



UL 875

STANDARD FOR SAFETY

Electric Dry-Bath Heaters

UL Standard for Safety for Electric Dry-Bath Heaters, UL 875

Tenth Edition, Dated July 8, 2024

Summary of Topics

This new Tenth edition of ANSI/UL 875 dated July 8, 2024 includes the following changes from the previous edition:

- Revisions based on the latest version of UL 4200A: Section [9](#) and [9.1](#);***
- Removal of the reference to UL 6059, Outline for Particular Requirements for Switches for Tools: [26.2](#);***
- Updates to Section [3](#) to add a list of Referenced Standards and update some references;***
- Editorial changes throughout***

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated May 3, 2024.

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UL 875

Standard for Electric Dry-Bath Heaters

Prior to the first edition, the requirements for the products covered by this standard were included in the Standard for Electric Heating Appliances, UL 499.

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The most recent designation of ANSI/UL 875 as an American National Standard (ANSI) occurred on July 8, 2024. 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 ULSE at any time. Proposals should be submitted via a Proposal Request in ULSE's Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements cover electric dry-bath heating equipment and other equipment rated 600 volts or less that is intended to produce a dry-heat environment to be installed in accordance with the National Electrical Code, NFPA 70. The relative humidity in the heated environment is in the region of 10 – 25 % and the purpose of the heated environment (for air temperatures, see Sections 37 and 38) is to promote perspiration in a short time by means of a relatively warm and dry atmosphere. The completed equipment is to be provided with an automatic temperature-regulating control that may be integral with the heater or wall-mounted, with an integral manual-reset limit control, a timer, and any other necessary associated equipment. Electric dry-bath heating equipment and other equipment intended to produce a dry-heat environment may consist of:

- a) A heater unit intended for fixed installation in a special room that is built or assembled in the field to comply to the manufacturer's size specifications;
- b) A combination of a heater unit and a prefabricated, factory-built rigid room in which the assembled combination may be specified for field installation, or that may be supplied with a power-supply cord and intended to be fastened in place or located in a dedicated space. The room may be arranged so that it can be taken apart for shipment; or
- c) A combination of a heater and a rigid cabinet that is constructed to enclose all but the user's head. The unit is provided with a power supply cord and is intended to be fastened in place or located in a dedicated space.

1.2 These requirements do not cover steam-bath heaters, or cable-type radiant-heating equipment, nor any other electric heating equipment or appliances that are covered in separate, individual requirements.

1.3 Throughout these requirements, the term "heater" is used broadly to refer to any heater unit, including its associated control assembly.

1.4 A heater shall employ materials and components throughout that are intended for the particular use and shall be made and finished with the degree of uniformity and grade of workmanship practicable in a well-equipped factory.

1.5 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this standard does not comply with this standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

2 Units of Measurement

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

2.2 Unless otherwise indicated, all voltage and current values mentioned in this standard are root-mean-square (rms).

3 Referenced Publications

3.1 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.

3.2 The following publications are referenced in this Standard:

ANSI C73.11, *Dimensions of Plugs and Receptacles – General Purpose 125 Volts, 15 Amperes, 2 Poles, 3 Wire Grounding Type*

ANSI C73.12, *Dimensions of Plugs and Receptacles – General Purpose 125 Volts, 20 Amperes, 2 Pole, 3 Wire Grounding Type*

ASTM E28, *Standard Test Methods for Softening Point of Resins Derived from Pine Chemicals and Hydrocarbons, by Ring-and-Ball Apparatus*

ASTM E230/E230M, *Standard Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples*

IEC 60127-1, *Miniature Fuses – Part 1: Definitions for Miniature Fuses and General Requirements for Miniature Fuse-Links*

IEC 60335-1, *Household and Similar Electrical Appliances – Safety – Part 1: General Requirements*

IEC 60738-1, *Thermistors – Directly heated positive temperature coefficient – Part 1: Generic specification*

IEC 61000-4-2, *Electromagnetic Compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic Discharge Immunity Test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-13, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signaling at a.c. power port, low frequency immunity tests*

IEC 61558-1, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

NFPA 70, *National Electrical Code*

UL 20, *General-Use Snap Switches*

UL 44, *Thermoset-Insulated Wires and Cables*

UL 66, *Fixture Wire*

UL 83, *Thermoplastic-Insulated Wires and Cables*

UL 157, *Gaskets and Seals*

UL 224, *Extruded Insulating Tubing*

UL 244A, *Solid-State Controls for Appliances*

UL 248-1, *Low-Voltage Fuses – Part 1: General Requirements*

UL 248-2, *Low-Voltage Fuses – Part 2: Class C Fuses*

UL 248-4, *Low-Voltage Fuses – Part 4: Class CC Fuses*

UL 248-5, *Low-Voltage Fuses – Part 4: Class CC Fuses*

UL 310, *Electrical Quick-Connect Terminals*

UL 353, *Limit Controls*

UL 486A-486B, *Wire Connectors*

UL 486C, *Splicing Wire Connectors*

UL 486E, *Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors*

UL 489, *Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures*

UL 489A, *Circuit Breakers for Use in Communications Equipment*

UL 496, *Lampholders*

UL 499, *Electric Heating Appliances*

UL 507, *Electric Fans*

UL 510, *Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape*

UL 514A, *Metallic Outlet Boxes*

UL 514C, *Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*

UL 514D, *Cover Plates for Flush-Mounted Wiring Devices*

UL 723, *Test for Surface Burning Characteristics of Building Materials*



UL 746B, *Polymeric Materials – Long Term Property Evaluations*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 758, *Appliance Wiring Material*

UL 773A, *Nonindustrial Photoelectric Switches for Lighting Control*

UL 796, *Printed Wiring Boards*

UL 817, *Cord Sets and Power-Supply Cords*

UL 840, *Insulation Coordination Including Clearance and Creepage Distances for Electrical Equipment*

UL 873, *Temperature-Indicating and -Regulating Equipment*

UL 917, *Clock-Operated Switches*

UL 935, *Fluorescent-Lamp Ballasts*

UL 943, *Ground-Fault Circuit-Interrupters*

UL 943B, *Appliance Leakage-Current Interrupters*

UL 969, *Marking and Labeling Systems*

UL 1004-1, *Rotating Electrical Machines – General Requirements*

UL 1004-2, *Impedance Protected Motors*

UL 1004-3, *Thermally Protected Motors*

UL 1004-7, *Electronically Protected Motors*

UL 1029, *High-Intensity Discharge Lamp Ballasts*

UL 1030, *Sheathed Heating Elements*

UL 1053, *Ground-Fault Sensing and Relaying Equipment*

UL 1059, *Terminal Blocks*

UL 1097, *Double Insulation Systems for Use in Electrical Equipment*

UL 1411, *Transformers and Motor Transformers for Use in Audio-, Radio-, and Television-Type Appliances*

UL 1434, *Thermistor-Type Devices*

UL 1441, *Coated Electrical Sleeving*

UL 1446, *Systems of Insulating Materials – General*

UL 1557, *Electrically Isolated Semiconductor Devices*

UL 1565, *Positioning Devices*

UL 1577, *Optical Isolators*

UL 1699, *Arc-Fault Circuit-Interrupters*

UL 1977, *Component Connectors for Data, Signal, Control and Power Applications*

UL 2353, *Single- and Multi-Layer Insulated Winding Wire*

UL 2459, *Insulated Multi-Pole Splicing Wire Connectors*

UL 4200A, *Products Incorporating Button Batteries or Coin Cell*

UL 4248-1, *Fuseholders – Part 1: General Requirements*

UL 4248-4, *Fuseholders - Part 4: Class CC*

UL 4248-6, *Fuseholders - Part 6: Class H*

UL 4248-9, *Fuseholders - Part 9: Class K*

UL 5085-1, *Low Voltage Transformers – Part 1: General Requirements*

UL 5085-2, *Low Voltage Transformers – Part 2: General Purpose Transformers*

UL 5085-3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

UL 8750, *Light Emitting Diode (LED) Equipment for Use in Lighting Products*

UL 60335-1, *Safety of Household and Similar Electrical Appliances, Part 1: General Requirements*

UL 60384-14, *Fixed Capacitors for Use in Electronic Equipment – Part 14: Sectional Specification: Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains*

UL 60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

UL 60730-2-7, *Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Timers and Time Switches*

UL 60730-2-9, *Automatic Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Temperature Sensing Controls*

UL 61058-1, *Switches for Appliances – Part 1: General Requirements*

UL 61800-5-1, *Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal, and Energy*

U.S. Department of Commerce Voluntary Product Standards PS 1, *Construction and Industrial Plywood*

4 Glossary

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

4.2 CONTROL, AUTOMATIC ACTION – A device in which the transmission and operation of at least one function are produced by initiation which is not the result of manual actuation.

4.3 CONTROL, LIMIT – A protective control, see [4.6](#).

4.4 CONTROL, MANUAL – A device that requires direct human interaction to activate or rest the control.

4.5 CONTROL, OPERATING – A device where the operation of which starts or regulates the appliance during normal operation. A regulating control is an operating control.

4.6 CONTROL, PROTECTIVE – A device where the operation of which is intended to prevent the risk of electric shock, fire, or injury (including thermal burns and hypothermia) to persons during abnormal operation of the appliance. A limit thermostat is a protective control.

4.7 CONTROL, REGULATING – An operating control, see [4.5](#).

4.8 CONTROL, SINGLE OPERATION DEVICE – A Type 1.H manual control, see [4.4](#) and [4.10](#).

4.9 CONTROL, TYPE 1.D ACTION – The actuation of a manual control designed so that disconnection can neither be prevented nor inhibited, by any reset mechanism and so that after disconnection, it is not possible to re-close the circuit even momentarily while the excess or fault condition persists.

4.10 CONTROL, TYPE 1.H ACTION – The actuation of a manual control that shall be so designed that the contacts cannot be prevented from opening and which may automatically reset to the closed position if the reset means is held in the reset position. The control shall not reset automatically at any temperature above -35 °C (-31 °F) with the reset mechanism in the normal position.

4.11 CONTROL, TYPE 2 ACTION – The actuation of an automatic action control for which the manufacturing deviation and the drift of its operating value, operating time, or operating sequence have been declared and tested under this standard.

4.12 CONTROL, TYPE M2 – A manual control that cannot function as an automatically reset device if the reset means is held in the reset or on position.

4.13 SAFETY CRITICAL FUNCTION (SCF) – Control, protection and monitoring functions which are being relied upon to reduce the risk of fire, electric shock, or casualty hazards.

CONSTRUCTION

5 Component Specifications

5.1 A component of a product covered by this standard shall:

- a) Comply with the requirements for that component as specified in this standard;
- b) Be used in accordance with its rating(s) established for the intended conditions of use;
- c) Be used within its established use limitations or conditions of acceptability; and
- d) Additionally comply with the applicable requirements of this end product standard.

5.2 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.

Exception No. 1: A component of a product covered by this standard is not required to comply with a specific component requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product,*
- b) Is superseded by a requirement in this standard, or*
- c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.*

Exception No. 2: A component complying with a component standard other than those cited in this standard is acceptable if:

- a) The component also complies with the applicable component standard indicated in this standard; or*
- b) The component standard:*
 - 1) Is compatible with the ampacity and overcurrent protection requirements in NFPA 70, where appropriate;*
 - 2) Considers long-term thermal properties of polymeric insulating materials in accordance with UL 746B, and*
 - 3) Any use limitations of the other component standard is identified and appropriately accommodated in the end use application. For example, a component used in a household application, but intended for industrial use and complying with the relevant component standard may assume user expertise not common in household applications.*

5.3 A component that is also intended to perform other functions, such as over-current protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable standard(s) that cover devices that provide those functions.

5.4 A component not anticipated by the requirements of this standard, not specifically covered by the component standards of this standard, and that involves a potential risk of electric shock, fire, or personal injury, shall be additionally investigated in accordance with the applicable standard, and shall comply with [5.1](#) (b) – (d).

5.5 With regard to a component being additionally investigated, reference to construction and performance requirements in another end product standard is appropriate where that standard anticipates normal and abnormal use conditions consistent with the application of this standard.

6 Safety Critical Functions

6.1 Any function involved in the control, protection, and monitoring of safety-related attributes of a unit whereby a loss/malfunction of its functionality would represent an unacceptable risk of fire, electric shock, or casualty hazards would be considered a safety critical function.

6.2 Electronic circuits that manage a safety critical function (SCF) shall be:

- a) Reliable as defined as being able to maintain the SCF in the event of single defined component faults; and
- b) Not susceptible to electromagnetic environmental stresses encountered in the anticipated environments of the appliance.

6.3 Electronic circuits managing safety critical functions shall comply with:

- a) Annex [A](#), Requirements for the Evaluation of Electronic Circuits; or
- b) UL 60730-1 and its Part 2's as specified in this standard. The function shall be considered Class B.

6.4 Functions specified in [Table 6.1](#) represent the common safety critical circuit functions of units. It is not intended to represent all possible safety critical functions.

Table 6.1
Safety Critical Functions

Function (see 6.1)	Hazard	Location of parameters and tests
Motor running overload protection	Risk of fire or electric shock	Section 20 , Motor-Running Overcurrent Protection
Manual reset temperature limit control, Liquid level controls, Pressure controls	Risk of fire or electric shock	30.1.3
Liquid level controls	Risk of fire or electric shock	Section 31 , Liquid Level Controls
Pressure controls	Risk of fire or electric shock	Section 32 , Pressure Controls

7 Frame and Enclosure

7.1 The frame and enclosure of a heater shall have the strength and rigidity necessary to resist the abuses likely to be encountered during intended service. The degree of resistance inherent in the appliance shall preclude total or partial collapse with the attendant reduction of spacings, loosening or displacement of parts, and other defects that, alone or in combination, constitute an increase in the risk of fire, electric shock, or injury to persons.

7.2 Among the factors taken into consideration when an enclosure is being evaluated for compliance are its:

- a) Physical strength;
- b) Resistance to impact;
- c) Moisture-absorptive properties;
- d) Combustibility;
- e) Resistance to corrosion;
- f) Resistance to distortion at temperatures to which the enclosure may be subjected under conditions of use; and
- g) Resistance to ultraviolet light, where applicable.

For a nonmetallic enclosure or part of an enclosure, all these factors are considered with regard to thermal aging.

7.3 A heater shall have provisions for mounting it to the floor, wall, or ceiling. Any fittings, such as brackets, hangers, bolts, or the like, necessary for proper mounting, shall be furnished with the heater together with instructions in accordance with [52.1\(d\)](#).

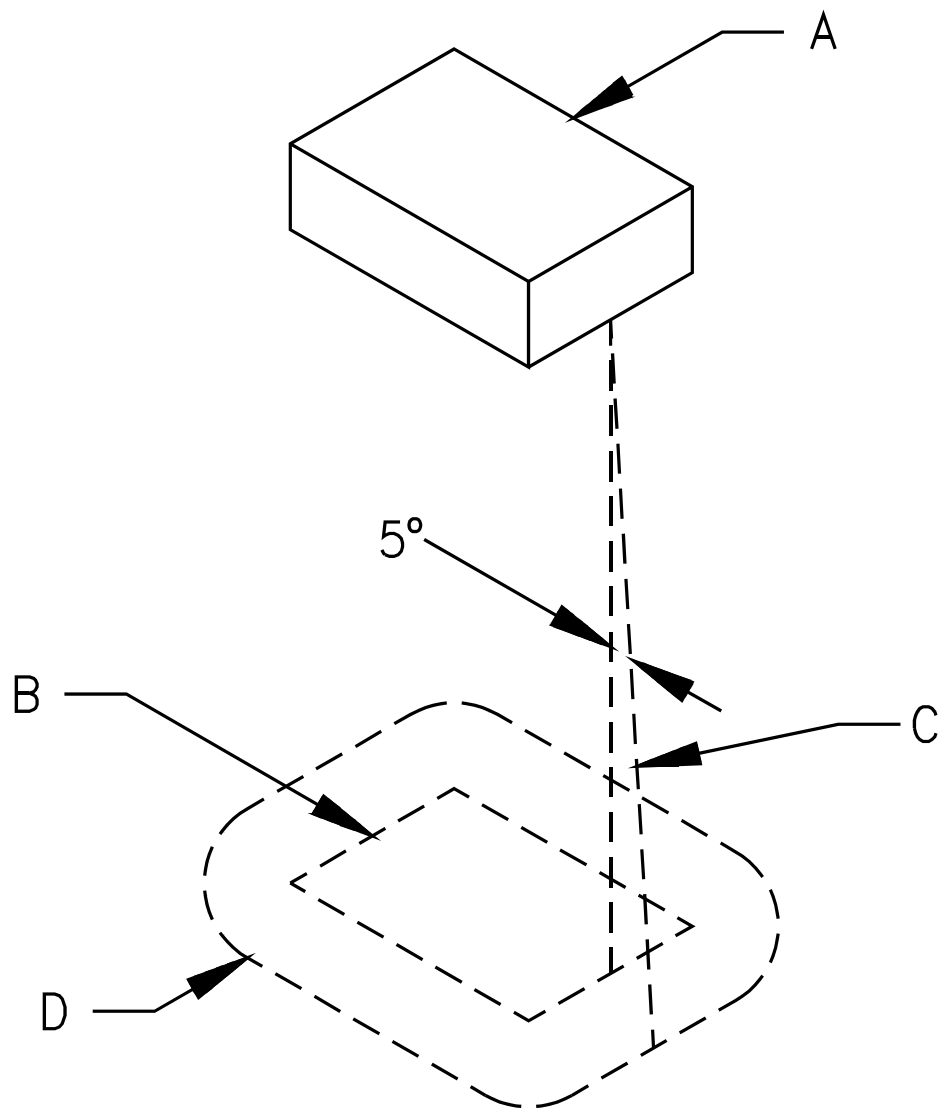
7.4 An opening in the bottom of a heater shall not be located below:

- a) An electrical part,
- b) Wiring, or
- c) A sheath-type heating element

unless a solid, noncombustible protective barrier complying with [Figure 7.1](#) is located between such part, wiring, or element and the supporting surface.

Exception: A barrier is not required under wiring that is provided with insulation having a flame-retardant rating (FR-1).

Figure 7.1
Location and Extent of Barrier



SA0604-1

A – Region to be shielded by barrier. This will consist of the entire component when it is not otherwise shielded, and will consist 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. When moving, the line is always:

- 1) Tangent to the component;
- 2) 5 degrees from the vertical; and
- 3) Oriented so that the area traced out on a horizontal plane is maximum.

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

7.5 The barrier mentioned in [7.4](#) shall:

- a) Be horizontal,
- b) Be located as indicated in [Figure 7.1](#), and
- c) Not have an area less than that described in the illustration.

Openings provided in the barrier for drainage, ventilation, and similar purposes shall not permit molten metal, burning insulation, or equivalent parts to fall on combustible material or persons (for ceiling-mounted heaters).

7.6 The structure of the part or of the heater may provide the equivalent of the barrier mentioned in [7.4](#) when it complies with [Figure 7.1](#).

7.7 The requirement in [7.4](#) requires use of a barrier of noncombustible material:

- a) Under a motor unless one of the following four items applies:
 - 1) The structural parts of the motor or of the heater 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 heater when the motor is energized under each of the following fault conditions:
 - i) Main winding opened,
 - ii) Starting winding opened,
 - iii) Starting switch short-circuited, and
 - iv) For a permanent-split-capacitor motor, the capacitor 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 (a protective device that is sensitive to both temperature and current) that will restrict the temperature of the motor windings from becoming more than 125 °C (257 °F) under the maximum load under which the motor will run without causing the protector to cycle and from becoming more than 150 °C (302 °F) with the rotor of the motor locked; or
 - 4) The motor complies with the requirements for impedance-protected motors.
- b) Under wiring, unless it is of the flame-retardant type. Neoprene-, and thermoplastic-insulated wires have been determined to be of this type.

7.8 The requirement in [7.4](#) also necessitates that a switch, transformer, relay, solenoid, or the like be completely enclosed, unless it can be shown that malfunction of the component is not likely to result in a fire, or unless there are no openings in the bottom of the heater enclosure. An un baffled opening in the bottom of the heater enclosure is not to be used when it is located directly below field- or factory-made splices or overcurrent protective devices.

Exception: Terminals of a switch, transformer, relay, solenoid, or the like need not be completely enclosed.

7.9 An opening for ventilation provided in the enclosure of a heater or in an externally-mounted component shall be located so that it will not vent into concealed spaces of a room, such as into false-ceiling space, into hollow spaces in the wall, or the like when the heater is installed as intended.

7.10 An opening for ventilation in the enclosure (other than in the bottom) of a heater and an opening associated with the dissipation of heater air from the element shall be provided with one or more baffles that will restrict the emission of flame, molten metal, burning insulation, or the like from the heater.

Exception: In a compartment other than one that houses an overcurrent protective device (such as fuses, circuit breakers, and the like), the baffles are not prohibited from being omitted when:

a) No ventilation opening in a vertical wall, other than one associated with the dissipation of heated air from the elements during intended operation of the heater, is more than 3/8 inch (9.5 mm) wide or

b) The heater is constructed so that it complies with the intent of these requirements, as shown by investigation.

7.11 The minimum thickness of cast- and sheet-metal portions of the enclosure shall be as indicated in [Table 7.1](#).

Table 7.1
Minimum Thicknesses of Enclosure Metal

Metal	At small, flat unreinforced surfaces and at surfaces that are reinforced by curving, ribbing, and similar reinforcement (or are otherwise of a shape or size) to ensure adequate physical strength		At relatively large, flat unreinforced surfaces	
	mm	(inch)	mm	(inch)
Die-cast	1.2	(3/64)	2.0	(5/64)
Cast malleable iron	1.6	(1/16)	2.4	(3/32)
Other cast	2.4	(3/32)	3.2	(1/8)
Uncoated sheet steel	0.66 ^a	(0.026) ^a	—	—
Galvanized sheet steel	0.74 ^a	(0.029) ^a	—	—
Nonferrous sheet	0.91 ^a	(0.036) ^a	—	—

^a Thinner sheet metal is not prohibited from being used when determined to be equivalent after evaluation under considerations such as those mentioned in [7.2](#) and [7.12](#).

7.12 In addition to being considered with reference to the factors mentioned in [7.2](#), an enclosure of sheet metal is to be evaluated with regard to its size and shape, the thickness of the metal, and its compliance for the particular application, considering the intended use of the heater.

7.13 Sheet metal to which a wiring system is to be connected in the field shall have a thickness not less than:

- a) 0.81 mm (0.032 inch) for uncoated steel;
- b) 0.86 mm (0.034 inch) for galvanized steel; and
- c) 1.14 mm (0.045 inch) when nonferrous.

7.14 A tapped hole for the attachment of threaded rigid conduit shall be provided with:

- a) An end stop, or shall be located so that a standard bushing may be attached to the end of conduit and

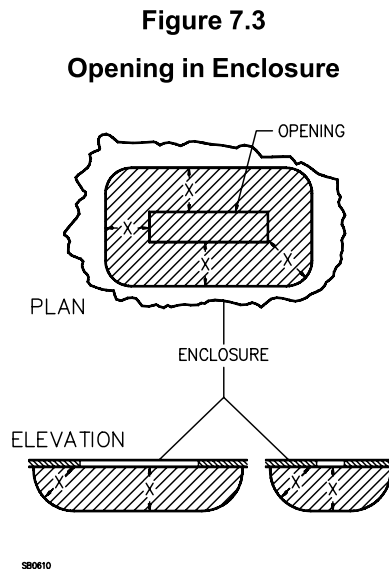
b) At least three full threads when tapped all the way through the wall of an enclosure, or with at least 3-1/2 full threads and a smooth, well-rounded inlet hole having a diameter approximately the same as the internal diameter of a standard bushing to provide resistance for the conductors equivalent to that provided by such a bushing.

7.15 An electrical part of a heater shall be located or enclosed so that resistance to unintentional contact with live parts will be provided.

7.16 In determining when an opening in an enclosure is to be used, consideration is to be given to the proximity of live parts and the possibility of the emission of burning insulation, molten metal, and the like through the opening.

7.17 The probe illustrated in [Figure 7.2](#) shall be applied to any depth that the opening will permit and shall be rotated or angled before, during, and after insertion through the opening to any position that is necessary to try to contact an uninsulated live part or film-coated wire. The probe shall be applied in the above-described manner and in any possible configuration; and, when necessary, the configuration shall be changed after insertion through the opening. Configuration refers to positioning of the jointed portions of the probe.

7.18 An opening that will permit entrance of a 3/4-inch diameter rod may be used under the conditions described in connection with [Figure 7.3](#).



(Proportions exaggerated for clarity)

NOTE – The opening may be used if, within the enclosure, there is no uninsulated live part or enamel-insulated wire less than X distance from the perimeter of the opening, as well as within the volume generated by projecting the perimeter X distance normal to its plane. X equals five times the diameter of the largest diameter rod which can be inserted through the opening, but not less than 101.6 mm (4 inches). In evaluating an opening, any barrier located within the volume usually is ignored unless it intersects the boundaries of the volume in a continuous, closed line.

7.19 During the examination of a heater in connection with the requirements in [7.15](#) – [7.17](#), a part of the outer enclosure that may be removed without the use of tools (to permit the attachment of accessories, to allow access to means for making operating adjustments, or for other reasons) is to be disregarded. It will not be assumed that such a part affords resistance to electric shock. A warning marking as specified in [50.10](#) is not considered to eliminate the risk of electric shock.

7.20 Gaskets and seals that comply with UL 157, are considered to fulfill the requirements of [14.2](#).

7.21 Unless otherwise specified in this end product standard, polymeric electrical insulating materials and enclosures shall comply with the applicable requirements of UL 746C.

7.22 Metallized or painted polymeric parts or enclosures shall comply with the applicable requirements of UL 746C. This requirement is not applicable to exterior surfaces of polymeric enclosure materials or parts provided that the metallized coating or paint does not offer a continuous path for an internal flame to propagate externally.

8 Risk of Injury to Persons

8.1 The rotors of motors, pulleys, belts, gears, and the like shall be enclosed or guarded to reduce adequately the risk of injury to persons.

8.2 With reference to the requirement in [8.1](#), the degree of protection required of the enclosure depends upon the general design and intended use of the heater. Among the factors to be taken into consideration in evaluating the compliance of the exposed moving parts are:

- a) The degree of exposure;
- b) The sharpness of the moving parts;
- c) The risk of unintentional contact with the moving parts;
- d) The speed of movement of those parts; and
- e) The risk of fingers, arms, or clothing being drawn into the moving parts.

8.3 The location of the heater will be taken into consideration in evaluating the intended degree of exposure of mechanical and electrical parts. For example, a greater degree of exposure may be used in a ceiling-mounted heater.

8.4 An edge, projection, or corner of an enclosure, opening, frame, guard, knob, handle, or the like of a heater shall be smooth and rounded, and not sharp enough to cause a cut-type injury when contacted during intended use or user maintenance.

8.5 When the external surface of the heater is of metal and exceeds 70 °C (158 °F) during intended operation or is of nonmetallic material and exceeds 95 °C (203 °F) during intended operation, the heater shall be provided with a nonmetallic guard or fence to restrict unintentional physical contact with the heater.

Exception: When the room is not provided as part of the heater, the installation instructions required in [52.1\(h\)](#) shall state the type of fence or guard to be installed.

8.6 The construction of a wall- or ceiling-mounted heater and its mounting hardware shall be subjected to the Static Loading Test, Section [45](#).

8.7 The construction and supporting hardware of a floor-mounted heater shall be subjected to the Static Loading Test, Section [45](#), and the Strength of Legs Test, Section [46](#).

9 Button Batteries or Coin Cell Batteries

9.1 The battery compartment of an appliance or any accessory, such as a wireless control, incorporating one or more button batteries or coin cell batteries shall comply with UL 4200A, if the appliance or any accessory:

- a) Is intended for use with one or more single cell batteries having a diameter of 32 mm (1.25 in) maximum with a diameter greater than its height; and
- b) The appliance is intended for consumer use.

10 Assembly

10.1 The door or cover of an enclosure shall be hinged when:

- a) It gives access to any fuse, circuit breaker, or manually-resettable thermal cutoff and
- b) Uninsulated current-carrying parts are exposed in connection with the intended replacement of the fuse or resetting of a manually-resettable device.

Such a door or cover also shall be provided with a latch or the equivalent and a captive screw to secure the door or cover in place.

10.2 A door or cover giving access to any over-current protective device in other than a low-voltage circuit shall be tight-fitting and shall overlap the surface of the enclosure around the opening.

10.3 A spring latch, magnetic latch, dimple, or any other mechanical arrangement that will hold the door in place and would require some effort on the user's part to open, may be used as a means for holding the door in place as required in [10.2](#).

10.4 A component of a heater that is likely to need inspection, replacement, cleaning, or other servicing shall be as readily accessible as practicable, without the use of special tools (flat blade and Phillips screwdrivers are not considered special tools) when it is intended to be manually operated or adjusted or when it will require periodic servicing.

10.5 A switch, lampholder, motor-attachment plug, or similar component shall be mounted securely and restricted from turning.

Exception No. 1: The requirement that a switch be restricted from turning may be waived when the following four conditions exist:

- a) Means of mounting the switch make it unlikely that operation of the switch will loosen it;*
- b) The switch is of a plunger or other type that does not tend to rotate when operated (a toggle switch is considered to be subject to forces that tend to turn the switch during the intended operation of the switch);*
- c) The spacings are not reduced below the minimum required values when the switch rotates; and*
- d) Intended operation of the switch is by mechanical means rather than by direct contact by persons.*

Exception No. 2: A lampholder of a type in which the lamp cannot be replaced (such as a neon pilot or indicator light in which the lamp is sealed in a nonremovable jewel) need not be restricted from turning when rotation cannot reduce spacings below the minimum required values.

10.6 The means for restricting the turning mentioned in [10.5](#) and [10.7](#) is to consist of more than friction between surfaces – for example, a lock washer, applied as intended, may be used as means to restrict turning of a small stem-mounted switch or other device having a single-hole mounting means.

10.7 A current-carrying part shall be secured to the base or mounting surface so that it will be restricted from turning or shifting in position when such motion may result in a reduction of spacings below the minimum values indicated in Spacings, Section [33](#).

11 Corrosion Resistance

11.1 Iron and steel parts shall be made resistant to corrosion by enameling, galvanizing, plating, or other equivalent means when the breakdown of such unprotected parts would be likely to result in the risk of fire, electric shock, or injury to persons.

Exception: Under certain conditions in which the oxidation of steel is not likely to be accelerated due to the exposure of metal to air, moisture, or other oxidizing influence – thickness of metal and temperature also being factors – surfaces of sheet steel within an enclosure may not be required to be made resistant to corrosion. Cast-iron parts are not required to be made resistant to corrosion. A sheath used on a heating element operating in air and terminal parts attached directly to the heating element need not be made resistant to corrosion.

11.2 The aging characteristics of plating or other finish used in a heater shall be such that deterioration of the finish will not eventually result in an unacceptable performance of the heater.

12 Supply Connections

12.1 General

12.1.1 A heater shall have provision for connection of one of the wiring systems in accordance with NFPA 70.

12.2 Field-wiring compartment

12.2.1 The location of a wiring compartment in which field-wiring connections are to be made shall be such that these connections may be readily inspected without moving the heater after it is installed as intended.

12.2.2 When a separate wiring compartment is provided for field-wiring connections, it shall be attached to the heater and restricted from turning with regard to the heater.

12.2.3 A wiring compartment for field-wiring connections shall be of metal and shall have a volume that will accommodate the wiring of the size indicated in [12.4.1](#) and conduit and fittings sized for that wire.

12.2.4 Electrical boxes and the associated bushings and fittings, and raceways, of the types specified in Chapter 3 of NFPA 70 and that comply with the relevant UL standard (such as UL 514A, UL 514C, UL 514D) and [5.1](#) are considered to fulfill the requirements of this standard.

12.3 Wire-bending space

12.3.1 The wire-bending space from a connector to the wall of an enclosure and to any barrier or other obstruction that is part of the equipment shall be as specified in Column A of [Table 12.1](#). The width of a wiring gutter provided at a knockout shall not be less than specified in Column A of [Table 12.1](#).

Table 12.1
Wire-Bending Space

Wire size		Minimum bending space, terminal to wall	
		A ^a	B ^b
mm ²	(AWG)	mm (inches)	mm (inches)
2.1 – 5.3	(14 – 10)	Not specified	Not specified
8.4	(8)	38.1 (1-1/2)	38.1 (1-1/2)
13.3	(6)	38.1 (1-1/2)	50.8 (2)
21.2	(4)	50.8 (2)	76.2 (3)
26.7	(3)	50.8 (2)	76.2 (3)
33.6	(2)	63.5 (2-1/2)	88.9 (3-1/2)
42.4	(1)	76.2 (3)	114.3 (4-1/2)
53.5	(1/0)	88.9 (3-1/2)	139.7 (5-1/2)
67.4	(2/0)	88.9 (3-1/2)	152.4 (6)

Table 12.1 Continued on Next Page