



UL 1994

STANDARD FOR SAFETY

Luminous Egress Path Marking Systems

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UL Standard for Safety for Luminous Egress Path Marking Systems, UL 1994

Fourth Edition, Dated May 29, 2015

Summary of Topics

This New Edition of ANSI/UL 1994 includes a revision to the Color Temperature Range for LED Activation Source in paragraph 33.2.3.

The effective date for UL LLC will be announced through Industry File Review – Announcement Letter.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated April 17, 2015.

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MAY 29, 2015



ANSI/UL 1994-2015

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UL 1994

Standard for Luminous Egress Path Marking Systems

Prior to the February 14, 2005 revisions, this standard was titled Low Level Path Marking and Lighting Systems.

First Edition – May, 1991

Second Edition – January, 1997

Third Edition – January, 2004

Fourth Edition

May 29, 2015

This ANSI/UL Standard for Safety consists of the Fourth Edition.

The most recent designation of ANSI/UL 1994 as an American National Standard (ANSI) occurred on May 29, 2015. ANSI approval for a standard does not include the Cover Page, Transmittal Pages and Title Page.

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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Standards for Components.....	A1
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INTRODUCTION

1 Scope

1.1 These requirements cover floor proximity and other egress path marking and lighting systems that provide a visual delineation of the path of egress. These systems are also used to identify significant egress path features such as doors, door hardware, door frames, stairs, stair landings, stair banisters, obstacles, egress symbols, information placards, and similar elements of the egress path.

1.2 These systems are intended for installation and use as required by building and fire safety codes such as the Life Safety Code, NFPA 101; the Building Construction and Safety Code, NFPA 5000, and the International Building Code sponsored by the International Code Council.

1.3 These requirements cover photoluminescent egress path marking system materials such as sheeting and adhesive-backed laminates. They also cover paints, pigments or inks pre-applied to a substrate. They are intended for installation where the facility illumination is sufficient to activate the photoluminescent material.

1.4 These requirements do not address the mounting integrity of path markers intended to be secured by adhesive to a building element. The suitability of this form of mounting for any given application is outside the scope of this Standard.

1.5 Self-luminous systems include constructions as defined in 5.13.

1.6 Externally powered lighting systems include varying designs of electric lamps that may be intended for connection to any combination of normal power supply, emergency power supply, and battery backup.

1.7 These requirements do not cover egress signs and lighting to be used independent from a path marking system, such as EXIT signs or other legally required legends or graphical symbols that are within the scope of the Standard for Emergency Lighting and Power Equipment, UL 924.

1.8 These requirements do not address the text or graphical symbol content, or the configuration of path marker signs.

1.9 The term "product" as used in these requirements refers to egress path marking and lighting systems or any part thereof covered by these requirements unless specifically noted otherwise.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this Standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components used in the products covered by this Standard.

2.2 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.

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

2.4 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.

3 Units of Measurement

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

4 References

4.1 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.

5 Glossary

5.1 For purposes of this Standard the following definitions apply.

5.2 DIRECTIONAL MARKER – A photoluminescent, self-luminous, or externally powered marker that is provided with a means of identifying the direction of emergency egress. A directional marker is intended only for use with and as part of a path marking and lighting system. See 1.7 for other limitations.

5.3 FLOOR PROXIMITY – A mounting location within 18 inches (45.7 cm) of grade. For stairs, the mounting location is measured relative to a line connecting the stair nosings.

5.4 HIGH-VOLTAGE CIRCUIT – A circuit involving a potential of more than 30 volts ac, 42.4 volts peak or dc, but not more than 600 volts.

5.5 HORIZONTAL LUMINOUS LENGTH – The length of the luminous segment parallel to the direction of travel in the path of egress, that is, the length a person would have to traverse to pass the luminous segment.

5.6 LOW-VOLTAGE CIRCUIT – A circuit involving a potential of not more than 30 volts ac, 42.4 volts peak or dc, and supplied by:

- a) An energy limiting battery circuit,
- b) A Class 2 transformer, or
- c) A combination of a transformer and fixed impedance which, as a unit, complies with all performance requirements for a Class 2 transformer.

(See also Low-Voltage, Power-Limited Circuits, Section 31.)

5.7 LUMINOUS SEGMENT – The portion of the path marking system that is intended to be illuminated after activation of the system.

5.8 PATH MARKER – A luminous strip or sign intended only for use with a luminous egress path marking system to assist building occupants in finding an exit.

5.9 PATH MARKER SIGN – A path marker that includes text and/or one or more graphical symbols intended to provide information related to egress features or procedures.

5.10 PATH MARKER STRIP – A path marker without text or graphical symbols.

5.11 PATH MARKER SYSTEM – An integrated collection of path marker strips and/or path marker signs intended to assist building occupants and/or first responders to deal effectively with evacuation scenarios.

5.12 PHOTOLUMINESCENT – Having the property of emitting light that continues for a length of time after excitation by visible or invisible light has been removed.

5.13 SELF-LUMINOUS – Illuminated by a self-contained power source (other than batteries) and operated independently of external power sources.

5.14 VISUAL DELINEATION – The use of visual cues to identify the path of egress accurately.

CONSTRUCTION

6 General

6.1 Product assembly

6.1.1 Systems shall include all components necessary for intended function when installed as specified in the manufacturer's instructions.

6.1.2 A product or system that is not assembled by the manufacturer as a complete unit shall include a list identifying all parts needed to form a complete system. All parts shall be marked or otherwise identified in the instructions. Any special tools required to complete the assembly shall be provided.

6.2 Mechanical protection

6.2.1 Louvers and other openings in the ultimate enclosure shall be constructed and located to reduce the risk of unintentional contact with hot surfaces or with moving parts that may cause a risk of injury to persons. In determining compliance with this requirement, parts such as covers, panels, or grilles used as part of the enclosure are to be removed unless tools are required for their removal.

6.2.2 The degree of protection required by 6.2.1 depends upon the general design and the intended use of the product. The location where the product ordinarily will be used is considered when judging the acceptable degree of exposure of moving parts. Other factors taken into consideration in judging the acceptability of exposed moving parts are:

- a) The degree of exposure;
- b) The sharpness of the moving parts;
- c) The likelihood of unintentional contact with the moving parts; and
- d) The speed of movement of those parts.

6.2.3 Moving parts that may cause injury to persons, such as fan blades or blower wheels, shall be guarded or enclosed so that the minor dimension of any opening does not exceed the values in 6.2.4 and 6.2.6. Parts required for guarding shall be secured by means dependent upon tools for their removal unless the guard is required to be in place in order for the product to function.

6.2.4 The distance from an opening to the moving part shall be in accordance with Table 6.1, but the minor dimension of the opening shall not, in any case, exceed 1 inch (25.4 mm). For an opening having a minor dimension intermediate between two of the values included in the table, the distance from the opening to the moving part shall be not less than that found by appropriate interpolation between the corresponding values in the table. The minor dimension of the opening is determined by the largest hemispherically tipped cylindrical probe that can be inserted through the opening with a force of 5 pounds (22.3 N). See 6.2.6 for round holes and slots.

Table 6.1
Dimensions of opening

Minor dimensions of opening ^a		Minimum distance from opening to moving part ^c	
inches	(mm)	inches	(mm)
1/4	(6.4)	1/2	(12.7)
3/8	(9.5)	1-1/2	(38.1)
1/2	(12.7)	2-1/2	(63.5)
3/4	(19.1)	4-1/2	(114.0)
1	(25.4)	6-1/2	(165.0)
1-1/2	(38.1)	10-1/2	(267.0)
2	(50.8)	14-1/2	(368.0)
2-1/4 ^b	(57.2)	16-1/2	(419.0)
2-1/2 ^b	(63.5)	18-1/2	(470.0)
2-3/4 ^b	(69.9)	20-1/2	(521.0)
3 ^b	(76.2)	22-1/2	(572.0)
Over 2	(Over 50.8)	30	(762.0)

^a Openings less than 1/4 inch (6.4 mm) are not to be considered.

Table 6.1 Continued

Minor dimensions of opening ^a inches (mm)	Minimum distance from opening to moving part ^c inches (mm)
^b These values apply only to openings at the base of the product where the upper edge of the opening is less than 8 inches (203 mm) above the floor. The product is to be in its intended operating position.	
^c Also applies to hot parts.	

6.2.5 A moving part is not to be considered when judging compliance with 6.2.2 if:

- a) The part is unlikely to be contacted through the opening because of the location of fixed components, including baffles,
- b) The part is made inoperative, when exposed, through the use of interlocking devices, or
- c) The chassis of the product is of a slide-out type construction that must be withdrawn from its enclosure to expose the moving part that may cause injury to persons.

6.2.6 If an opening consists of a round hole or slot having a major straight line dimension of less than 2 inches (50.8 mm), the distance to a moving part that may cause injury to persons shall be in accordance with Table 6.2. If an opening consists of a round hole or slot having a major straight line dimension more than 2 inches (50.8 mm), the distance to a moving part that may cause injury to persons shall be in accordance with Table 6.1. For an opening having a minor dimension intermediate between two of the values included in the table, the distance from the opening to the moving part shall be not less than that found by interpolation between the corresponding values shown in the appropriate column.

6.3 Electrical protection

6.3.1 Louvers and other openings in the enclosure shall be constructed and located to reduce the risk of unintentional contact with uninsulated live parts. In determining compliance with this requirement, parts such as covers, panels, and grills used as part of the enclosure are to be removed unless tools are required for their removal or an interlock is provided.

6.3.2 Uninsulated high-voltage live parts shall be located, guarded, or enclosed as indicated in 6.3.3 – 6.3.8.

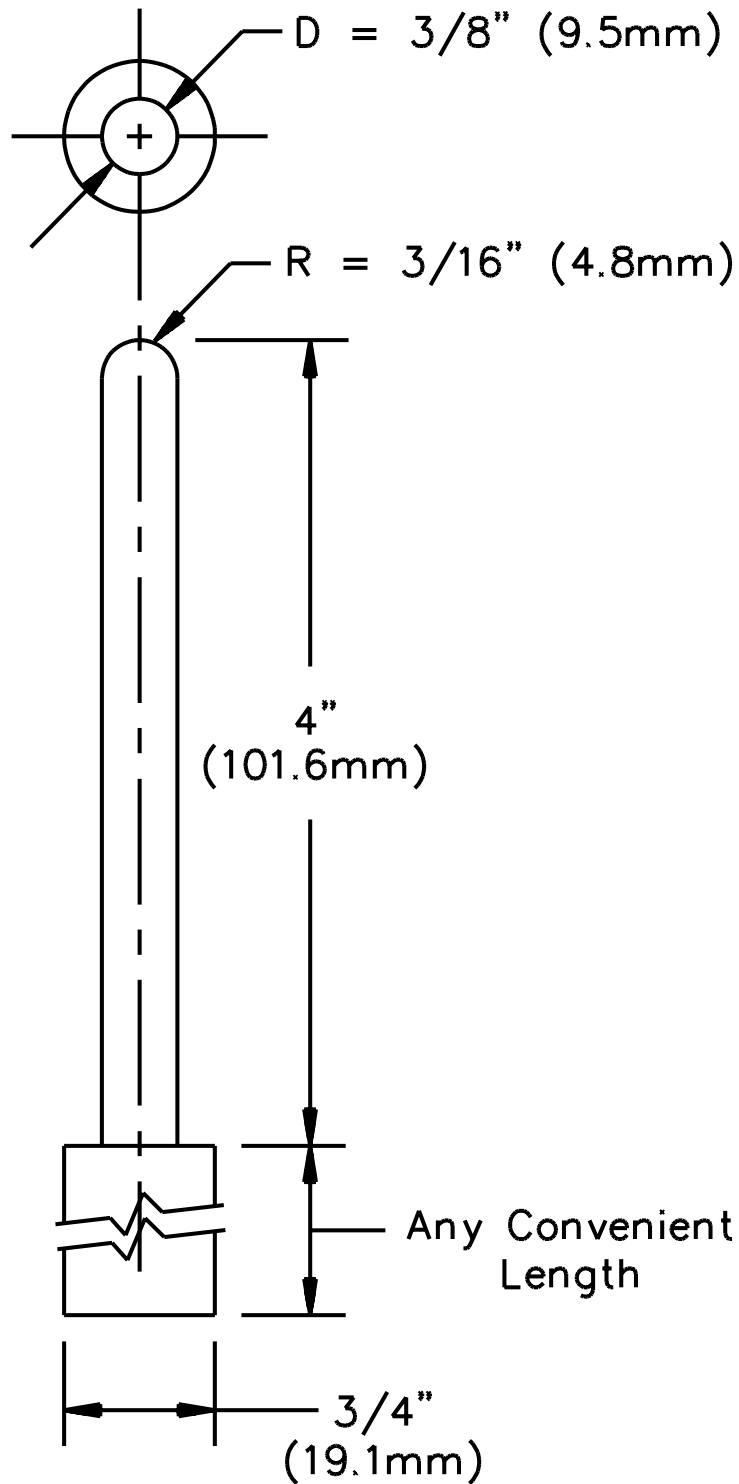
6.3.3 If an opening in the enclosure will not permit the entrance of a 3/4 inch (19.1 mm) diameter rod, the probe illustrated in Figure 6.1 shall not touch any uninsulated live parts and the probe illustrated in Figure 6.2 shall not touch any film-coated wire when inserted through the opening. The probe shall not pass through grilles, screens, louvers, or the like when a force of 5 pounds (22.3 N) is applied.

Table 6.2
Dimension of openings for round holes or slots having a major dimension less than 2 inches (50.8 mm)^a

Minor dimension of opening		Minimum distance from opening to moving part ^b			
		Round holes		Slots	
inches	(mm)	inches	(mm)	inches	(mm)
1/4	(6.4)	1/8	(3.2)	1/2	(12.7)
3/8	(9.5)	1	(25.4)	1-1/2	(38.1)
1/2	(12.7)	2	(50.8)	2-1/2	(63.5)
3/4	(19.1)	3-1/4	(82.6)	3-1/4	(82.6)
1	(25.1)	4	(102.0)	4	(102.0)

^a Table 6.1 applies if major dimension of slot is 2 inches (50.8 mm) or greater.
^b Also applies to hot parts.

Figure 6.1
Probe



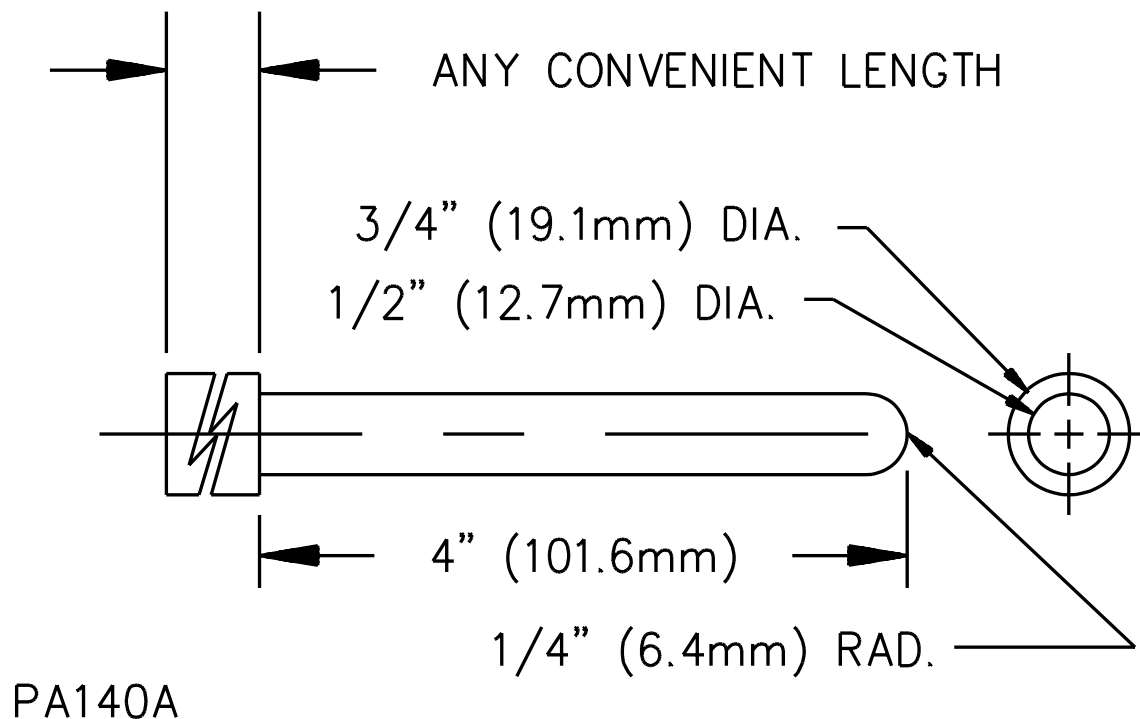
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Figure 6.2
Probe



6.3.4 An opening in an electrical enclosure shall not permit entrance of a 1 inch (25.4 mm) diameter rod and shall be sized and so arranged that the probe shown in Figure 6.3 cannot be made to contact any uninsulated live electrical part (other than low-voltage) when inserted through the opening in a straight or articulated position.

6.3.5 An opening that permits entrance of a 1 inch (25.4 mm) diameter rod is acceptable under the conditions described in Figure 6.4.

6.3.6 With respect to 6.3.4, the probe may be articulated into any configuration and may be rotated or angled to any position before, during, or after insertion into the opening, and the penetration may be to any depth allowed by the opening size, including minimal depth combined with maximal articulation.

6.3.7 If any part of the enclosure must be opened or removed for user servicing with or without the use of tools, or can be opened or removed without the use of tools, the probe is to be applied without the part in place.

6.3.8 In addition to the requirements in 6.3.2 – 6.3.5, uninsulated live parts inside the enclosure that are likely to be contacted by persons performing operations such as replacing fuses, resetting manual-reset devices, replacing air filters, oiling motors, or other such intended normal service operations, shall be located, guarded, or enclosed to prevent unintentional contact.

Exception: Uninsulated live parts need not comply with this requirement if tools are required to expose the uninsulated live part or a keyed lock is used to prevent access to the live parts.

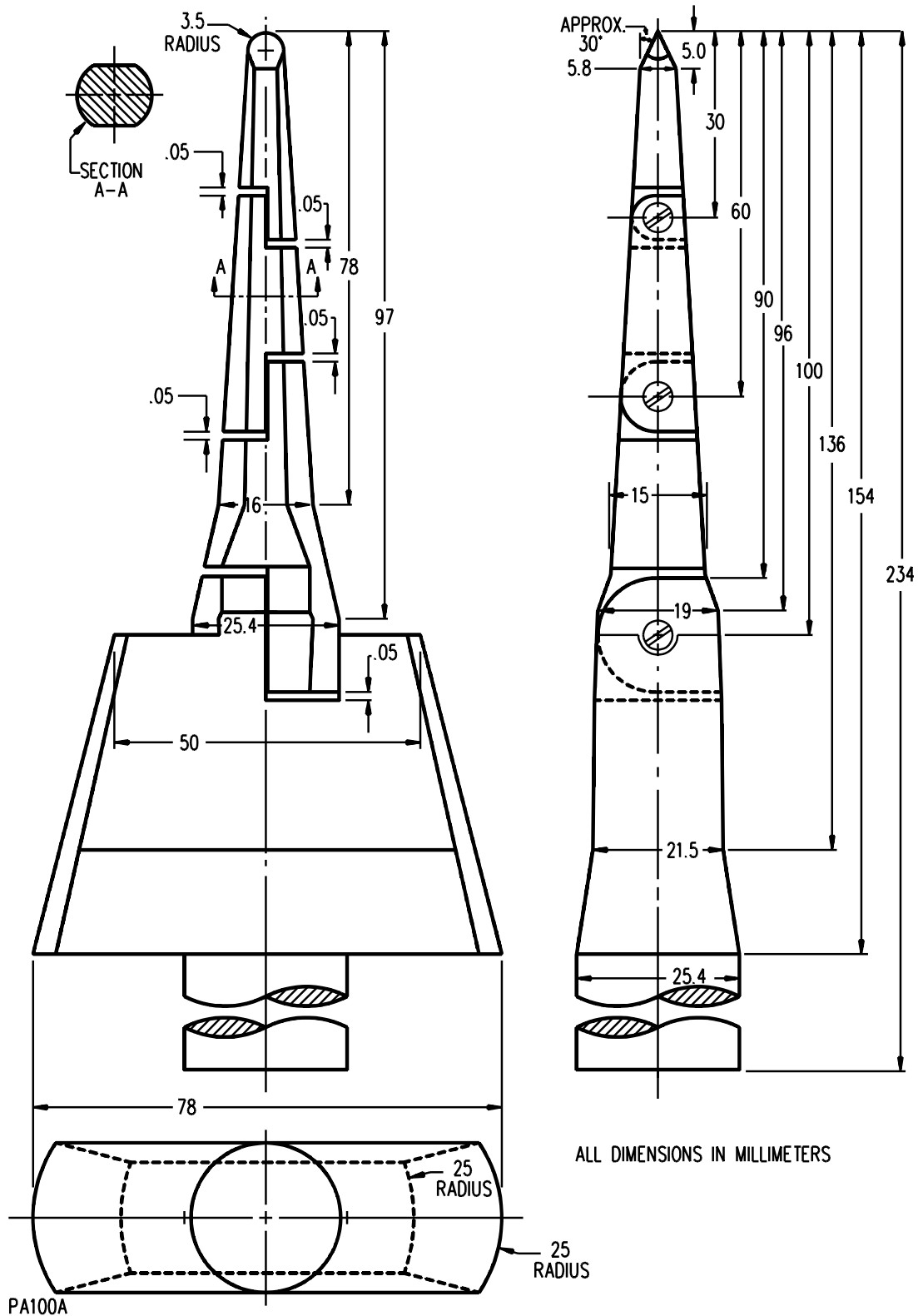
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Figure 6.3
Probe

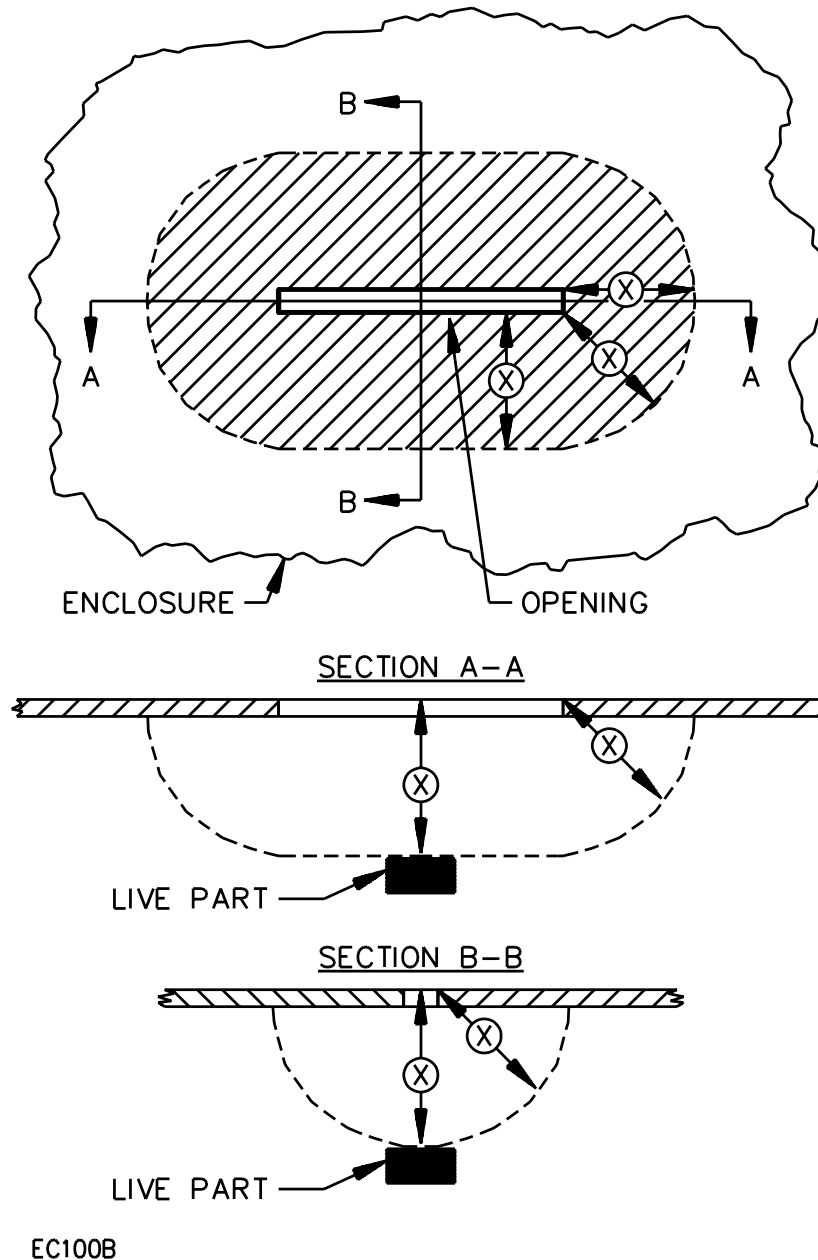


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Figure 6.4
Opening in enclosure



The opening is acceptable if, within the enclosure, there is no uninsulated live part or film-coated wire:

- 1) less than X inches from the perimeter of the opening, as well as
- 2) within the volume generated by projecting the perimeter X inches normal to its plane.

X equals five times the diameter of the largest diameter rod that can be inserted through the opening, but not less than 4 inches (101.6 mm).

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7 Accessories

7.1 A product having provisions for the use of accessories to be attached in the field shall be constructed so that the use of these accessories will not introduce a risk of fire, electric shock, or unintentional contact with moving parts that may cause injury to persons.

7.2 The product shall comply with the requirements of this Standard with or without the accessory installed.

7.3 Electrical installation of accessories by the user shall be restricted to an arrangement that can be accomplished by means of receptacles and plug-in connectors.

7.4 With reference to 7.3, low-voltage accessories may be connected by other means provided the installation does not require rearrangement of components or wiring, cutting or splicing of existing wiring, or soldered connections.

7.5 The installation of accessories by service personnel shall be by means of receptacles, plug-in connectors, insulated wire connectors, or by connection to existing wiring terminals.

7.6 With reference to 7.5, any installation that requires the cutting of wiring or the soldering of connections by the installer is not acceptable. Installations that require cutting, drilling, or welding are not acceptable in electrical enclosures and in other areas where such operations may damage electrical components and wiring within the enclosure.

7.7 A strain relief means shall be provided for the wiring in the accessory if there is a possibility of transmitting strain to the terminal connections during installation. See 35.1 for test of strain relief means.

7.8 All terminals and wiring intended to be field connected shall be identified:

- a) On the accessory;
- b) On the product if connections are made between the accessory and the product; or
- c) On the wiring diagram or diagrams provided with the product.

7.9 Except where it is obvious, the mounting location of the accessory shall be indicated on the product. If the mounting location is obvious due to the function of the accessory and arrangement of the product, and instructions are provided covering the installation and location for the accessory, the mounting location of the accessory need not be indicated on the product.

7.10 As part of the investigation, accessories are to be trial-installed to determine that:

- a) Their installation is feasible;
- b) The instructions (see Installation and Operating Instructions, Section 44) are detailed and correct; and
- c) The use of the accessories does not introduce a risk of fire, electric shock, or unintentional contact with moving parts that may cause injury to persons.

8 Enclosures

8.1 General

8.1.1 Enclosures shall be formed and assembled so that they will have the strength and rigidity necessary to resist the abuses to which they may be subjected without total or partial collapse and resulting reduction of spacings, loosening or displacement of parts, or other serious defects. Enclosures for individual electrical components, outer enclosures, and the combinations of the two are to be considered in determining compliance with this requirement.

8.1.2 Among the factors that are taken into consideration when evaluating an enclosure are:

- a) Mechanical strength;
- b) Resistance to impact;
- c) Moisture-absorptive properties;
- d) Flammability;
- e) Resistance to distortion at temperatures to which the material may be subjected under conditions of use; and
- f) Resistance to corrosion.

For a nonmetallic enclosure or part of an enclosure, all of these factors are considered with respect to aging. See Polymeric Materials, Section 9.

8.1.3 The enclosure or enclosures of the product shall prevent mechanical damage to wiring and electrical components.

8.1.4 The enclosure shall prevent the emission of molten metal, burning insulation, flaming particles, or the like through openings onto flammable material, including surfaces over which the product is mounted.

8.1.5 An outer cabinet or enclosure is not required for a product having all electrical parts, other than motors, individually and completely enclosed; and having all electrical wiring enclosed in metal-clad cable, conduit, or the equivalent.

8.1.6 A piece that is in effect a part of the enclosure, such as a dial or nameplate, shall be of metal or other material as specified for the enclosure.

8.1.7 Where insulating material other than electrical insulation is provided within the enclosure, consideration is to be given to the burning characteristics of the material, and the proximity of an ignition source, in determining compliance with 8.1.4.

8.1.8 All intended mounting positions of the product are to be considered when determining if it complies with 8.1.4.

8.1.9 Unless it can be determined that failure of an electrical component will not result in a risk of fire, components such as controls, solenoids, starting relays, and switches shall be individually enclosed, except at terminals. See 8.3.1 – 8.5.2.

8.1.10 Electrical parts (see 8.1.9) within the outer enclosure need not be individually enclosed if the assembly conforms with the following:

- a) Their design and location with respect to openings in the outer enclosure will not result in the emission of flame or molten metal through openings in the enclosure or it can be shown that failure of the component would not result in a risk of fire;
- b) There are no openings in the bottom of the compartment in which the part is located that would permit dropping of molten metal, and the like on flammable material; and
- c) The part is not in proximity to flammable material other than electrical insulation.

8.1.11 The outer enclosure of a product is to be evaluated with respect to its size, shape, metal thickness, and use. Sheet steel shall have a thickness of not less than 0.026 inch (0.66 mm) if uncoated, not less than 0.029 inch (0.74 mm) if galvanized, or not less than 0.036 inch (0.91 mm) if of nonferrous sheet metal.

8.1.12 Sheet metal to which a wiring system is to be connected in the field shall have a thickness not less than 0.032 inch (0.81 mm) if uncoated steel, not less than 0.034 inch (0.86 mm) if galvanized steel, and not less than 0.045 inch (1.14 mm) if nonferrous.

8.1.13 If threads for the connection of conduit are tapped all the way through a hole in an enclosure wall, or if an equivalent construction is employed, there shall be not less than three nor more than five threads in the metal, and the construction of the product shall be such that a conduit bushing can be properly attached. If threads for the connection of conduit are not tapped all the way through a hole in an enclosure wall, conduit hub, or the like, there shall be not less than 3-1/2 threads in the metal, and there shall be a smooth rounded inlet hole for the conductors that shall afford protection to the conductor equivalent to that provided by a standard conduit bushing. The inlet hole shall have an internal diameter approximately the same as that of the corresponding trade size of rigid conduit.

8.1.14 A knockout in a sheet metal enclosure shall be secured in place, but it shall be removable without deformation of the enclosure that would result in damage to electrical components or reduction in electrical spacings. See 8.1.16.

8.1.15 A knockout shall remain in place when a force of 10 pounds (44.5 N) is applied at right angles to the knockout by a 1/4 inch (6.4 mm) diameter mandrel with a flat end. The mandrel shall be applied at the point most likely to cause movement of the knockout.

8.1.16 A knockout shall be provided with a flat surrounding surface for seating of a conduit bushing and be so located that installation of a bushing at any knockout likely to be used during installation will not result in spacings between uninsulated live parts and the bushing of less than those required by this Standard.

8.1.17 In measuring a spacing between an uninsulated live part and a bushing installed in a knockout, it is to be assumed that a bushing having the dimensions indicated in Table 8.1 is in place, in conjunction with a single locknut installed on the outside of the enclosure.

Table 8.1
Knockout or hole sizes and dimensions of bushings

Trade size of conduit		Knockout or hole diameter		Bushing dimensions			
inches	(mm) OD	inches	(mm)	Overall diameter		Height	
				inches	(mm)	inches	(mm)
1/2	(21.3)	7/8	(22.2)	1	(25.4)	3/8	(9.5)
3/4	(26.7)	1-3/32	(27.8)	1-15/64	(31.4)	27/64	(10.7)
1	(33.4)	1-23/64	(34.5)	1-19/32	(40.5)	33/64	(13.1)
1-1/4	(42.3)	1-23/32	(43.7)	1-15/16	(49.2)	9/16	(14.3)
1-1/2	(48.3)	1-31/32	(50.0)	2-13/64	(56.0)	19/32	(15.1)
2	(60.3)	2-15/32	(62.7)	2-45/64	(68.7)	5/8	(15.9)
2-1/2	(73.0)	3	(76.2)	3-7/32	(81.8)	3/4	(19.1)
3	(88.9)	3-5/8	(92.1)	3-7/8	(98.4)	13/16	(20.6)
3-1/2	(101.6)	4-1/8	(104.8)	4-7/16	(112.7)	15/16	(23.8)
4	(114.0)	4-5/8	(117.5)	4-31/32	(126.2)	1	(25.4)
4-1/2	(127.0)	5-1/8	(130.2)	5-35/64	(140.9)	1-1/16	(27.0)
5	(141.3)	5-5/8	(142.9)	6-7/32	(158.0)	1-3/16	(30.2)
6	(168.3)	6-3/4	(171.5)	7-7/32	(183.4)	1-1/4	(31.8)

8.1.18 Steel enclosures shall be protected against corrosion by metallic or nonmetallic coatings such as plating or painting.

8.2 Doors and covers

8.2.1 Service covers or panels in the outer enclosure shall require the use of tools for removal or shall be provided with an interlocking mechanism if they give access to unenclosed uninsulated high-voltage live parts or moving parts that may cause injury to persons.

8.2.2 An interlocking mechanism that:

- a) Must be engaged in the closed position of the cover before parts are energized; and
- b) Will secure the cover in the closed position when engaged is considered to comply with 8.2.1.

8.2.3 A hinged panel or cover shall be so positioned or arranged that when it is in an open position it will not fall or swing due to gravity or vibration so as to cause injury to persons from the panel or cover, from moving parts that may cause injury to persons, or from uninsulated live parts.

8.2.4 The assembly shall be arranged so that an overcurrent protective device, such as a fuse, the intended protective function of which requires renewal, can be replaced and manual-reset devices can be reset without removing parts other than a service cover or panel, and the cover or door enclosing the device.