge of the interruption is not less than 1/2 inch (12.7 mm), and
- c) The balance of the required minimum joint width is provided from the outer edge of the interruption to the outside of the enclosure.

6.2.1.3 A rabbet joint may have a diametrical clearance at the axial section of not more than twice the clearance specified in Figure 6.1 if neither the axial nor the radial section of the joint is less than 1/16 inch (1.6 mm) wide.

6.2.1.4 An enclosure having a free internal volume (air volume) of 300 cubic inches (4.9 L), 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 (12.7 mm) wide rabbet joint (see Figure 6.2):

- 1) Neither the axial nor the radial section of the joint is less than 3/64 inch (1.2 mm) wide,
- 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 with the cover in the most unfavorable position.

b) Three-eighths inch (9.5 mm) wide flat joint (see Figure 6.3):

- 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 joint more than 1/8 inch (3.2 mm) at any point,
- 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 based on its physical 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 with the cover in the most unfavorable position.

6.2.2 Labyrinth joints

6.2.2.1 A joint of the labyrinth type shall be investigated in accordance with the requirements in 16.11.

6.2.3 Threaded joints

6.2.3.1 A threaded joint shall consist of the number of fully engaged threads indicated in Table 6.1, but in no case less than five. Threads shall not be finer than indicated in Table 6.1.

6.2.3.2 A joint of the serrated type with thread contour shall not have more than 20 serrations per inch (25 mm) and shall have at least five fully engaged and tightly clamped serrations.

Figure 6.1
Relation between clearance and width of joint

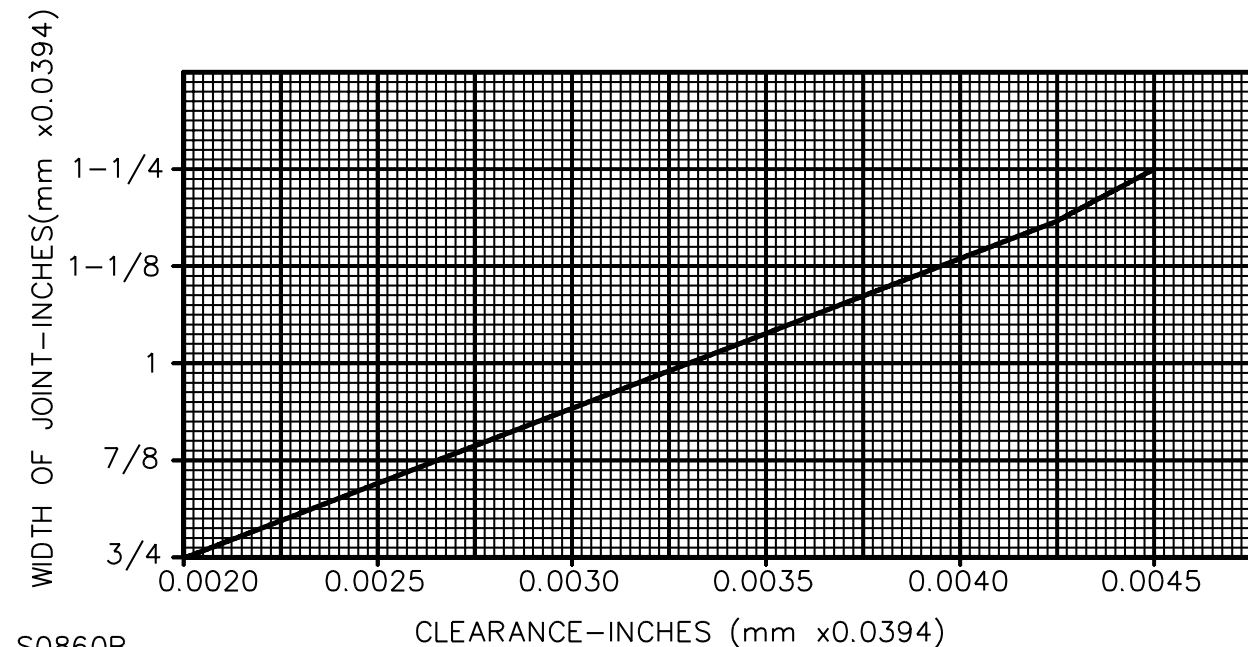
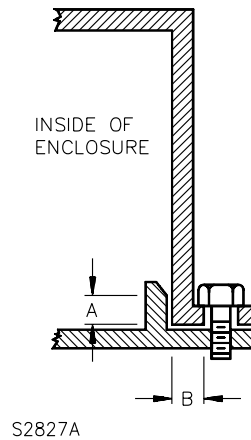


Figure 6.2
Rabbet joint

(See 6.2.1.4(a) and 6.3.2)

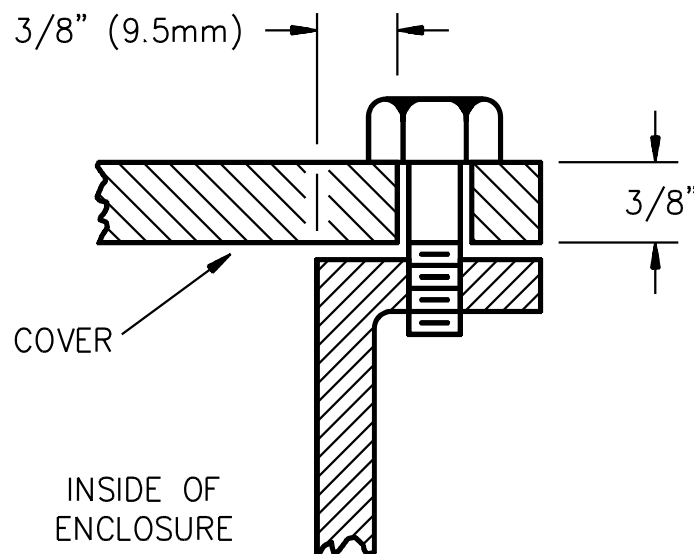


$A+B = 1/2$ inch (12.7 mm) for Class I, Groups C and D enclosures having free internal volume not more than 300 cubic inches (4920 cm³)

$A+B = 7/8$ inch (22.2 mm) for Class I, Group B enclosures having free internal volume not more than 100 cubic inches (1640 cm³)

Figure 6.3
3/8 inch (9.5 mm) Wide flat joint for a device having free internal volume not more than 300 cubic inches (4920 cm³)

(See 6.2.1.4(b) and 6.3.1)



S2834

Table 6.1
Thread engagement

Maximum diameter of threaded sections, inch (mm)	Maximum acceptable number of threads per inch (per 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

6.2.4 Bolts in joint width

6.2.4.1 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 Figure 6.1. The distance from inside the enclosure to the edge of the nearest clearance hole is measured with the cover in the most unfavorable position. See 6.2.4.2 and Figure 6.4.

6.2.4.2 All bolt holes in a joint width shall be bottomed or the bolts or screws for fastening a cover shall each engage at least five full threads in a tapped hole.

6.2.4.3 A bolt in a joint width may be provided with a lock washer.

6.2.4.4 The requirements in 6.2.4.1 and 6.2.4.2 apply, in general, to machine screws having a round cross section. Screws that form their own machine-type thread and have been investigated for securing enclosure parts may also be located in the joint width if they comply with the requirements in 6.2.4.1 and 6.2.4.2, 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.