

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

UL Standard for Safety
for
Electrically Operated Valves For Use in Hazardous (Classified) Locations, UL 1002

Sixth Edition, Dated February 14, 1994

Revisions: This Standard contains revisions through and including December 23, 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 July 30, 1996. The bulletin is now obsolete and may be discarded.

The revisions dated December 23, 1996 include a reprinted title page (page 1) for this Standard.

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UL 1002

Standard for

**Electrically Operated Valves For Use
In Hazardous (Classified) Locations**

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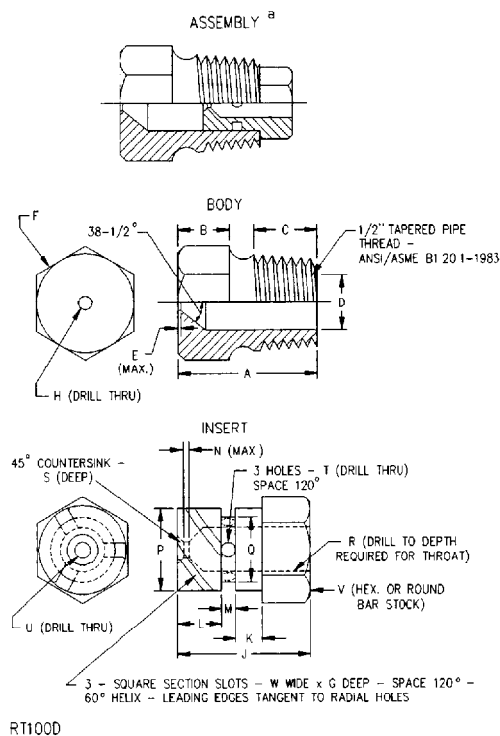
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Figure 16.2
Rain-test spray head



Item	inch	mm	Item	inch	mm
A	1-7/32	31.0	N	1/32	0.80
B	7/16	11.0	P	.575	14.61
C	9/16	14.0		.576	14.63
D	.578	14.68	Q	.453	11.51
	.580	14.73		.454	11.53
E	1/64	0.40	R	1/4	6.35
F	c	c	S	1/32	0.80
G	.06	1.52	T	(No. 35) ^b	2.80
H	(No. 9) ^b	5.0	U	(No. 40) ^b	2.50
J	23/32	18.3	V	5/8	16.0
K	5/32	3.97	W	0.06	1.52
L	1/4	6.35			
M	3/32	2.38			

^a Nylon Rain-Test Spray Heads are available from Underwriters Laboratories Inc.

^b ANSI B94.11 Drill Size.

^c Optional - To serve as wrench grip.

17 Accelerated Aging Test of Gaskets

17.1 A gasket of an elastomeric or thermoplastic material or a composition gasket using an elastomeric material to make an enclosure raintight shall be subjected to the accelerated-aging tests described in 17.2 or 17.3, whichever is applicable. As a result of the test, there shall be no evidence of deterioration such as softening, hardening, or cracking after flexing.

17.2 A gasket of rubber or neoprene, or a composition gasket containing an elastomeric material, is to be exposed in an air oven for 70 hours at $100^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($212^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$). See UL 157, Table 4.3, for oven aging conditions for service temperatures exceeding 60°C (140°F).

17.2 revised December 23, 1996

17.3 A gasket of thermoplastic material, or a composition thereof, may be accepted after consideration of the effects of heat aging, distortion under conditions of use, and the means of securing the gasket to the cover or enclosure.

MARKING

18 Details

18.1 Each valve shall be marked with the following:

- a) The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified.
- b) A distinctive catalog designation to specifically identify the valve.
- c) The electrical ratings.
- d) The maximum rated pressure, or the maximum operating pressure differential if lower than the rated pressure, or both.
- e) The hazardous location in which the valve is intended to be used; for example, "Class ___, Group ___." A valve that has been investigated and found acceptable for exposure to Class I and Class II location conditions at the same time shall be marked with the following or equivalent wording: "Suitable for simultaneous use in Class I, Group ___ and Class II, Group ___ locations."
- f) A cautionary statement containing the word "CAUTION" and the following or the equivalent "To reduce the risk of ignition of hazardous atmospheres, disconnect from the supply circuit before opening enclosure. Keep tightly closed when in operation."

Exception: A valve whose electrical enclosure has no internal volume need not be marked.

- g) The duty cycle if intended for intermittent operation.
- h) Maximum operating temperature or temperature code as specified in Table 18.1, if the operating temperature exceeds 100°C (212°F). This marking is to be based on the maximum temperature attained in the Temperature Test, Section 11, or Burnout Test, Section 12, whichever is higher. The operating temperature or temperature code shall be near the marking required by item (e). It shall be identified as "Operating Temperature _____", or "Operating Temperature Code _____", or the equivalent.

18.1 revised August 8, 1996

August 8, 1996 - UL 1002

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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 electrically operated valves 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 August 8, 1996

1.2 The requirements in this standard also apply to motor-operated valves and to magnetically-operated devices such as solenoids 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.

1.2 revised August 8, 1996

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

- a) A minimum ambient temperature of minus 70°C (minus 94°F),
- b) An oxygen concentration not greater than 21 percent by volume, and
- c) A nominal barometric pressure of one atmosphere.

1.3 revised August 8, 1996

1.4 These requirements do not cover valves for a fluid-power system, which is a system that transmits and controls power through use of a pressurized fluid within an enclosed circuit.

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 revised July 13, 1995

2 General

2.1 General

2.1.1 These devices shall also comply with the applicable requirements that are specified in the Standard for Electrically Operated Valves, UL 429, and other standards for similar devices for use in ordinary locations.

2.1.1 revised August 8, 1996

2.2 Units of measurement

2.2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

2.3 Undated references

2.3.1 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.

2.4 Components

2.4.1 Except as indicated in 2.4.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.4.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

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

2.4.4 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.

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 18.1.1 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 August 8, 1996

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

2A.2.1 Explosion-proof electrical equipment intended to be marked in accordance with 18.1.2 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 August 8, 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 18.1.3 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 August 8, 1996

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

2A.4.1 Explosion-proof electrical equipment intended to be marked in accordance with 18.1.4 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 August 8, 1996

CONSTRUCTION

3 Enclosure

3.1 Material

3.1.1 The enclosure housing the electrical components of a valve shall be made of iron, steel, copper, brass, bronze, aluminum or an aluminum alloy 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.

3.1.1 revised August 8, 1996

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

3.1.3 Among the factors that shall 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 at temperatures to which the enclosure may be subjected under all conditions of use.

All of these factors are to be considered with respect to thermal aging. See Parts I and II of Supplement SB for tests on polymeric enclosures and parts of enclosures.

3.1.3 revised August 8, 1996

No Text on This Page

3.2 Thickness

3.2.1 Other than as noted in 3.2.2, the thickness of an enclosure wall shall not be less than that specified in Table 3.1.

3.2.2 A machined or threaded joint in the wall of a cast-metal enclosure shall have a thickness through the overlap of not less than that specified in Table 3.1.

3.2.3 A component that closes an opening in the enclosure, such as a guide tube, that is necessary to permit proper operation of a magnetically operated part may have a wall thickness less than specified in Table 3.1 if:

- a) The thinner component is shielded from any electrical component that is subject to arcing by an insulation barrier at least 0.028 inch (0.70 mm) thick or a grounded metal barrier of such construction that an arcing fault between the electrical component and the barrier will prevent the arc from reaching the thinner section of the enclosure, or other equivalent means. Consideration is to be given to overcurrent protection that may be provided in the circuit, and, for an insulating material barrier, consideration is to be given to moisture absorptive properties, combustibility, resistance to distortion at temperatures to which it may be subjected, and thermal aging;
- b) Internal wiring cannot contact the thinner component;
- c) Mechanical protection is provided, such as by location within the equipment, to reduce the likelihood of mechanical damage to the thinner component; and
- d) The thinner component is formed of stainless steel, brass, or other acceptable inherently corrosion-resistant metal.

Table 3.1
Thickness of metal for enclosure

External Enclosure Dimensions		Minimum Thickness, Inch (mm)		
Length or Diameter, Inches (m)	Area of Any One Surface, Square Inches (m ²)	Cast Brass, Bronze, Copper, or Malleable Iron	Cast Iron and Aluminum ^a	Sheet Steel
22 (0.56)	480 (0.31)	0.093 (2.36)	0.125 (3.18)	0.067 (1.70)
30 (0.76)	620 (0.39)	0.093 (2.36)	0.125 (3.18)	0.093 (2.36)
60 (1.5)	1500 (0.97)	0.125 (3.18)	0.187 (4.75)	0.125 (3.18)
Over 60 (Over 1.5)	Over 1500 (Over 0.97)	0.187 (4.75)	0.250 (6.55)	0.187 (4.75)

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

4 Joints in Enclosure

4.1 General

4.1.1 A joint in an enclosure 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/ASME B46.1-1985.

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

4.1.3 An electrical enclosure having a free internal volume less than the smaller limits specified may have joint dimensions specified for enclosures with larger free internal volumes.

4.1.4 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 or insulation, or both, are not to be considered in the determination of the free internal volume.

4.1.5 A feeler gauge utilized to measure the clearance specified in these requirements is to be 1/8 to 1/2 inch (3.2 to 12.7 mm) wide.

4.1.6 A joint of a serrated type with a thread contour shall not have more than 20 serrations per inch and shall have at least five fully engaged and tightly clamped serrations.

4.1.7 The joint requirements specified in 4.1.1 – 4.1.6 shall apply to all joints in an electrical enclosure including any joints leading from the inside of the electrical enclosure to the inside of the valve body.

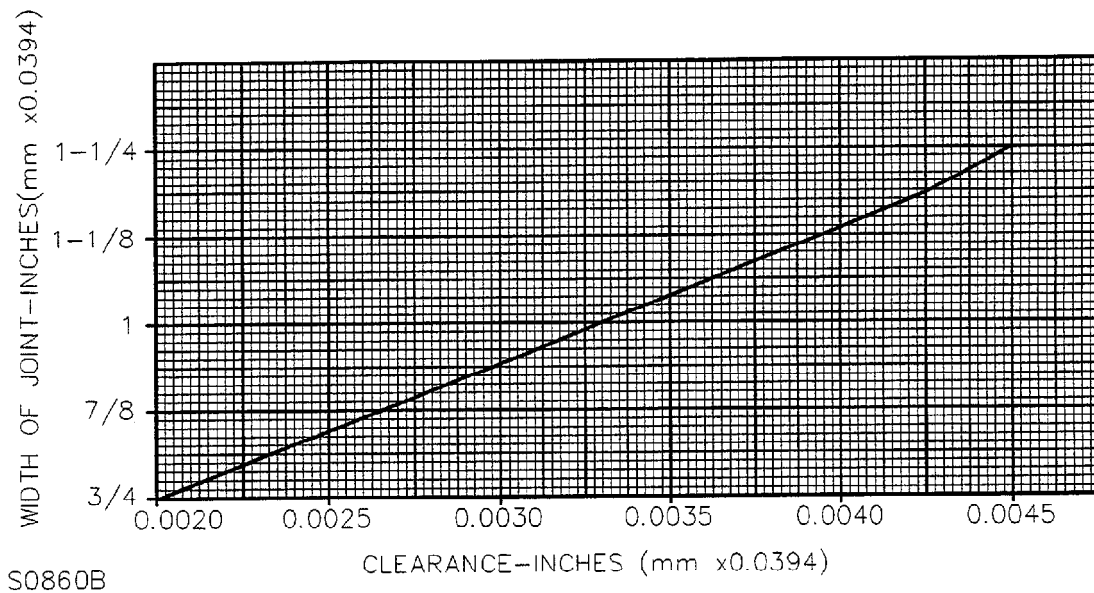
4.2 Class I, Groups C and D locations

4.2.1 Flat and rabbet joints

4.2.1.1 Other than as noted in 4.2.1.2 – 4.2.2.1, the width of a joint and the clearance, when assembled, shall be as specified in Figure 4.1, and the width of the joint shall not be less than 3/4 inch (19.1 mm).

4.2.1.2 A rabbet joint may have a diametrical clearance at the axial section of not more than twice the clearance specified in Figure 4.1 if neither the axial nor the radial section of the joint is less than 1/16 inch (1.6 mm) wide.

Figure 4.1
Relation between clearance and width of joint
 (See 4.2.1.1 and 4.2.1.2)



S0860B

4.2.1.3 An enclosure having a free internal volume of 300 cubic inches (4920 cm³), 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 item (a) or (b), respectively.

a) One-half inch rabbet joint (see Figure 4.2):

- 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 wide flat joint (see Figure 4.3):

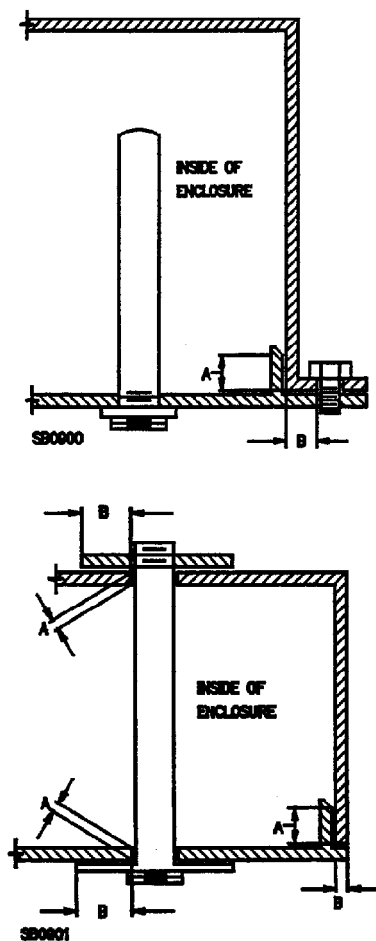
- 1) The clearance between the joint surfaces is less than 0.0015 inch (0.038 mm) and such that a 0.0015 inch feeler gauge will not enter the joint more than 1/8 inch (3.2 mm) at any point,
- 2) The thickness of the cover at the joint width is not less than 3/8 inch, unless stiffened or reinforced metal of a lesser thickness has been found to be acceptable based on its 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 with the cover in the most unfavorable position.

4.2.1.4. The width of a joint in an enclosure having a free internal volume of not more than 6 cubic inches (0.1 dm³) shall not be less than 1/4 inch (6.4 mm). The clearance between the joint surfaces shall not be more than 0.004 inches (0.10 mm) for a Group C enclosure or 0.006 inches (0.15 mm) for a Group D enclosure.

4.2.1.4 added August 8, 1996

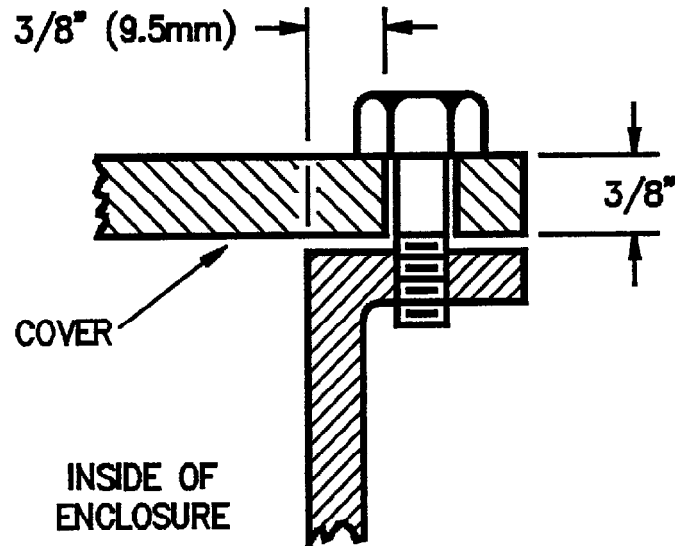
Figure 4.2
Rabbit joints
(See 4.2.1.3(a) and 4.3.1.2)



$A + B = 1/2$ inch (12.7 mm) minimum 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) minimum for Class I, Group B enclosures having free internal volume not more than 100 cubic inches (1640 cm³).

Figure 4.3
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 4.2.1.3(b) and 4.3.1.1)



S2834

4.2.2 Labyrinth joints

4.2.2.1 A joint of the labyrinth type shall be investigated in accordance with the requirements in 13.12.

4.2.3 Threaded joints

4.2.3.1 A threaded joint shall consist of the number of fully engaged threads specified in Table 4.1 but not less than five. Threads shall not be finer than specified in Table 4.1.

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

4.2.4 Bolts in joint width

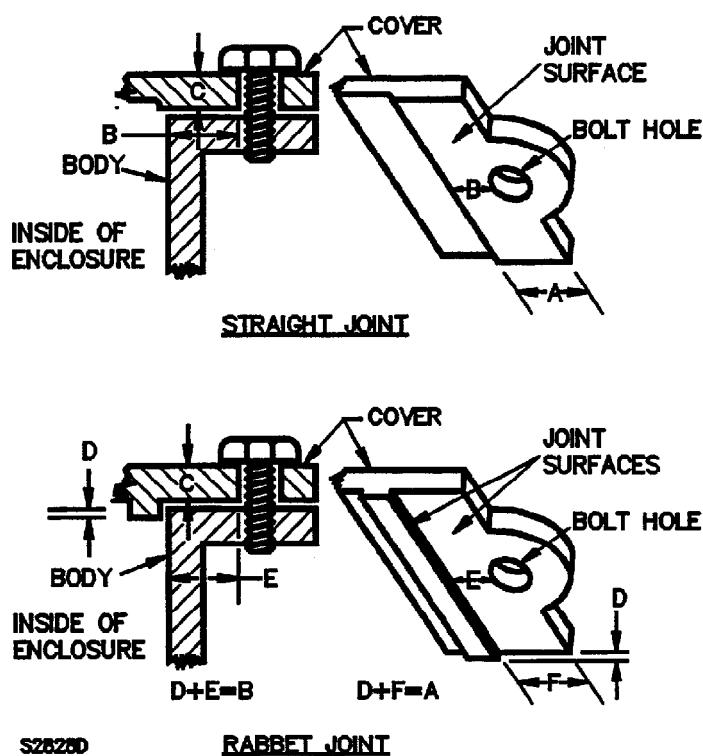
4.2.4.1 A bolt may be located in a 3/4 inch (19.1 mm) or wider joint if the distance from the inside of the enclosure to the nearest edge of the clearance hole for the bolt is not less than 1/2 inch (12.7 mm), and the diametrical clearance between the bolt and the clearance hole is not more than 0.045 inch (1.1 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 4.1. The distance from inside the enclosure to the edge of the nearest clearance hole is to be measured with the cover in the most unfavorable position. The bolts may be provided with lock washers. If bolts or screws for fastening a cover each engage at least five full threads in a tapped hole in the enclosure, the hole need not be bottomed. See Figure 4.4.

Table 4.1
Thread engagement

Maximum diameter of threaded sections, inch	Maximum acceptable number of threads per inch	Minimum acceptable number of threads engaged
No limit	20	5
3/8	24	5
Over 3/8	24	6
Over 3/8	28	7
Over 3/8	32	8

Figure 4.4

(See 4.2.4.1)



A = Required minimum width of joint (see Figure 4.1)

B = Minimum distance from inside enclosure to bolt clearance hole

C = One-half 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

4.2.4.2 The requirements in 4.2.4.1 apply, in general, to round machine screws. 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 4.2.4.1 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.

4.3 Class I, Group B locations

4.3.1 Flat and rabbet joints

4.3.1.1 The width of a joint in an electrical enclosure having a free internal volume of 30 cubic inches (492 cm^3) 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 hole. The thickness of 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 joint more than $1/8$ inch (3.2 mm) at any point. See Figure 4.3.

4.3.1.2 The width of a joint in an electrical enclosure having a free internal volume more than 30 cubic inches (492 cm^3), but not more than 100 cubic inches (1640 cm^3), shall not be less than $5/8$ inch (15.9 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 joint more than $1/8$ inch (3.2 mm) at any point. An enclosure having rabbet joints shall have a total width of a joint of not less than $7/8$ inch (22.2 mm), with either the axial or radial section of the joints not 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 (0.063 mm) and the clearance at a radial section of the joint shall not be more than 0.0015 inch. See Figure 4.2.

4.3.1.3 The width of a joint in an electrical enclosure having a free internal volume more than 100 cubic inches (1640 cm^3) but not more than 350 cubic inches (5740 cm^3) 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.

4.3.2 Threaded joints

4.3.2.1 A threaded joint in an electrical enclosure shall have:

- a) At least eight fully engaged threads with a Class 1 thread fit,
- b) At least seven with a Class 2 fit, or
- c) At least six with a Class 3 fit.

See the Standard for Unified Inch Screw Threads (UN and UNR Thread Form), ANSI/ASME B1.1-1989 for definitions of Class 1, 2, and 3 fits.

Exception: A conduit connection and a joint having tapered threads need not comply with this requirement.

4.3.2.1. revised August 8, 1996

4.3.2.2 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.

4.4 Class I, Group A locations

4.4.1 A threaded joint in an electrical enclosure shall have:

- a) At least eight fully engaged threads with a Class 1 fit,
- b) At least seven with a Class 2 fit, or
- c) At least six with a Class 3 fit.

See the Standard for Unified Inch Screw Threads (UN and UNR Thread Form), ANSI/ASME B1.1-1989 for definitions of Class 1, 2, and 3 fits.

Exception: A conduit connection and a joint having tapered threads need not comply with this requirement.

4.4.1 revised August 8, 1996

4.4.2 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.

4.5 Class II locations

4.5.1 The width of a joint measured from the inside of the 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 (0.05 mm) for a 3/16 inch-wide joint and not more than 0.003 inch (0.08 mm) for a 1/4 inch (6.4 mm) wide joint. The specified width shall be provided between the inside of the enclosure and the nearest edge of each bolt hole and elsewhere, with the cover in the most unfavorable position. See 4.1.1 for the roughness of joint surface requirements.

4.5.2 A threaded joint shall consist of at least three threads fully engaged. A screw shall not have more than 32 threads per inch.

4.5.3 A gasket used in a joint shall be formed of polytetrafluoroethylene, plant-fiber sheet-packing material, or a material having similar characteristics. The gasket material shall be mechanically attached and protected from abuse. The width of gasket contact shall not be less than 3/8 inch (9.5 mm) at all points around the joint.

4.5.4 If a gasket of polytetrafluoroethylene is used, it shall be installed to reduce the likelihood of cold flow of the gasket material.

4.5.5 A material that upon aging readily hardens or adheres to metal surfaces, or both, is not considered to be an acceptable gasket material. Adhesive or cement shall not be used for attaching a gasket.

5 Shaft Openings

5.1 General

5.1.1 A shaft opening in an electrical enclosure shall be of the metal-to-metal type. See 4.1.1 regarding the roughness of the metal surfaces forming the opening.

11.11 A valve intended for intermittent operation is to be energized and de-energized at its rated duty cycle until equilibrium temperatures are attained.

11.12 For a valve including switching devices or other auxiliary circuits, all such circuits are to carry rated current during the temperature test.

11.13 An electrically operated valve for use in Class II, Group E locations is to be blanketed with magnesium dust during the temperature test. See 15.5 for a description of the dust.

11.14 An electrically operated valve for use in Class II, Group F, Group G, Groups F and G, or Groups E, F, and G locations is to be blanketed with grain dust during the temperature test. See 15.4 for a description of the dust.

11.15 The thickness of the dust blanket used during the tests specified in 11.13 and 11.14 shall be equivalent to that remaining on the device following the Dust-Penetration Test, Section 15.

11.16 For an electrically operated valve intended and marked for use where Class I and Class II conditions may exist simultaneously, the marked operating temperature or temperature code shall be based on temperatures attained during the test with dust blanket.

12 Burnout Test

12.1 The electrical enclosure shall not be damaged and the temperatures at any point on the exterior surface of the electrical enclosure or the valve body shall not exceed the maximum allowable temperature specified in Table 12.1 when the valve is tested under the conditions described in 12.2 – 12.14.

12.1 revised August 8, 1996

Table 12.1
Maximum allowable external temperature,
abnormal operating conditions

Class	Group	Temperature,	
		°C	°F
I	A,B,C,D	a	a
II	E	200	392
II	F	200	392
II	G	165	329

^a Operating temperature or temperature indicated by temperature code marked on product.

12.2 The marked operating temperature or temperature code shall be based on operation in the ambient specified in 12.7. See 18.1(h)

12.3 When conducting the burnout test, the valve is to be mounted or suspended away from the heat conducting bodies and fitted with lengths of pipe as specified in 11.6.

Exception: With the concurrence of those concerned, the burnout test may be conducted without the pipes attached.

12.4 Openings for conduit are to be plugged so there is no circulation of air through the conduit openings. If a length of pipe is attached to the opening for conduit, the end of the pipe is to be plugged.

12.5 The valve mechanism shall be blocked in the position assumed when the valve is de-energized, the valve is then energized continuously at rated frequency and at the voltage specified in Table 10.1, with the valve grounded.

12.6 The circuit to which the valve is connected for test in accordance with 12.1 – 12.5 is to be protected by fuses rated at least 20 amperes for devices rated up to 125 volts, 15 amperes for devices rated up to 250 volts, or ten times the current input rating of the valve, whichever is greater. Opening of the fuses or opening of the coil is considered to be acceptable and the test is to be terminated when it has been determined that the maximum external temperatures have been obtained.

Exception: With the concurrence of those concerned, fuses of lesser value may be used if the fuse does not open during the test. If the fuse opens, the burnout test shall be repeated with a fuse rated as specified in 12.6.

12.7 A valve that is intended for use in an ambient temperature of 40°C (104°F) or less is to be tested at an ambient of 40°C. A valve that is intended for use in an ambient higher than 40°C is to be tested at the higher ambient.

12.8 A valve for use in Class II, Group E locations is to be blanketed with magnesium dust during the burnout test.

12.9 A valve for use in Class II, Group F, Group G, Groups F and or G, or Groups E, F, and G locations is to be blanketed with grain dust during the burnout test.

12.9 revised August 8, 1996

12.10 The thickness of the dust blanket used during the test described in 12.8 and 12.9 shall be equivalent to that remaining on the device following the Dust-Penetration Test, Section 15.

12.11 For an electrically operated valve intended and marked for use where Class I and Class II conditions may exist simultaneously, the marked operating temperature or temperature code shall be based on temperatures attained during the test with dust blanket.

12.12 A valve that is provided with an automatic reset temperature-limiting device is to be subjected to the burnout test for 72 hours, followed by a dielectric voltage withstand test at 1000 volts plus twice rated maximum voltage, in accordance with the Standard for Electrically Operated Valves, UL 429. The valve is then to be subjected to the burnout test for an additional 15 days, followed by the dielectric voltage withstand test at twice rated maximum voltage.

Exception: An automatically reset temperature-limiting device may permanently open the circuit before 15 days of operation if:

a) It is specifically intended to do so, and

b) Testing of three samples shows that it will do so consistently and without grounding to the enclosure, damage to the valve, or evidence of any risk of fire.

12.12 added August 8, 1996