



UL 962

STANDARD FOR SAFETY

Household and Commercial Furnishings

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UL Standard for Safety for Household and Commercial Furnishings, UL 962

Third Edition, Dated July 7, 2008

SUMMARY OF TOPICS

This revision to UL 962 includes the following changes in requirements:

Required Marking for Commercial Displays

Conductors Subject to Flexing

Requirements for Low Voltage LED Arrays

Text that has been changed in any manner or impacted by UL's electronic publishing system 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.

In the revisions dated March 1, 2013, pages 3 and 4 have been intentionally deleted from the Standard due to the deletion or relocation of text.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated October 19, 2012.

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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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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JULY 7, 2008

(Title Page Reprinted: March 1, 2013)

Historical Note: The First Edition of UL 962, dated August 15, 1996, was withdrawn on July 1, 1998.

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UL 962

Standard for Household and Commercial Furnishings

First Edition – August, 1996

Second Edition – October, 2003

Third Edition

July 7, 2008

This UL Standard for Safety consists of the Third Edition including revisions through March 1, 2013.

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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PART 1 – ALL FURNISHINGS

INTRODUCTION

1 Scope

1.1 These requirements cover:

- a) Motor-operated furniture, such as motor-operated beds and chairs;
- b) Electrified and non-electrified furniture, such as:
 - 1) Lighted curio cabinets;
 - 2) Microwave carts; and
 - 3) Bed headboards
- c) Non-seasonal electrical decorations such as lava lamps and wave machines;
- d) Home and individual office furnishings, such as study carrels, consoles and desks;
- e) Commercial product and informational displays such as:
 - 1) Shelving units;
 - 2) Kiosks (such as the mini-stores in the middle of a mall);
 - 3) Cash station stands;
 - 4) Motorized carpet displays; and
 - 5) Product platforms
- f) Electrified building components, such as windows and built in bathroom cabinets; and
- g) Other similar miscellaneous furnishings intended for use in residential or commercial environments.

1.2 These requirements cover products rated 600 V ac or less.

1.3 A furnishing intended to support audio equipment or a video display (CRT, LCD, Plasma and the like) shall be evaluated in accordance with one of the following:

- a) A furnishing which is floor supported and intended to support a video display but is not intended for use as a mobile cart for the video display shall be evaluated to UL 962 and may include features that allow securement to the building structure;
- b) If the furnishing is provided with casters or wheels, the Standard for Household, Commercial, and Professional-Use Carts and Stands for Use with Audio/Video Equipment, UL 1678, or the Standard for Tall Institutional Carts for Use With Audio-, Video-, and Television-Type Equipment, UL 1667, as applicable to the use of the cart shall apply;

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c) If the furnishing is intended to be mounted to walls, ceilings or another permanent part of a building as the primary support means, the Outline of Investigation for Wall and Ceiling Mounts and Accessories, Subject 2442, shall apply;

d) If a furnishing is supplied with all of the video and/or audio components by the manufacturer of those components, the requirements contained in the video or audio component standard shall be applied – the Standard for Audio, Video and Similar Electronic Apparatus, UL 60065, or the Standard for Information Technology Equipment – Safety, UL 60950, – as applicable to the product.

Exception: A video display support system evaluated in accordance with (a) – (c) above and supplied with all of the video and or audio components is not subject to 1.3(d).

1.3 effective April 12, 2012

1.4 These requirements do not cover products intended for patient care including where oxygen is being used. Patient care products are covered by the Standard for Medical Electrical Equipment, Part 1: General Requirements for Safety, UL 60601-1. Electrified equipment used for massaging and exercising is covered under the Standard for Motor-Operated Massage and Exercise Machines, UL 1647. Office furnishings are covered by the Standard for Office Furnishings, UL 1286. Multiple outlet strips intended for general use (i.e. Relocatable Power Taps) are not covered by this standard.

1.4 revised June 11, 2010

1.5 Lighted display cases and cabinets, such as jewelry display cases, used in commercial applications are covered by the Standard for Wired Cabinets, UL 65. Advertising displays are covered by the Standard for Electric Signs, UL 48.

1.6 Custom-built commercial products such as ticket machines and electronic point of sale products that dispense a product in exchange for money are covered in the Outline of Investigation for Custom Built Kiosks, Subject 2361.

1.7 These requirements do not cover portable luminaires. The Standard for Portable Electric Luminaires, UL 153, covers portable luminaires.

1.8 A product that employs an electromagnetic interference filter shall also comply with the Standard for Electromagnetic Interference Filters, UL 1283. A product that employs a transient voltage surge suppressor shall also comply with the Standard for Surge Protective Devices, UL 1449. Telephone equipment and communication circuit protectors included in a furnishing shall comply with the requirements in the Standard for Information Technology Equipment Safety – Part 1: General Requirements, UL 60950-1, and the requirements in the Standard for Secondary Protectors for Communications Circuits, UL 497A, respectively. A furnishing that incorporates an antenna discharge unit or provides antenna connections to a television, a high-voltage video product, or antenna shall comply with the applicable requirements in the Standard for Antenna Discharge Units, UL 452, and the Standard for Audio-Video Products and Accessories, UL 1492. A product that employs ground-fault protection shall comply with the requirements in the Standard for Ground-Fault Circuit Interrupters, UL 943.

1.8 revised June 11, 2010

1.9 Bunk bed structural requirements are covered by the Standard Consumer Safety Specification for Bunk Beds, ASTM F1427. Any electrical components of bunk beds are required to meet the applicable requirements of UL 962.

1.10 Toy chest structural requirements are covered by the Standard Consumer Safety Specification for Toy Chests, ASTM F834. Any electrical components of these products are required to meet the applicable requirements of UL 962.

1.11 These requirements do not cover products that are specifically intended for infants or juveniles.

1.12 Furnishings incorporating low pressure inflators and fans are covered by the Standard for Electric Fans, UL 507, and in addition shall comply with the applicable requirements of UL 962.

1.13 Lighted make-up mirrors shall comply with the Standard for Portable Electric Luminaires, UL 153, the Standard for Furniture Power Distribution Units, UL 962A, if provided with one or more receptacles, and shall also comply with the applicable requirements of UL 962.

1.14 Permanently wired Luminaires used within or attached to furnishings shall comply with the Standard for Luminaires, UL 1598.

1.15 These requirements do not cover furnishings, equipment or appliances that are covered by requirements that are separate from this standard.

2 Glossary

2.1 For the purpose of this standard the following definitions apply.

2.2 ACCESSIBLE PART – A part located so that it is able to be contacted by a person, either directly or by means of the probe illustrated in Figure 14.1.

2.2.1 ACCESSORY – An optional part that electrically and/or mechanically interfaces with the basic furnishing and is intended to be attached to the furnishing by the user or installer. Subassemblies field assembled to form the basic furnishing are not accessories.

2.2.1 added August 17, 2010

2.3 APPURTENANCE – Accessory objects on a furnishing such as a door, drawer, or a sliding work surface.

2.4 CABINET LIGHT – A portable luminaire, see 2.34, intended for final installation into a cabinet (open or enclosed) such as a china hutch, bookcase, bar, console, bed headboard, or similar furnishing.

2.5 CLASS 2 CIRCUIT – An isolated secondary circuit involving a potential of not more than 30-volt rms maximum 42.4 volts peak open circuit secondary potential under any condition of loading or open circuit. There shall be no electrical connection between the primary and secondary windings of a transformer or between a primary or secondary circuit and the enclosure.

a) An inherently-limited Class 2 transformer;

b) A combination of an isolated transformer secondary winding and a fixed impedance or regulating network that together comply with the performance requirements for an inherently limited Class 2 transformer; or

c) One or more combinations of a transformer and an overcurrent protective device that together comply with the performance requirements for a non-inherently-limited Class 2 transformer.

2.5 effective April 12, 2012

2.6 COMMERCIAL DISPLAY – A furnishing other than a display case or cabinet that is used in a retail establishment to display merchandise.

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2.7 COMMERCIAL ESTABLISHMENT – A place in which business is transacted, such as an office building, factory, warehouse, or similar location, and which is not a residence.

2.8 DECORATIVE FURNISHING – A non-seasonal furnishing intended to be used year round that exists for an aesthetic or ornamental purpose.

2.9 DISPLAY CASE – A totally enclosed lighted furnishing used to display merchandise in a retail establishment.

2.10 ENCLOSURE, ELECTRICAL – That part of the product that:

a) Renders inaccessible all or any parts of the equipment that may otherwise present a risk of electric shock; and/or

b) Retards propagation of flame initiated by electrical disturbances occurring within.

2.10 effective April 12, 2012

2.11 ENCLOSURE, MECHANICAL – A part of the equipment intended to reduce the risk of injury due to mechanical and other physical hazards.

2.11 effective April 12, 2012

2.12 FIXED FURNISHING – Intended to be permanently connected electrically to a source of supply.

2.12 effective April 12, 2012

2.13 FUNCTIONAL LOAD^a – The level of loading or force typical of hard use.

2.13 effective April 12, 2012

2.14 FURNISHING SUPPORT SYSTEM – A system of components intended to secure a furnishing to the building or other structure.

2.14 effective April 12, 2012

2.15 FURNITURE POWER DISTRIBUTION UNIT – A furniture power distribution unit consists of an attachment plug cap and a length of flexible cord terminated in an enclosure in which are mounted one or more receptacles. These units are able to include power, phone, data, or video connectors. Furniture power distribution unit is intended to be installed by furniture manufacturers at their factory. They also are able to be provided with fuses or other supplementary overcurrent protection, switches, suppression components, EMI filters, uninterruptible power supplies, and/or indicator lights in any combination, or connections for cable communications, telephone and/or antenna.

2.16 HOME AND INDIVIDUAL OFFICE FURNISHING – A furnishing used for conducting business either in the home or an office that is intended to stand alone or be mechanically and electrically connected together. An example of a furnishing that is able to be electrically and mechanically connected together are conference room tables with power and communication receptacles that are frequently moved.

2.17 INTERMITTENT OPERATION EQUIPMENT – Operation in a series of specified cycles each composed of a period of operation under normal load, followed by a rest period with the equipment switched off or running idle.

2.17 effective April 12, 2012

2.18 ISOLATED SECONDARY CIRCUIT – A circuit derived from an isolated secondary winding of a transformer and that has no direct connection back to the line-connected circuit (other than through grounding means). A secondary circuit that has a direct connection back to the line-connected circuit is determined to be part of the line-connected circuit.

2.18 effective April 12, 2012

2.19 LEAKAGE CURRENT – All currents, including capacitively coupled currents, that flow through a person upon contact between accessible conductive surfaces of a product and ground or other accessible surfaces of the product.

2.20 LIMITED POWER SOURCE (LPS) – A limited power source is as defined in the Standard for Information Technology Equipment Safety – Part 1: General Requirements, UL 60950-1, and shall comply with the requirements of UL 60950-1.

2.20 effective April 12, 2012

2.21 LOCATION, DAMP – An exterior or interior location that is normally or periodically subject to condensation of moisture in, on, or adjacent to, the furnishing, and includes partially protected locations.

2.21 effective April 12, 2012

2.22 LOCATION, DRY – A location not normally subject to dampness, but may include a location subject to temporary dampness, as in the case of a building under construction, provided ventilation is adequate to prevent an accumulation of moisture.

2.22 effective April 12, 2012

2.23 LOCATION, WET – A location in which water or other liquid can drip, splash, or flow on or against the furnishing.

2.23 effective April 12, 2012

2.24 LOCKED-ROTOR CURRENT – The current measured from the line when the armature or rotor is prevented from rotating.

2.24 effective April 12, 2012

2.25 LOSS OF SERVICEABILITY^a – The failure of any component to carry its intended load or to perform its normal function or adjustment.

2.25 effective April 12, 2012

2.26 LOW-VOLTAGE CIRCUIT – A circuit involving a potential of not more than 30 volts alternating current (42.4 peak) open circuit.

2.26 effective April 12, 2012

2.27 MATTRESS – A resilient material or combination of materials enclosed by ticking used alone or in combination with other products intended or promoted for sleeping upon. The term includes but is not limited to adult mattresses, youth mattresses, crib mattresses, bunk beds mattresses, futons, flip chairs without permanent backs or arm rests, sleeper chairs, water or air beds if they contain upholstery material between the ticking and mattress core.

2.28 MATTRESS FOUNDATION – A ticking covered structure used to support a mattress or sleep surface. The structure may incorporate other materials such as foam, springs, and the like used alone or in combination.

2.29 MATTRESS SET – A Mattress provided with or without the mattress foundation.

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2.30 MOTOR-OPERATED FURNISHING – An appliance provided with a motor used for sitting, laying, or used for decoration, such as a wave machine.

2.31 OFFICE FURNISHING – A furnishing used in an office and intended to always be mechanically connected together to form a system. It also is able to be electrically connected together.

2.32 PANEL – A flat rectangular vertical piece that forms part of or all of a wall or office partition.

2.33 PORTABLE FURNISHING – Meets all of the following:

a) Not secured to the building structure unless provided with a securement means that allows the furnishing to be removed without the use of tools, and

b) Connected electrically to an electrical source of supply with a power supply cord and plug.

2.33 effective April 12, 2012

2.34 PORTABLE LUMINAIRE – A portable luminaire is a cord connected luminaire that provides illumination for a room or specific area and is able to be moved to a new location with or without the use of readily available tools. Tiffany type lamps and similar lighted decorative lamps are portable lamps rather than a decorative furnishing.

2.35 PROOF LOAD^a – The level of loading or force in excess of hard use.

2.35 effective April 12, 2012

2.36 PUBLIC OCCUPANCIES – Include but are not limited to health care facilities, old age convalescent and board and care homes, college dormitories, residence halls, jails, prisons, nursing care homes, public auditoriums, hotels and motels.

2.37 RACEWAY – A completely enclosed channel intended specifically for the holding and routing of wiring, excluding communication and low-voltage wiring. A raceway provides mechanical protection to the internal wiring.

2.38 RELOCATABLE POWER TAP (RPT) – A relocatable power tap consists of an attachment plug cap and a length of flexible cord terminated in an enclosure in which are mounted one or more receptacles. A relocatable power tap is able to be provided with suitable supplementary overcurrent protection, switches, and indicator lights singularly or in any combination. A relocatable power tap containing three or more receptacles also are able to employ a transient voltage surge suppressor (TVSS) and/or an electromagnetic interference (EMI) filter. A RPT is intended for general use.

2.39 RESIDENCE – A place where people live (such as a house or apartment). A hotel common area such as the lobby or a restaurant are public occupancy areas. The terms "household" and "residence" are equivalent.

2.40 SAFETY CIRCUIT – A circuit that senses the presence of a user or bystander which is in danger of risk of injury from the furnishing and places or stops the furnishing in a position that prevents a risk of injury to a user or bystander under normal, abnormal circuit operation or upon circuit failure.

2.41 STATIONARY FURNISHING –

a) Intended to be fastened in place requiring tools for removal and connected electrically to an electrical source of supply with a power supply cord and plug; or

b) Unlikely to be frequently relocated due to size, weight or configuration and connected electrically to an electrical source of supply with a power supply cord and plug.

2.41 effective April 12, 2012

2.42 SURFACE CLASSIFICATIONS^a –

SURFACE – A moveable, typically stowable, surface whose primary function is to support office equipment such as printers and scanners.

KEYBOARD SURFACE – An adjustable, rolling or stationary surface that is intended for placement of the keyboard, and/or other computer input devices.

PRIMARY SURFACE – A surface that has the apparent potential for the highest loading or a surface on which a person may sit. In cases where more than one horizontal surface exists, there may be more than one primary surface. In cases where all surfaces are intended for equipment there may be no primary surfaces.

SECONDARY SURFACE – A surface that is vertically separated from and smaller than the primary work surface(s). It is used for storage (that is, a shelf) or occupied exclusively by the equipment placed on the surface.

WRITING SHELF – A moveable, typically stowable surface that is not intended to carry loads greater than 25 pounds (11 kg), whose primary function is to support ancillary office tasks, such as writing and short-term reference material handling.

DOOR SHELF – A surface or load-bearing compartment affixed to a door.

2.42 effective April 12, 2012

2.43 **TICKING** – The outer most layer of fabric or related material of a mattress or mattress foundation.

2.44 **TIP OVER^a** – The condition where the unrestricted unit will not return to its normal upright position.

2.44 effective April 12, 2012

2.45 **USER ADJUSTABLE SURFACES^a** – A surface that is intended to be adjusted by the user while under normal use including articulating keyboard mechanisms.

2.45 effective April 12, 2012

2.46 **WIRED CABINET** – See 2.9.

2.47 **WORKING EDGE^a** – The side of the surface at which the primary user works. Some surfaces such as conference tables may have more than one working edge.

2.47 effective April 12, 2012

2.48 **WORK SURFACE^a** – A horizontal surface used to perform tasks and/or for storage space.

^a With the permission of BIFMA, this definition is reproduced from the BIFMA/ANSI Standard for Small Office/Home Office Furniture Tests, ANSI/SOHO S6.5-2001. BIFMA shall not be responsible for the manner in which the information is presented, used, nor for any interpretations thereof.

2.48 effective April 12, 2012

3 Components

3.1 Except as indicated in 3.2, a component of products 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.

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.

3.5 Portable luminaires used in products covered by this standard shall comply with the requirements for cabinet lights in the Standard for Portable Electric Luminaires, UL 153. Non-portable luminaires shall comply with the Standard for Luminaires, UL 1598.

3.6 Safety Circuits employing solid-state devices shall comply with the Standard for Tests for Safety-Related Controls Employing Solid-State Devices, UL 991.

3.7 Furnishings which incorporate neon lamps shall comply with the Standard for Neon Transformers and Power Supplies, UL 2161, and shall also comply with the requirements of UL 962.

4 Units of Measurement

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

4.2 Values of voltage and current are rms values, unless otherwise stated.

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 Assembly

6.1 A furnishing shall be completely wired with all splices and electrical connections before the furnishing leaves the factory. The furnishing itself is not prohibited from being shipped unassembled.

Exception: Electrical connections made by connectors instead of splices are not required to be wired before the furnishing leaves the factory.

6.2 A furnishing shall be shipped from the factory in a carton or as an unpackaged complete assembly. Unassembled parts, when required elsewhere in the standard to accompany the furnishing, shall be included. Glassware is not required to be actually mounted in a frame or holder; it is able to be separately wrapped to protect it from breakage during shipment.

6.3 When wires pass through a joint between sections of a furnishing that are separable for packing purposes, the joint shall be such that rotation of one section with respect to the other during the assembly of the sections is limited to not more than 360 degrees. Friction alone does not meet the intent of the requirement to prevent rotation.

Exception: When all of the following conditions exist, rotation between sections of a furnishing is not limited to 360 degrees:

- a) The internal diameter of the tubing through which the wires pass is 1/2 inch (12.7 mm) or more;*
- b) The rotation during assembly is limited to not more than one revolution for each 3 inches (76 mm) of unobstructed tubing length through which the wires pass, when such rotation does not place any stress on the conductors; and*
- c) The conductors do not involve splices unless the splices are:*
 - 1) Inaccessible during assembly in accordance with Figure 14.1, articulate probe with web stop; and*
 - 2) Secured and provided with strain relief that has been shown to be reliable and not easily defeated by the user.*

6.4 When a splice or an electrical connection is located in a section of a furnishing that is separable for packing purposes, as noted in 6.2 and 6.3, the unit shall be provided with strain relief to reduce the risk of stress being transmitted to the splice or electrical connection during unpackaging and assembly of the furnishing. The strain relief shall be reliable and not easily defeated by the user. See the Strain Relief for Internal Conductors and Connectors Test, Section 41.

6.5 When wires pass through a joint between sections of a furnishing that are separable for packing purposes the joint or section shall comply with 15.5, Protection of wiring, while unassembled.

6.6 When in any position of adjustment, a spring-loaded or adjustable section of a furnishing shall not transmit stress to a splice or wiring within any section of the unit either during assembly or when completely assembled. For example, the stem of an adjustable height floor-furnishing unit shall raise and lower without binding or crimping the wiring of the unit.

6.7 As specified in 6.2, a carton is a box of cardboard, pasteboard, shrink film, or similar material (but not newspaper, wrapping paper, tissue paper, or similar paper products). It is not required to be rectangular in form, since the "pinch pack" of cardboard wrap with the ends pinched together and stapled is determined to be a carton.

6.8 A part that must be removed to assemble furnishing in the intended manner to the supply circuit is not required to be fastened, but the construction shall be such, and the hardware shall be provided, to allow field assembly.

6.9 Any furnishing that is not completely assembled shall be provided with assembly instructions.

7 General

7.1 Table 7.1 provides a summary of the differences between the requirements for household furnishings and commercial furnishings. In some circumstances, the requirements for commercial use furnishings also apply to household furnishings, depending on the design of the product.

Table 7.1
Comparison of household and commercial furnishing requirements

Table 7.1 effective April 12, 2012

Requirement	Household	Commercial
Construction:		
Glass Panels	None	Must meet minimum thickness and be nonshattering glass or subjected to Impact Test (66.1)
Cords	SPT-2 or better (15.2.7)	Hard Usage such as SJ (67.1)
Performance:		
Flammability	Beds and Upholstered Furnishings (Section 9)	Beds and Upholstered Furnishings (Section 9) Cabinets, walls, shelves etc. potentially needs Flame and Smoke Indices (66.3)
Glass panels	None	Glass Panel Impact (67.1)
Markings:		
Smoke Index	None	Must be marked if over 450 (68.1)
Proprietary Wiring System	None	System identification marked on product (68.2)

7A Accessories

7A.1 A furnishing having provision for the use of an accessory shall be constructed so that the use of the accessory does not introduce a risk of fire, electric shock, or injury to persons.

7A.1 added August 17, 2010

7A.2 A furnishing shall comply with the requirements in this Standard with or without the accessory installed.

7A.2 added August 17, 2010

7A.3 Installation of an accessory by the user shall be restricted to an arrangement by which the electrical connections are accomplished by means of mating connectors, attachment plugs and receptacles, or attachment plugs and cord connectors that maintain correct polarity.

7A.3 added August 17, 2010

7A.4 Installation of an accessory intended to be made by the installer or service personnel shall be by means of mating connectors, attachment plugs and receptacles, plug-in connectors, pigtail leads and insulated wire connectors, or by connection to existing wiring terminals such as a terminal block or an installed electrical device.

7A.4 added August 17, 2010

7A.5 With reference to 7A.4, installation of an accessory shall not require cutting of wiring or the soldering of connections by the installer.

7A.5 added August 17, 2010

7A.6 Strain-relief means shall be provided for the wiring of an accessory where stress may be transmitted to the connections during or after installation.

7A.6 added August 17, 2010

7A.7 The mounting method and location of an accessory shall be specified in the installation instructions for the furnishing. See Section 59A.

7A.7 added August 17, 2010

7A.8 Instructions shall be provided with the accessory covering the model number or series of furnishing the accessory is intended for use with. See Section 59A.

7A.8 added August 17, 2010

7A.9 An accessory shall be trial-installed to determine that the installation is feasible, that the instructions are detailed and accurate, and that the furnishing complies with the requirements of this standard with the accessory installed.

7A.9 added August 17, 2010

7A.10 An accessory may be shipped with or separately from the basic furnishing.

7A.10 added August 17, 2010

7A.11 A part that is required for the furnishing to perform its basic function is not considered an accessory and shall be supplied with the basic furnishing.

7A.11 added August 17, 2010

CONSTRUCTION

8 General

8.1 Each electrical device and insulated conductor shall have a voltage rating at least equal to the voltage that is applied to it during intended use.

8.2 Each electrical device shall have an ampere rating and each insulated conductor shall have an ampacity rating for the maximum current to which it is subjected during intended use.

8.3 Means shall be provided to reduce the risk of contact between the surface of a cabinet and a cabinet light other than at the intended mounting means. The means provided shall have strength and rigidity to reduce the risk of distortion which facilitates installation in a manner other than intended.

8A Heating Pads - For Use in Upholstered Furnishings

8A.1 A heating pad employed in a furnishing shall comply with the applicable requirements in the Standard for Electric Heating Pads, UL 130.

Exception: A heating pad that is not accessible and that complies with the requirements in the Resistance to Moisture Test, Section 49B.1; Flexing and Twisting Test, Section 49B.2; and Thermostat Test, Section 49B.3, is acceptable.

8A.1 added April 12, 2011

8A.2 Fabric, batting, padding, foam, and synthetic or natural leather shall not be relied upon to serve as electrical insulation.

8A.2 added April 12, 2011

8A.3 Current-carrying metal parts within a heating pad shall be electrically insulated with a material that complies with the Standard for Polymeric Materials - Use in Electrical Equipment Evaluations, UL 746C. The thickness (not including the envelope or padding material) of insulation applied directly to the current-carrying metal parts shall not be less than 0.028 inch (0.71 mm) unless the parts are secured in position (to prevent their motion relative to one another, the envelope, or both). If the parts are secured, 0.013 inch (0.33 mm) shall be the minimum insulation thickness.

8A.3 added April 12, 2011

8A.4 A furnishing heating pad shall be provided with a supplemental envelope (enclosure) that complies with the following:

- a) The envelope shall enclose all electrical parts of the pad without any ventilation or other openings;
- b) An envelope of unsupported vinyl sheeting on a household furnishing pad shall not be thinner than 0.012 inch (0.3 mm). An envelope of unsupported vinyl sheeting on a commercial furnishing pad shall not be thinner than 0.020 inch (0.5 mm);
- c) The average thickness of a rectangular specimen measuring approximately 1 by 4 inches (25 by 102 mm) is to be determined from measurements made by means of a dead-weight dial micrometer having a flat anvil and a flat-faced cylindrical presser foot that is 0.25 ± 0.01 inch (6.35 ± 0.25 mm) in diameter and exerts 85 ± 3 gf (0.83 ± 0.03 N) on the specimen. The calibration of the dial on the micrometer is to facilitate estimation of each measurement to 0.0001 inch (0.0025 mm); and

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d) The thickness of a specimen is to be measured midway across the width of the specimen at the center of its length and at points 1/2 inch (13 mm) from each end. Each measurement is to be estimated at the nearest 0.0001 inch (0.0025 mm) and recorded. The smallest of the three recorded thicknesses is to be rounded off to the nearest 0.001 inch (0.025 mm).

8A.4 added April 12, 2011

8A.5 Foam padding in direct contact with or provided as a component of a heating pad shall comply with the requirements for HBF or better material as specified in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

8A.5 added April 12, 2011

9 Mattress/Foundation Sets and Upholstered Furnishings – Flammability

9.1 All Mattresses, Mattress Sets and Mattress Foundations shall comply with the Federal Register 16 CFR Part 1633 – Standard for the Flammability (Open Flame) of Mattress Sets. The mattress shall be marked as required in 16 CFR Part 1633 and any other markings required by this standard.

9.2 All Mattresses, Mattress Sets and Mattress Foundations shall comply with the Federal Register 16 CFR Part 1632 – Standard For The Flammability Of Mattresses and Mattress Pads. The mattress shall be marked as required in 16 CFR Part 1632 and any other markings required by this standard.

9.3 Mattresses, Mattress Sets and Mattress Foundations intended for use in public occupancies shall comply with 9.1, 9.2, and the State of California Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation, Technical Bulletin 129, Flammability Test Procedure for a Mattress for use in Public Buildings (October 1992). The mattress shall be marked in accordance with 55.22.

9.4 Upholstered seating furnishings intended for household use shall comply with the State of California Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation, Technical Bulletin 117, Requirements, Test Procedure and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used in Upholstered Furniture (March 2000) or Technical Bulletin 133, Flammability Test Procedure for Seating Furniture for use in Public Occupancies (January 1991). The furnishing shall be marked in accordance with 55.23.

9.5 Upholstered seating furnishings intended for use in public occupancies shall comply with the State of California Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation, Technical Bulletin 133, Flammability Test Procedure for Seating Furniture for use in Public Occupancies (January 1991). The furnishing shall be marked as indicated in 55.23.

Exception: An upholstered furnishing marked in accordance with 55.24 does not need to be evaluated for flammability.

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10 Frame and Enclosure

10.1 General

10.1.1 A furnishing shall be formed and assembled so that it has the strength, stability, and rigidity required to resist the abuses during normal use and maintenance to which it is subjected without increasing the risk of fire, electric shock, or injury to persons. See Section 34, Strength of Electrical Enclosure Tests.

10.1.2 A part such as a splice, tap, wire, transformer, capacitor, ballast, current-carrying part, or device with an exposed live part shall be contained in an enclosure constructed of metal, glass, ceramic, porcelain, or polymeric material. Such parts shall be contained in the enclosure during normal maintenance and use.

Exception No. 1: A current-carrying part of a wiring device (such as the screw shell and center contact of a lampholder, the lampholder contacts, starter holder contacts, or similar components of a fluorescent luminaire) that are normally fitted with a functional component (a lamp, a starter, or similar component) during use of the furnishing is not required to be additionally enclosed.

Exception No. 2: A component, such as a ballast, that has an integral outer housing that has been evaluated as an enclosure is not required to be additionally enclosed.

Exception No. 3: A power-supply cord is not required to be contained within the furnishing other than at the connection point to internal components.

10.1.3 A frame, guard, handle, or similar part; or an exposed portion of an enclosure, such as an edge, projection, or corner, shall be smooth and rounded. Such components shall not be so sharp as to constitute a risk of injury to persons during intended use and maintenance of a product, when investigated in accordance with the Standard for Test for Sharpness of Edges on Equipment, UL 1439.

10.1.4 Among the factors that shall be evaluated (refer to 10.4) when investigating a nonmetallic enclosure are resistance to:

- a) Mechanical damage;
- b) Impact;
- c) Moisture-absorption;
- d) Combustion; and
- e) Distortion at temperatures to which the material is subjected under conditions of intended use or foreseeable misuse.

10.2 Enclosures and guards

10.2.1 When the operation and maintenance of a furnishing by the user or bystanders involves the risk of injury to persons, protection shall be provided to reduce the risk.

10.2.2 When investigating a furnishing with respect to the requirement in 10.2.1, conditions of foreseeable misuse shall be evaluated.

10.2.3 A functional attachment that is made available or specified by the manufacturer for use with a furnishing shall be included in the investigation of the furnishing. Unless the manufacturer specifies the use of two or more attachments at the same time, only one attachment at a time is to be investigated with the furnishing.

10.2.4 Whether a guard, a release, an interlock, or similar device is required and whether such a device is adequate shall be determined from an investigation of the complete furnishing, its operating characteristics, and the potential risk of injury to persons. The investigation shall include evaluation of the results of breakdown or malfunction of any one component, and not more than one component at a time, unless one event contributes to another. When the investigation shows that breakdown or malfunction of a particular component results in a risk of injury to persons, that component shall be investigated for reliability.

10.2.5 A moving part, lifting or reclining mechanism, the rotor of a motor, a pulley, belt, gear, fan, or other part that constitutes a risk of injury shall be enclosed or provided with means to reduce the risk of injury. Such a part shall not be able to be contacted by the probe illustrated in Figure 14.1 unless the furnishing is provided with a safety circuit and complies with 10.2.6.

10.2.6 Furnishings that present a risk of injury as described in 10.2.5 shall be provided with either an active safety circuit or passive guard to prevent injury.

10.2.7 Safety systems that are electrical in nature shall be designed such that any failure of the system will result in the furnishing not producing a risk of injury due to the safety system failure.

10.2.8 A mechanical safety system, such as a guard, shall comply with clause 10.2.11.

10.2.9 During the investigation of a furnishing to determine compliance with 10.2.5, a part of the enclosure that is removable without the use of a tool (such as an accessory, the cover over an opening for an operating adjustment, or similar components) is to be opened or removed.

Exception: A part that is removable without the use of a tool is not required to be opened or removed when the furnishing is marked in accordance with 55.10.

10.2.10 Among the factors to be evaluated with respect to both intended operation of the furnishing and any foreseeable misuse in investigating an exposed moving part are:

- a) The degree of exposure required to perform the intended function;
- b) The sharpness of the moving part;
- c) The risk of unintentional contact;
- d) The speed of the moving part; and

e) The risk that a part of the body is endangered or that clothing is able to be entangled by the moving part, resulting in a risk of injury to persons.

f) An exposed motorized or otherwise powered moving part shall not exert a force greater than 40 pounds between the moving part and any object that can be inserted between the moving part and a fixed structure such as but not limited to a wall, ceiling, floor, table, stand, shelf, work surface or any portion of the device. All degrees of rotation and movement shall be considered in the evaluation. The furnishing shall be subjected to the Entrapment Force Measurement Test, Section 31.14

10.2.10 effective April 12, 2012

10.2.11 Guards shall:

- a) Require the use of tools for their removal;
- b) Be removable for servicing;
- c) Have sufficient strength and rigidity;
- d) Be complete;
- e) Not present a risk of injury to persons such as a pinch point, during additional handling because of required service, such as cleaning, unjamming, or similar service; and
- f) Be self-restoring.

10.2.12 An enclosure or guard over a rotating part shall retain a part that, because of breakage or other reasons, becomes loose or separates from a rotating part, and shall retain a foreign object that is able to be struck and propelled by the rotating part.

10.2.13 When breakage or deterioration of material adjacent to a moving part results in an increased risk of injury, the material shall have such properties as to withstand the loads it is subjected to during use of the furnishing.

10.2.14 A portable furnishing that does not incorporate a shade as specified in the Standard for Portable Electric Luminaires, UL 153, for portable lamps shall comply with Section 49, Lamp Drape Test, and shall be marked with the maximum wattage lamp intended for use with the furnishing in accordance with the requirements of UL 153.

10.2.14 effective April 12, 2012

10.3 Metallic electrical enclosures

10.3.1 A metal electrical enclosure employed as the enclosure for live parts and as the sole means of protecting electrical components against mechanical abuse shall be of sheet metal complying with the dimensions specified in Table 10.1.

Exception No. 1: Sheet metal other than that specified in Table 10.1 is not prohibited from being used when it provides protection for wiring equivalent to that afforded by the metal specified in Table 10.1. Equivalency shall be determined by the equivalence of thickness tests described in Section 34, Strength of Electrical Enclosure Tests.

Exception No. 2: A sheet-metal electrical enclosure that is recessed or otherwise protected from mechanical abuse such that a 2 inch (51 mm) diameter sphere is not able to contact the electrical enclosure is able to have a minimum wall thickness as specified in Table 10.1.

Table 10.1
Thicknesses of sheet-metal electrical enclosure

Material	Minimum thickness, inch (mm)		
	Knockouts and other points of connection for a wiring system	Sheet-metal electrical enclosure	Recessed sheet-metal electrical enclosure
Uncoated sheet steel	0.036 (0.91)	0.025 (0.64)	0.023 (0.58)
Sheet aluminum	0.050 (1.27)	0.035 (0.89)	0.029 (0.74)

10.3.2 An electrical enclosure or fitting base shall have a uniform wall thickness throughout its entire length. Both inside and outside surfaces of each length of an electrical enclosure or fitting base shall be free of scale and rust.

Exception: Sections of reduced thickness are not prohibited from being used to facilitate knockouts.

10.3.3 A metal cap or cover for an electrical enclosure shall be at least as thick as specified in Table 10.1, and shall comply with the applicable requirements in this section.

10.3.4 A cast metal electrical enclosure shall be at least as thick as specified in Table 10.2.

Table 10.2
Thickness of cast metal parts

Material	Minimum thickness	
	inch	(mm)
Malleable iron	3/32	(2.4)
Iron other than malleable iron	1/8	(3.2)
Die-cast nonferrous:		
Part is ribbed or otherwise reinforced	1/16	(1.6)
Part is not ribbed or otherwise reinforced	3/32	(2.4)
Cast nonferrous other than die-cast	3/32	(2.4)

10.4 Electrical enclosures of polymeric material

10.4.1 A polymeric electrical enclosure employed as the enclosure for live parts and as the sole means of protecting electrical components against mechanical abuse shall have the strength to resist the mechanical stresses to which it is subjected during intended use of the product.

10.4.2 A polymeric material that is intended to support an outlet, fitting, or other part shall have the strength and rigidity required for the application.

10.4.3 To determine compliance with 10.4.1 and 10.4.2, a polymeric raceway is to be subjected to the equivalence of thickness and mold stress tests specified in Section 34, Strength of Electrical Enclosure Tests, as applicable.

10.4.4 Unless superseded by other requirements in this section, a polymeric enclosure part shall comply with the enclosure requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

10.5 Barriers

10.5.1 The enclosure of a motor-operated furnishing shall reduce the risk of molten metal, burning insulation, flaming particles, or similar materials falling on combustible materials, including the surface upon which the furnishing is supported.

10.5.2 The requirement in 10.5.1 necessitates that a switch, a relay, a solenoid, or similar device be individually and completely enclosed, except for terminals, unless it is shown that malfunction of the component does not result in a risk of fire, or there are no openings in the bottom of the furnishing enclosure. It also necessitates the use of a barrier:

a) Under a motor unless:

- 1) The structural parts of the motor or of the furnishing provide the equivalent of such a barrier;
- 2) The protection provided with the motor is such that no burning insulation or molten material falls to the surface that supports the furnishing when the motor is energized under each of the following fault conditions:
 - i) Open main winding;
 - ii) Open starting winding;

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iii) Starting switch short-circuited; and

iv) Capacitor of permanent-split capacitor motor short-circuited – the short circuit is to be applied before the motor is energized, and the rotor is to be locked;

3) The motor is provided with a thermal motor protector or the motor is impedance protected. Both means of protection must comply with the Standard for Overheating Protection for Motors, UL 2111.

b) Under wiring, unless it is neoprene, cross-linked polyethylene, or thermoplastic-insulated.

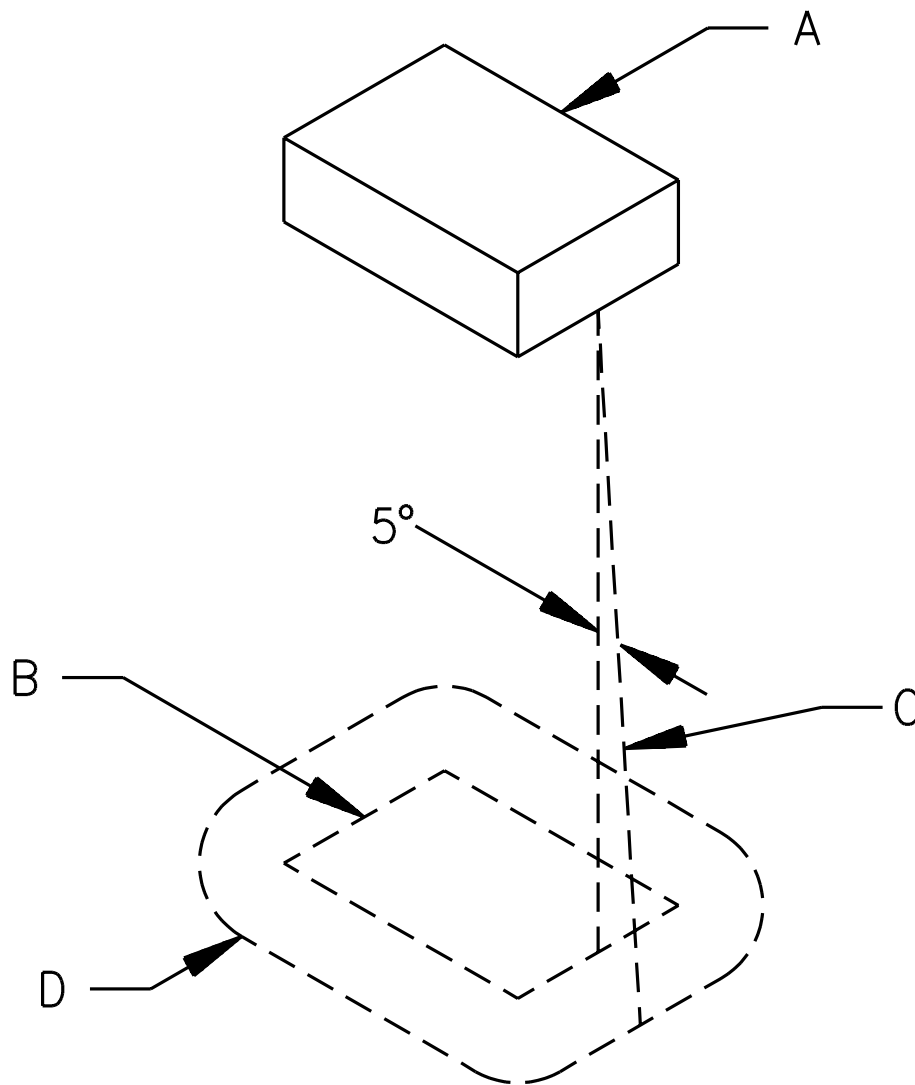
10.5.3 The barrier specified in 10.5.2 shall be of noncombustible material or shall comply with the Internal Barriers section in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, and shall have a comparative tracking index (CTI) of:

a) 4 for furnishings for household use; and

b) 3 for furnishings for commercial applications.

10.5.4 The barrier specified in 10.5.2 shall be horizontal, shall be located as illustrated in Figure 10.1, and shall not have an area less than that described in Figure 10.1. Openings for drainage, ventilation, or similar condition, are not prohibited from being employed in the barrier, when such openings do not allow molten metal, burning insulation, or similar materials to fall on combustible material.

Figure 10.1
Location and extent of barrier



SA0604-1

A – Region to be shielded by barrier. This consists of the entire component when it is not otherwise shielded and consists of the unshielded portion of a component that is partially shielded by the component enclosure or equivalent.

B – Projection of outline of component on horizontal plane.

C – Inclined line that traces out minimum area of barrier. The line is always tangent to the component, 5 degrees from the vertical, and oriented so that the area traced out on a horizontal plane is maximum.

D – Location (horizontal) and minimum area for barrier. The area that is included inside the line of intersection traced out by the inclined line C and the horizontal plane of the barrier.

10.6 Doors or covers

10.6.1 A door or a cover of an enclosure that provides access to any overload protective device requiring resetting or renewal shall be hinged or otherwise attached in an equivalent manner.

10.6.2 Means shall be provided for holding the door or cover over a fuseholder in a closed position, and the door or cover shall be tight-fitting.

10.7 Mounting means

10.7.1 An opening provided for mounting shall be located or guarded so that a nail, hook, or similar part does not reduce spacings, displace a part that creates a risk of fire or electric shock, and does not contact one of the following:

- a) An uninsulated live part;
- b) Magnet wire;
- c) Internal wiring; or
- d) Any other part that creates a risk of fire or electric shock.

10.7.2 A furnishing intended to be mounted shall employ a mechanical means of mounting that does not rely on friction.

10.7.3 An adhesive used to secure a furnishing or part of a furnishing which if displaced could cause a risk of injury shall be investigated to determine that it reliably secures the product. General – Adhesives, Function Analysis, and Program of Investigation, in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, shall be used when performing the investigation. The maximum force as defined in UL 746C shall be the weight of the part or furnishing under investigation.

10.8 Polymeric Device Supporting Means

10.8.1 A polymeric device which provides mechanical support or electrical insulation or separation whose deterioration would reduce spacings between uninsulated live parts or could result in a risk of injury created due to softening or melting of the support means shall comply with mechanical RTI temperature limits (with and without impact) for the material in the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B.

10.8.1 effective April 12, 2012

11 Protection Against Corrosion

11.1 Iron and steel parts shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means, when corrosion of such parts results in a risk of fire, electric shock, or injury to persons.

Exception: This requirement does not apply to bearings, laminations, or minor parts of iron or steel, such as washers, screws, or similar parts.

11.2 Copper, aluminum, and alloys of copper and aluminum, stainless steel, and similar materials having inherent resistance to atmospheric corrosion may be used without additional corrosion protection.

11.3 All exposed, exterior and interior, surfaces of ferrous metal parts shall be protected by one of the following:

- a) A coating of nonferrous metal applied by the hot dip process method;
- b) A plating of nonferrous metal applied either by electro-deposition or by chemical means;
- c) A coating of vitreous enamel;
- d) Baked paint, or similar type of coating; or
- e) Air-dry paint.

11.4 When deterioration of a liquid container provided as a part of an furnishing results in a risk of fire or electric shock, the container shall be of a material that is resistant to corrosion by the liquid with which it is intended to be used.

12 Damp and Wet Location Furnishings – Resistance to Liquid Damage

12.1 When a furnishing is intended to be used where the deterioration or breakage of a liquid container, seal, or similar component increases the risk of electric shock or liquid spillage, the container, seal, or similar component shall be resistant to deterioration from the liquid intended to be used in contact with that component. The liquid shall be evaluated with respect to its toxic, acid, alkaline, flame and conductive properties. The determination of resistance to deterioration is based upon the material comprising the container, seal, or similar component, its size and shape, the mode of application, and other factors. Gaskets and seals are to be evaluated to the Standard for Gaskets and Seals, UL 157.

12.1 effective April 12, 2012

12.2 A cord connected furnishing (such as a green house, lighted planter, lighted make-up mirror) using insulating material that is capable of being adversely affected by moisture under its intended operating conditions shall be investigated in accordance with the Humidity Conditioning Test, Section 46, followed by the Leakage Current Test, Section 36.

12.2 effective April 12, 2012

12.3 A permanently wired furnishing using insulating material that is capable of being adversely affected by moisture under its intended operating conditions shall be investigated in accordance with the Humidity Conditioning Test, Section 50, followed by the Insulation Resistance Test, Section 47.

12.3 effective April 12, 2012

12.4 Wet location furnishings shall be investigated in accordance with Part 4 Outdoor Furnishings.

12.4 effective April 12, 2012

13 Furnishings with Water Reservoirs or for Use with Water

13.1 A furnishing that has water contained within the furnishing or has water added to the furnishing in use shall comply with 12.1 and Section 53, Flooding Test.

13.1 effective April 12, 2012

14 Accessibility of Uninsulated Live Parts and Film-Coated Wire

14.1 To reduce the risk of unintentional contact that results in a risk of electric shock from an uninsulated live part or film-coated wire, an opening in an enclosure shall comply with either:

- a) For an opening that has a minor dimension (see 14.5) less than 1 inch (25.4 mm), such a part or wire shall not be contacted by the probe illustrated in Figure 14.1.
- b) For an opening that has a minor dimension of 1 inch (25.4 mm) or more, such a part or wire shall be spaced from the opening as specified in Table 14.1.

Exception: A motor is not required to comply with these requirements when it complies with the requirements in 14.2.

Table 14.1
Minimum required distance from an opening to a part involving a risk of electric shock

Minimum dimension ^a of opening		Minimum distance from opening to part	
inches	(mm) ^b	inches	(mm) ^b
3/4 ^c	(19.1)	4-1/2	(114)
1 ^c	(25.1)	6-1/2	(165)
1-1/4	(31.8)	7-1/2	(191)
1-1/2	(38.1)	12-1/2	(318)
1-7/8	(47.6)	15-1/2	(394)
2-1/8	(54.0)	17-1/2	(445)
d		30	(762)
^a See 14.5. ^b Between 3/4 and 2-1/8 inches (19.1 and 54.0 mm), interpolation is to be used to determine a value between values specified in the table. ^c Any dimension less than 1 inch (25.4 mm) applies to a motor only. ^d More than 2-1/8 inches, and not more than 6 inches (152 mm).			

14.2 With respect to a part or wire as specified in 14.1, in an integral enclosure of a motor as specified in the Exception to 14.1:

a) An opening that has a minor dimension (see 14.5) less than 3/4 inch (19.1 mm) is able to be used when:

- 1) Film-coated wire is not able to be contacted by the probe illustrated in Figure 14.3;
- 2) In a directly accessible motor (see 14.6), an uninsulated live part is not able to be contacted by the probe illustrated in Figure 14.1; and
- 3) In an indirectly accessible motor (see 14.6), an uninsulated live part is not able to be contacted by the probe illustrated in Figure 14.2.

b) An opening that has a minor dimension of 3/4 inch or more is able to be used when a part or wire is spaced from the opening as specified in Table 14.1.

Figure 14.2
Straight probe

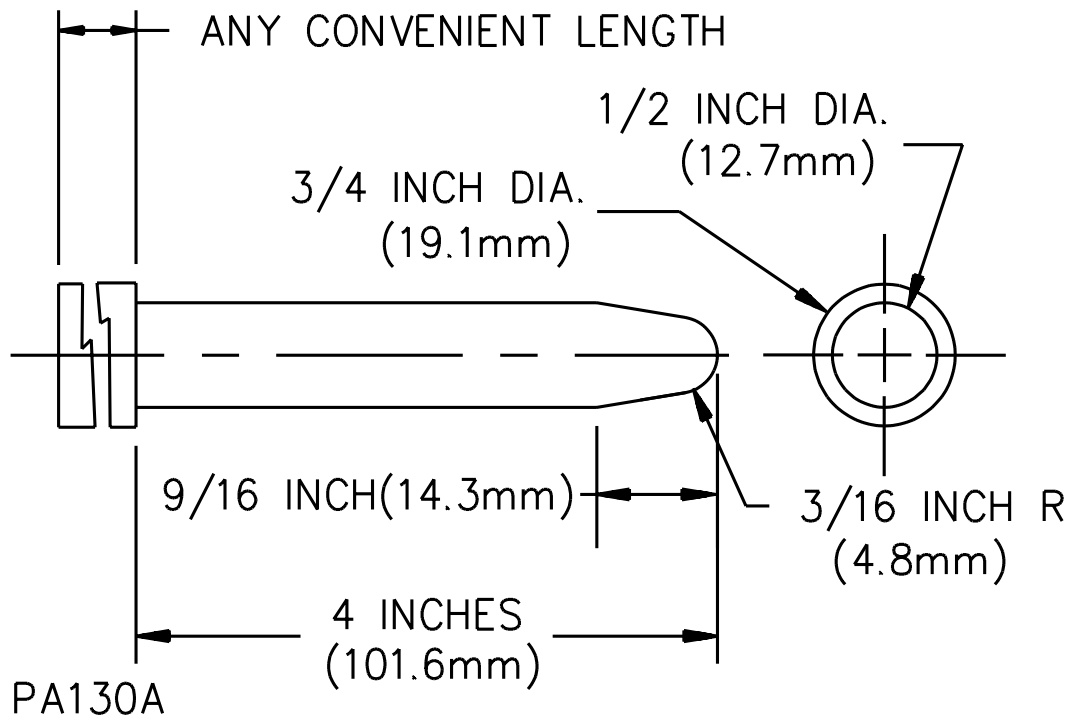
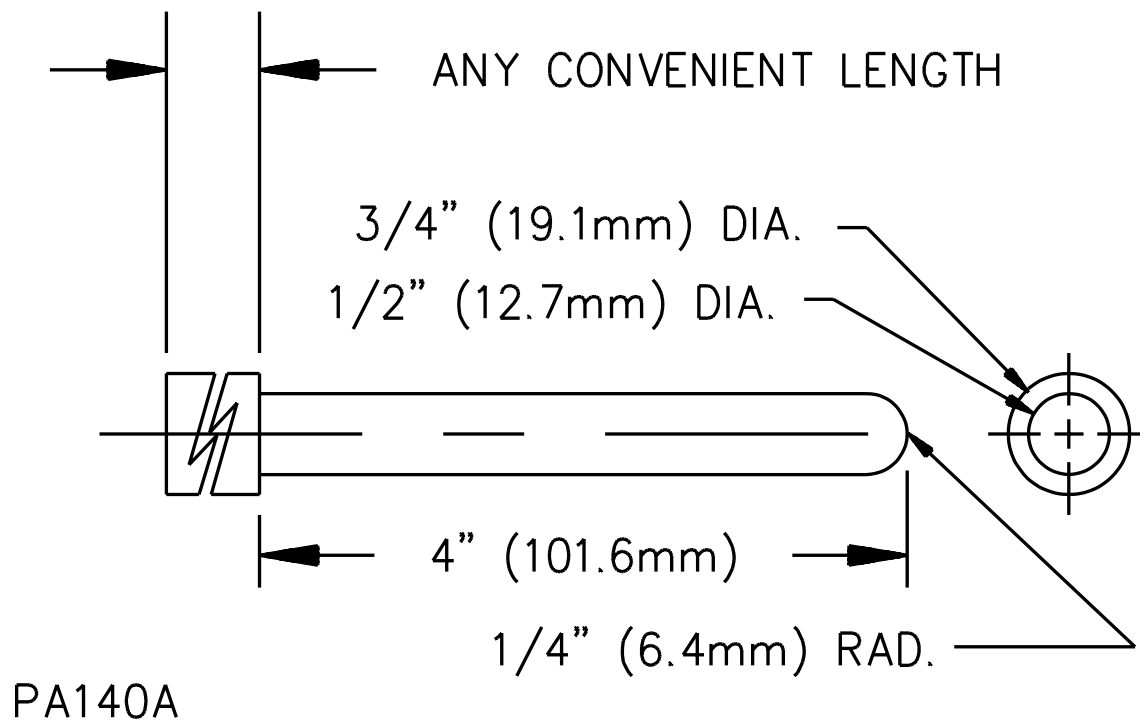


Figure 14.3
Straight probe



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14.3 The probes specified in 14.1 and 14.2 and illustrated in Figures 14.1 – 14.3 shall be applied to any depth that the opening allows, and shall be rotated or angled before, during, and after insertion through the opening to any position required to examine the enclosure. The probe illustrated in Figure 14.1 shall be applied in any configuration allowed by the construction; and, when required, the configuration shall be changed after insertion through the opening.

14.4 The probes specified in 14.2 and 14.3 shall be used as measuring instruments to investigate the accessibility provided by an opening, and not as instruments to investigate the strength of a material: they shall be applied with the minimum force required to determine accessibility.

14.5 With reference to the requirements in 14.1 and 14.2, the minor dimension of an opening is the diameter of the largest cylindrical probe having a hemispherical tip that is able to be inserted through the opening.

14.6 With reference to the requirements in 14.2, an indirectly accessible motor is a motor that is accessible only by opening or removing a part of the outer enclosure (such as a guard or panel) that is able to be opened or removed without using a tool, or that is located at such a height or is otherwise guarded or enclosed so that it is not contacted during normal use of the furnishing. A directly accessible motor is one that is able to be contacted without opening or removing any part or that is located so as to be accessible to contact during normal use of the furnishing.

14.7 During the examination of a furnishing to determine compliance with 14.1 or 14.2, a part of the enclosure that is able to be opened or removed by the user without a tool (such as an accessory, the cover over an opening for an operating adjustment, or similar components) is to be opened or removed.

14.8 With reference to the requirements in 14.1 and 14.2, an insulated brush cap is not required to be additionally enclosed.

15 Power-Supply Connections

15.1 Permanently connected furnishing

15.1.1 A furnishing is able to be provided with means for permanent connection to the power supply.

15.1.2 A permanently connected furnishing shall be provided with field-wiring terminals or leads for the connection of conductors having an ampacity rated as intended for the furnishing, and in accordance with the National Electrical Code, ANSI/NFPA 70. A furnishing is able to be provided with a splice compartment or a junction box to make connections.

15.1.3 A lead that is intended to be connected in the field to a power-supply circuit conductor shall not be smaller than 18 AWG (0.82 mm²), and shall be sized based on the rated current of the furnishing.

15.1.4 A terminal or splice compartment shall be complete and shall enclose all field-wiring terminals and splices to be made in the field.

15.1.5 Each terminal or splice compartment in which power-supply connections are to be made in the field shall be located so that the connections are able to be readily inspected after installation of the furnishing.

15.1.6 The compartment specified in 15.1.5 shall be located so that, when making conduit connections, internal wiring and electrical components are not exposed to mechanical abuse or strain.

15.1.7 A terminal compartment intended for connection of a supply electrical enclosure shall be attached so as to be prevented from turning with respect to the supporting surface.

15.1.8 A wiring terminal shall be prevented from turning or shifting in position.

15.1.9 A wire-binding screw at a wiring terminal shall not be smaller than No. 10 (4.8 mm diameter). If a pretapped hole is not provided, a thread-forming screw shall be used.

Exception: A No. 8 (4.2 mm diameter) screw is able to be used at a terminal intended only for connection of a 14 AWG (2.1 mm²) conductor.

15.1.10 A terminal plate tapped for a wire-binding screw shall be of metal not less than 0.050 inch (1.27 mm) thick.

Exception: A plate not less than 0.030 inch (0.76 mm) thick is able to be used when the tapped threads comply with Section 35, Tightening Torque Test.

15.1.11 A wire-binding screw shall be provided with an upturned lug, cupped washer, or equivalent means that retains a supply conductor of the size intended.

15.1.12 A terminal (for example, a plate and screw) intended for the connection of the grounded supply conductor shall be formed of or plated with metal that is substantially white in color and shall be readily distinguishable from other terminals or shall be clearly identified in some other manner, such as on an attached wiring diagram.

15.1.13 A lead intended for the connection of the grounded power-supply conductor shall be finished to show a white or gray color, and shall be readily distinguishable from other leads.

15.1.14 The free length of a lead located inside an outlet box or field-wiring compartment and intended for field connection to a branch circuit shall not be less than 6 inches (152 mm).

15.1.15 When a terminal block is provided, it shall be suitable for field wiring.

15.1.16 An opening for conduit shall have dimensions as indicated in Table 15.1.

Table 15.1
Dimensions associated with openings for conduit

Nominal trade size of conduit	Unthreaded opening diameter ^a		Throat minimum		Diameter maximum		Minimum diameter of flat surface
inches	inch	(mm)	inch	(mm)	inch	(mm)	inch (mm)
1/2	0.875	(22.2)	0.56	(14.2)	0.62	(15.7)	1.15 (29.2)
3/4	1.109	(28.2)	0.74	(18.8)	0.82	(20.8)	1.45 (36.8)
1	1.375	(34.9)	0.94	(23.9)	1.05	(26.7)	1.80 (45.7)
1-1/4	1.734	(44.0)	1.24	(31.5)	1.38	(35.1)	2.31 (58.7)

^a A plus tolerance of 0.031 inch (0.79 mm) and a minimum tolerance of 0.015 inch (0.38 mm) applies to the knockout diameter. Knockout diameters are measured other than at points where a tab remains after removal of knockout.

15.1.17 The minimum unobstructed diameter of the flat surface surrounding the back of an opening for unthreaded conduit shall be as indicated in Table 15.1.

15.1.18 When threads for the connection of threaded conduit are tapped all the way through a hole, there shall be no fewer than 3-1/2 or more than 5 threads. The construction of the hole shall be such that a conduit bushing is able to be properly attached and the minimum unobstructed diameter surrounding the back of the hole shall be as indicated in Table 15.1.

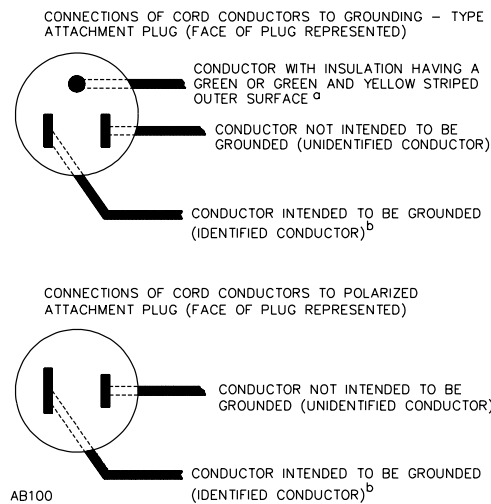
15.1.19 When threads for the connection of threaded conduit are not tapped all the way through a hole, there shall be no fewer than five full threads. The unthreaded parts of the hole and the back edge shall be smooth and well rounded for protection of the conductors. The unthreaded throat diameter of the hole shall have an internal diameter as noted in Table 15.1.

15.2 Cord-connected furnishing

15.2.1 A furnishing intended to be connected to the power-supply circuit by means of a flexible cord shall be provided with a flexible cord and an attachment plug for connection to the supply circuit. Furnishings supplied with more than one power supply cord shall comply with 15.3.

15.2.2 The attachment plug of a furnishing intended to be connected to a nominal 120 volt circuit, and, when employing devices required to be connected to a specific supply conductor, such as an Edison-screw lampholder, a single-pole switch with a marked "off" position, and a general-use receptacle, shall be a polarized type. The connections to the attachment plug shall be in accordance with Figure 15.1. The polarity identification of the supply cord shall be in accordance with Table 15.2. See 61.3.

Figure 15.1
Connections to attachment plugs



^a In the above illustration, the blade to which the green conductor is connected is able to have a U-shape instead of a circular cross section.

^b Signifies a conductor identified in accordance with Table 15.2. The grounded (identified) conductor is the neutral supply conductor.

Table 15.2
Polarity identification of flexible cords

Method of identification	Usable combinations	
	Wire intended to be grounded ^{a,b}	All other wires ^a
Color of braid on individual conductors	Solid white or gray – without tracer Color other than white or gray, with tracer in braid	Solid color other than white or gray – without tracer Solid color other than white or gray – without tracer
Color of insulation on individual conductors	Solid white or gray ^c Light blue ^d	Solid color other than white or gray Solid color other than light blue, white, or gray
Other means	Tin or other white metal on all strands of the conductor ^e A stripe, ridge or groove on the exterior surface of the cord ^f	No tin or other white metal on the strands of the conductor
^a A wire finished to show a green color with or without one or more yellow stripes or tracers is to be used only as an equipment-grounding conductor. See 17.2.1 and Figure 15.1. ^b The grounded conductor is the neutral supply conductor. ^c Only for cords – other than Types SPE-2 and SPT-2 – having no braid on any individual conductor. ^d For jacketed cords. ^e Only for Type SPT-2 cords. ^f Only for Types SPE-2 and SPT-2 cords.		

15.2.3 A furnishing that is required to employ a polarized attachment plug, as specified in 15.2.2, and that is provided with a separate or detachable cord set shall also employ an appliance connector of the polarized type.

15.2.4 A furnishing required to be grounded shall be provided with a grounding-type attachment plug.

15.2.5 If the cord includes an equipment grounding conductor, the grounding conductor shall be connected to all exposed or accessible dead metal of the furnishing by a mechanical means in accordance with Grounding and Bonding, Section 17 and to the grounding pin of a grounding attachment plug. See Figure 15.1.

15.2.6 The power-supply cord shall be rated for use at a voltage not less than the rated voltage of the product. The power-supply cord shall be sized in accordance with Table 15.3. A furnishing provided with a receptacle shall be provided with a 12 AWG (3.3 mm²) cord when the receptacle is rated 20 amps or 14 AWG (2.1 mm²) cord when the product is rated 15 amps or less.

Table 15.3
Size of power-supply cord

Cord size AWG (mm ²)	Maximum rating (Amperes)	
	3 current-carrying conductors	2 current-carrying conductors
12 (3.3)	20	25
14 (2.1)	15	18
16 (1.3)	10	13
18 (.82)	7	10

15.2.7 A flexible cord shall be at least Type SPT-2, SPE-2, or the equivalent. Type SVT cord is equivalent when individual conductors are provided with supplementary insulation or spaced away from metal.

15.2.8 For furnishings where the cord exits the furnishing at a height greater than 3 feet (0.9 m), the cord length shall be a minimum of 9 feet (2.74 m) and a maximum of 15 feet (4.57 m) as measured from the exit of the furnishing to the attachment plug face. For furnishings where the cord exits the furnishing at a height of 3 feet (0.9 m) or less, the cord length shall be a minimum of 5 feet (1.5 m) and a maximum of 10 feet (3.05 m). The cord length for components used in the furnishings and not connected to the wall receptacle shall be long enough to reach the next component and the cord shall be routed away from the heat sources and secured.

15.2.9 Means shall be provided to support the cord to reduce risk of contact with a cabinet light at a location other than the cord exit.

15.2.10 The furnishing shall be constructed so that neither the cord nor plug is damaged when the furnishing is placed against a wall. Examples of constructions include, but are not limited to wood blocks to hold the furnishing out from the wall and right angle (flat) cord/plugs.

15.2.11 Power supply cords and inter-connecting cords that constitute a risk of injury from damage shall be protected from moving parts of a furnishing.

15.3 Multiple power supply cords

15.3.1 Cord connected furnishings shall not be provided with more than one power supply cord unless all of the following conditions are met:

- a) Not more than two cords are provided;
- b) Each flexible cord is of the type, size, and rating required for the type of product and the load supplied;
- c) Each attachment plug cap's rating is:
 - 1) Not less than that of the furnishing and not less than the maximum current input of the furnishing when tested in accordance with the Input Test, Section 38.
 - 2) The current rating of the attachment plug of a furnishing rated more than 15 amperes shall not be less than 125 percent of the maximum current input of the furnishing when tested in accordance with the Input Test, Section 38, and not less than 125 percent of the rated current of the furnishing.
- d) The total current input per Section 38, Input Test, (including current through all cords) is not more than 80 percent of the branch circuit supply for the single branch circuit to which it is connected (based on the plug configuration);

Exception No. 1: The current is not required to be less than 80 percent of the single branch circuit when the plugs are supplied by separate branch circuits, evidenced by any of the following:

- a) The attachment plugs are not the same configuration or rating and the instructions contain the information in 60.6 (a) and (b);*
- b) The rating of either or both plugs is greater than 20 Amps; or*
- c) The product is marked in accordance with 55.16 or 55.18, and the instructions contain the information in 60.6 (a) and (c).*

Exception No. 2: The current is not required to be less than 80 percent of the branch circuit rating when:

- a) Both attachment plugs are rated 15 Amps or less; and*
- b) The total current input is equal to or less than the attachment plug rating.*
- e) With reference to Exception No. 1(d)(a), where detachable power supply cords are used, both the attachment plugs and the means of connecting the cord to the furnishing shall have different configurations.
- f) The product is provided with a single accessible control or switch with a marked "off" position that disconnects all ungrounded conductors of the product;

Exception: The furnishing is not required to have a single disconnect when multiple disconnect means are provided in accordance with any of the following:

- a) There is a control or switch for each of the two power supply cords, and the controls or switches are grouped and identified;*
- b) Both power supply cords are of the detachable type, the only supplied loads are receptacles, and the cord attachment points are grouped and identified;*
- c) The product is provided with a mechanical or electrical interlock system that results in all ungrounded conductors of the supply being disconnected in the event that either cord is disconnected; or*
- d) A marking is provided and located adjacent to each switch in accordance with 55.19.*
- g) The furnishing is rated in accordance with 54.3;
- h) The product contains the markings in 55.15; and
- i) The furnishing is provided with instructions as indicated in 60.6.

15.4 Strain relief

15.4.1 A strain-relief means shall be provided so that mechanical stress placed on a flexible cord or flexible conduit (such as a pull or twist) is not transmitted to terminals, splices, or internal wiring. When a clamp is employed with a cord, auxiliary insulation is required when the clamp is able to damage the cord insulation.

15.4.2 To determine compliance with 15.4.1, a strain relief means is to be subjected to the applicable tests described in Section 40, Strain Relief Tests.

15.4.3 A metal strain relief clamp or band shall not be used.

15.4.4 If a knot in a flexible cord serves as strain relief, any surface against which the knot bears against or with which it potentially comes in contact shall be free from projections, sharp edges, burrs, fins, and similar protrusions.

15.5 Protection of wiring

15.5.1 The point where a flexible cord passes through an opening in a wall, barrier, or enclosure, shall be an opening that is free from sharp edges, burrs, and fins that are able to damage the conductor insulation.

15.5.2 The cord shall be provided with mechanical means that prevent the cord being pushed inside the enclosure and contacting:

- a) A lamp or heated surface;
- b) A sharp edge; or
- c) A moving part.