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November 2, 1995

Revision pages for

Standard for

Electric Baseboard Heating Equipment

UL 1042, Fourth Edition

Attached to this transmittal notice is a reprinted title page for the Fourth edition of UL 1042.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the approved text of ANSI/UL 1042-1995.

Attention is directed to the note on the title page of this standard outlining the procedure to be followed to retain the Department of Defense approved text of UL 1042.

Revised and/or additional pages may be issued from time to time.

With the inclusion of the accompanying material, the standard consists of pages dated as shown in the following checklist:

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1	April 11, 1994 (Reprinted November 2, 1995)
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39	June 7, 1995
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62, 63	June 7, 1995
64 – 67, A1	April 11, 1994

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1

UL 1042

Standard for

Electric Baseboard Heating Equipment

Prior to the first edition, the requirements for the products covered by this standard were included in the Standard for Electric Space Heating Equipment, UL 573.

First Edition – June, 1972
 Second Edition – March, 1979
 Third Edition – September, 1987

Fourth Edition

April 11, 1994

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated April 11, 1994. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

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

Approved as ANSI/UL 1042-1986, September, 1986
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The Department of Defense (DoD) has adopted UL 1042 on August 30, 1986. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Revisions of this standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest published set of revision pages.

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**Underwriters Laboratories Inc.®**A not-for-profit organization dedicated to public safety
and committed to quality service**June 7, 1995****Revision pages for****Standard for****Electric Baseboard Heating Equipment****UL 1042, Fourth Edition**

Attached to this transmittal notice is a revision of the Fourth edition of UL 1042.

A CHANGE ON A PAGE DATED JUNE 7, 1995 IS INDICATED BY A SMALL PRINT NOTE FOLLOWING THE AFFECTED ITEM, PRECEDED AND FOLLOWED BY AN ASTERISK.

THIS REVISION IS BEING ISSUED TO CORRECT INCORRECT REFERENCES. THE REQUIREMENTS ARE NOW IN EFFECT.

Attention is directed to the note on the title page of this standard identifying that the Department of Defense has adopted the text of UL 1042.

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28 Floor Heaters

28.1 A floor-insert heater shall be so constructed to permit cleaning and to minimize the possibility of the accumulation of flammable dirt and litter where it might become ignited.

28.2 A heater intended to be installed flush with or beneath a floor shall be provided with an automatic temperature control other than a thermal cutoff. The control shall comply with the requirements in 24.1.2 – 24.1.10.

28.3 There shall be no openings in wiring compartments through which objects such as nails or pins may penetrate and contact uninsulated live parts.

PERFORMANCE

29 General

29.1 If a portable heater is intended to be shipped with the legs detached or arranged in other than the intended operating position, the tests are to be conducted with the legs in place as well as detached or in the shipping position. See 33.1.13 and note (e) to Table 33.1. Assembly instructions shall be furnished. See 55.4.

Exception: The tests with the legs detached or in the shipping position need not be conducted if the heater is marked in accordance with 54.24.

29.1 revised June 7, 1995

30 Power Input Test

30.1 The power input to a heater shall not be more than 105 percent of its marked rating.

30.2 Power input is to be measured with the heater at the intended operating temperature under full-load conditions and while connected to a supply circuit of rated voltage in accordance with 33.1.21. If a heater employs a nonmetallic element (such as carbon), the power input is to be determined when the element is new.

30.2 revised June 7, 1995

31 Leakage Current Test

31.1 The leakage current of a cord-connected heater shall be not more than:

- a) 0.5 milliamperes for a heater having a nominal 120 volt rating, and
- b) 0.75 milliamperes for a heater having a nominal 208 or 240 volt rating.

31.2 Leakage current refers to all currents, including capacitively coupled currents, which may be conveyed between exposed conductive surfaces of a heater and ground or other exposed conductive surfaces of a heater.

31.3 All exposed conductive surfaces are to be tested for leakage currents. The leakage currents from the surfaces are to be measured to the ground supply conductor individually as well as collectively where simultaneously accessible and from one surface to another where simultaneously accessible. Parts are considered to be exposed surfaces unless guarded by an enclosure considered acceptable for protection against risk of electric shock as defined in 4.13 and Accessibility of Uninsulated Live Parts, Film-Coated Wire, and Moving Parts, Section 5. Surfaces are considered to be simultaneously accessible where they can be contacted by one or both hands of a person at the same time. These measurements do not apply to terminals operating at low-voltages as defined by 13.4.11.

31.3 revised June 7, 1995

31.4 If a conductive surface other than metal is used for the enclosure or part of the enclosure, the leakage current is to be measured using a metal foil with an area of 10 by 20 centimeters (4 by 8 inches) in contact with the surface. Where the surface is less than 10 by 20 centimeters the metal foil is to be the same size as the surface. The metal foil is not to remain in place long enough to affect the temperature of the heater.

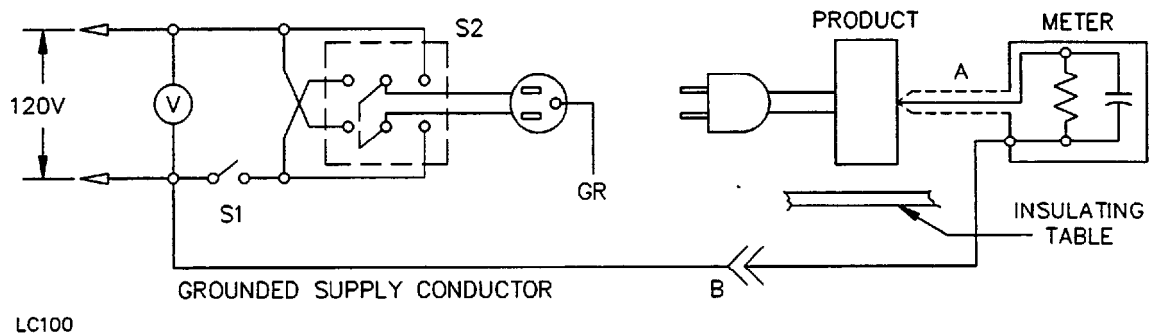
31.5 The measurement circuit for leakage current is to be as shown in Figure 31.1. The measurement instrument is defined in (a) – (d). The meter which is actually used for a measurement need only indicate the same numerical value for a particular measurement as would the defined instrument. The meter used need not have all the attributes of the defined instrument.

- a) The meter is to have an input impedance of 1500 ohms resistive shunted by a capacitance of 0.15 microfarad.
- b) The meter is to indicate 1.11 times the average of the full-wave rectified composite waveform of voltage across the resistor or current through the resistor.
- c) Over a frequency range of 0 to 100 kilohertz, the measurement circuitry is to have a frequency response (ratio of indicated to actual value of current) equal to the ratio of the impedance of a 1500 ohm resistor shunted by 0.15 microfarad capacitor to 1500 ohms. At an indication of 0.5 or 0.75 milliampere, the measurement is to have error of not more than 5 percent at 60 hertz.
- d) Unless the meter is being used to measure leakage from one part of a heater to another, the meter is to be connected between the accessible parts and the grounded supply conductor.

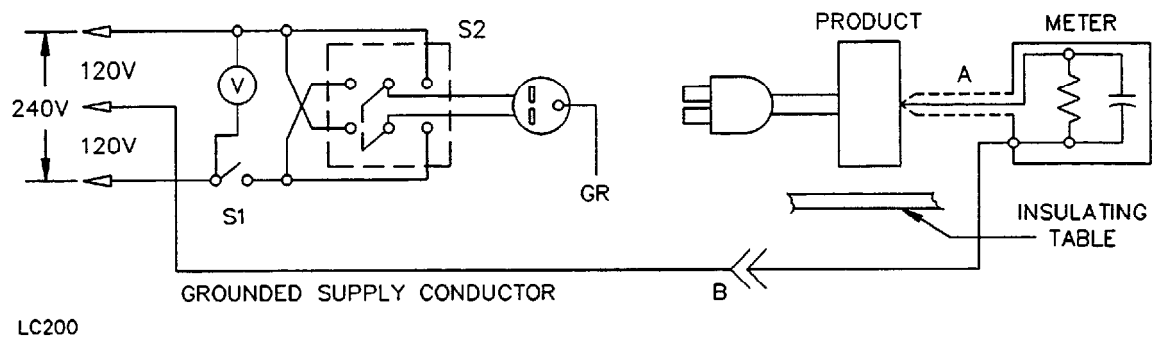
31.6 A sample of a heater is to be tested for leakage current starting with the as-received condition with all switches and thermostats closed, but with the grounding conductor, if any, opened at the attachment plug. The as-received condition is without prior energization, except as may occur as part of the production-line testing. However, a cord-connected heater that complies with the Humidity Conditioning Test, Section 51, need not be tested in the as-received condition, but instead may be tested after the conditioning specified in Section 51. The supply voltage is to be 120 or 240 volts, depending upon the voltage rating of the heater. The test sequence, with reference to the measuring circuit, Figure 31.1, is to be as follows:

- a) With switch S1 opened, the heater is to be connected to the measuring circuit. Leakage current is to be measured using both positions of switch S2.
- b) Switch S1 is then to be closed, energizing the heater, and within a period of 5 seconds, the leakage current is to be measured using both positions of switch S2 and with the heater operated at maximum heat setting of controls.
- c) Leakage current is to be monitored until thermal stabilization under the maximum heat condition. Both positions of switch S2 are to be used. The equivalent of thermal stabilization is considered to be attained as in the Continuous Operation Test, 33.3.1 and 33.3.2. If any adjustable thermostat does not cycle at the maximum heat setting, it is to be adjusted until it does cycle before the final measurements at thermal stabilization are taken. Measurements are to be made with the thermostat, if any, open and closed.
- d) If the heater employs a single pole switch or a control thermostat for adjusting temperatures, then monitoring of leakage current is to continue until the leakage current stabilizes or decreases after the heater is turned off.

Figure 31.1
Leakage-current measurement circuits



Product intended for connection to a 120 volt power supply.



Product intended for connection to a 240 or 208 volt power supply.

- a) Probe with shielded lead – under some circumstances where higher frequency components are present, shielding of measuring instrument and its leads may be necessary.
- b) Separated and used as clip when measuring currents from one part of product to another.

32 Continuity of Grounding Connection Test

32.1 The resistance of the grounding path between all exposed dead metal parts and all dead metal parts exposed during any servicing operation (including maintenance and repair) that are liable to be energized, and the equipment-grounding terminal or lead or the point of attachment of the wiring system or the grounding blade of an attachment plug, shall be no more than 0.1 ohm.

32.2 The resistance may be determined by any convenient method except that when referee measurements are necessary, either a direct or alternating current at a potential of no more than 12 volts, *and equal to the maximum current rating of the branch-circuit overcurrent protection device that may be employed with the heater is to be passed from the equipment grounding terminal or the point of attachment of the wiring system or the grounded blade of the attachment plug to the dead metal part, and the resulting drop in potential in volts divided by the current in amperes passing between the two points is to be calculated to obtain the resistance.*

33 Temperature Test

33.1 General

33.1.1 An automatic temperature-regulating control is to be shunted out of the circuit during all Continuous Operation and Abnormal Operation Tests. If its operation is so affected by the temperature of the external ambient air that a hazardous condition may result, a temperature-limiting control is also to be shunted out of the circuit unless the heater is subjected to the tests specified in 33.1.2.

33.1.2 The temperature-limiting control need not be shunted out of the circuit if all of the Abnormal Operation Test (overvoltage, tip over, drape, stalled fan, cheesecloth drape, padded surface and blanketing usually performed on the heater) are repeated while the heater is located in a room having an average temperature of 0°C (32°F).

33.1.3 For both Continuous Operation and Abnormal Operation Tests, a portable heater and sections of fixed heaters are to be mounted in the intended manner in a wall angle as described in 33.1.9. The sections are to be installed as close to the floor as their construction will permit unless they are marked in accordance with 54.30.

33.1.3 revised June 7, 1995

33.1.4 The test installation of a baseboard-type heater system is to employ at least three heater sections and one or more accessory section, unit, or fitting intended for use with the system, such as receptacle, thermostat, or corner sections. An accessory section is to be connected between two heater sections. If an inside corner section is supplied, it is to connect two heater sections as intended.

33.1.5 The felt mentioned in 33.1.14 and 41.2 is to be 100-percent standard-weight, all-cattle-hair, punched felt with center reinforcement consisting of burlap having a mass of 5 ounces per square yard (170 g/m²). Felt 1 inch (25 mm) thick has a mass of 105 ± 15 ounces per square yard (3.56 ± 0.51 kg/m²). Felt 3/4 inch (19 mm) thick has a mass of 79 ± 9 ounces per square yard (2.68 ± 0.31 kg/m²).

33.1.6 Wherever cheesecloth is mentioned in connection with either a Normal- or an Abnormal-Temperature Test, the cloth is to be bleached cheesecloth 36 inches (910 mm) wide, running 14 – 15 yards per pound (approximately 28 – 30 m/kg), and having what is known to the trade as a "count of 32 x 28," that is, for any square inch, 32 threads in one direction and 28 threads in the other direction (for any square centimeter, 13 threads in one direction and 11 threads in the other direction).

33.1.7 The blanket material mentioned in 41.3 is 100 percent unbleached cotton flannelette sheet blanket, and is generally available in the 80-by-108-inch (2-by-2.7-m) size.

33.1.8 The white duck material mentioned in 42.2 is to have a mass of 8 ounces per square yard (0.27 kg/m²).

53.3 The input may be determined by direct measurement of current (or power), or it may be determined indirectly by measurements of resistance and appropriate computation.

53.4 Each heater shall withstand, without breakdown the test potential specified in 53.5 applied between live parts and dead metal parts.

53.5 The test potential is to be applied for 1 minute and is to be 1000 volts if the heater is rated at 250 volts or less and is to be 1000 volts plus twice rated voltage if the heater is rated at more than 250 volts; except that the duration may be reduced to 1 second if the value of the test potential is 120 percent of that specified above.

53.6 Periodically, two samples of the heater shall be tested for compliance with 53.2 using instruments which comply with the following:

- a) The accuracy is to be 1 percent of full scale value or better.
- b) The instrument is to have a full-scale deflection no more than 3-1/3 times the value to be measured.
- c) The smallest scale division of the instrument is to be in accordance with Table 53.1.
- d) The instrument is to be calibrated at least once per year by comparison with a standard that is traceable to the National Bureau of Standards.

53.7 The manufacturer shall conduct a production-line test on each heater that employs a tip-over switch to determine that the switch functions properly after assembly in the heater.

Table 53.1
Instrument scale divisions

Ammeters	
Full scale deflection, amperes	Smallest scale division no more than, amperes
1	0.02
5	0.1
10	0.2
More than 10	0.5
Voltmeters	
Full scale deflection, volts	Smallest scale division no more than, volts
150	1.5
300	3.0
More than 300	5.0

53.8 The manufacturer shall keep records of his production-line tests, available for review.

53.9 The manufacturer shall test each heater provided with a power-supply cord incorporating a grounding conductor to ensure that electrical continuity exists between an exposed dead metal part of the heater and the grounding blade of the attachment-plug cap, as required by 26.3.

53.10 For the test mentioned in 53.9, the manufacturer is to employ an indicating device (an ohmmeter, a low-voltage battery-and-buzzer combination, or the like).

MARKING AND INSTRUCTIONS

54 Marking

54.1 A heater or electrical accessory shall be rated in amperes, volt-amperes, or watts (see 54.5) and also in volts; and if intended for use on alternating current only or direct current only shall be marked to so indicate. The rating shall include the number of phases if the heater is designed for use on a polyphase circuit, and shall include the frequency (that is, hertz, Hz, cycles per second, cps, cycles/seconds, c/s), if necessary because of motors, relay coils, or other control devices. The voltage rating shall be any appropriate single voltage or voltage range such as: 100 – 120, 200 – 208, 220 – 240, 254 – 277, 440 – 480, 550, 575, and 600.

54.2 Heaters having surfaces which are exempted from the temperature limits of D.5 of Table 33.1 by the exception in note g shall be marked where readily visible after installation: "Not For Residential Use," or equivalent.

54.3 If, because of unbalanced loads, the rated current at one or more terminals or leads differs from that at the remaining terminals or leads, the marking shall include the rated current for each terminal or lead, properly identified.

54.4 The marked rating for each terminal or lead, as specified in 54.3 may be omitted providing:

- a) The current in any unbalanced leg shall not exceed the rated current by more than 5 percent, and
- b) The size of the power-supply conductors will be adequate for the maximum unbalanced load in accordance with 10.2.1.

54.4 revised June 7, 1995

54.5 A fixed or stationary heater that includes a motor load of more than 1/8 horsepower (93 W) output shall have a dual rating as described below, with each segment of the rating identified. One segment of the rating shall be that of the motor load in amperes. The other segment shall be the rating of the total load other than the motor load (heater load, lighting load, or the like), and it may be in amperes or in watts or kilowatts.

54.6 The nameplate marking of a permanently connected heater that includes a motor rated more than 1/8 horsepower (93 W) shall include the minimum circuit ampacity and the maximum current rating of the circuit protective device.

54.7 If a heater includes an attachment-plug receptacle that is not intended as a disconnecting means for any part of the heater or necessary accessory and that may, therefore, serve as a general-use outlet, the added load that the receptacle may impose on the heater and its supply connections (not less than 660 watts or 6 amperes per pair of slots) shall be taken into consideration in determining the electrical rating of the heater.

54.8 The requirement in 54.7 does not apply to an attachment-plug receptacle for general use as covered in 21.1.

54.9 A heater or accessory shall be permanently marked, in such location that the marking will be visible (after installation in the case of a permanently connected heater or accessory other than a kit which is to be mounted on or in the heater itself), with the name or trademark of the manufacturer or private labeler, the catalog number or the equivalent, and the electrical ratings (in accordance with 54.1 and 54.5) of each circuit to which a supply connection is made.

54.10 The marking shall include the date of manufacture, which may be abbreviated or in an established or otherwise acceptable code that will enable the heater or accessory to be identified as being manufactured within a consecutive 3 month period.

54.11 If overcurrent protective devices are provided as a separate assembly (see 19.2), the heater shall be marked to indicate that it is to be used only with this separate assembly.

54.12 The electrical rating shall be completely indicated in the marking, and reference to a wiring diagram for one or more items of the rating is not acceptable in lieu of including the rating in the marking except as indicated in 54.13.

54.13 For a heater requiring multiple supply sources, the ratings of the individual circuits of the heater may be shown on a wiring diagram permanently attached to the heater, and need not be indicated on the nameplate, which need show only the total rating.

54.14 Equipment requiring multiple supply sources shall indicate the number of supply sources. If more than one disconnect switch may be required to disconnect all power, other than NEC Class 2, within a control assembly or compartment, the assembly or compartment shall be marked as follows, or with an equivalent wording:

"CAUTION – HAZARD OF ELECTRIC SHOCK – MORE THAN ONE DISCONNECT SWITCH MAY BE REQUIRED TO DE-ENERGIZE THE EQUIPMENT FOR SERVICING."

The marking shall be in letters not less than 1/8 inch (3.2 mm) in height and shall be of a permanent type located on the outside of the control assembly or compartment, such as on the cover, or on a stationary (fixed, nonremovable) part inside the control assembly or compartment. The warning marking placed inside the cover or on the connection diagram attached to the inside of a cover is not acceptable.

54.15 Equipment intended to be used only on a 15 or 20 ampere branch circuit, as indicated in 10.2.5, shall be marked "Use only on ___ ampere branch circuit." See also 19.7 and 19.8.

54.15 revised June 7, 1995

54.16 A transfer switch accessory shall be marked to indicate the maximum current rating of the branch circuit to which it is to be connected.

54.17 If a manufacturer produces or assembles equipment at more than one factory, each finished heater and accessory shall have a distinctive marking, which may be in code, to identify it as the product of a particular factory.

54.18 Each heater shall be permanently marked on a surface where it will be readily visible from the exterior of the heater after the heater is installed or positioned as intended with the following wording or the equivalent, "CAUTION – High Temperature, Keep Electrical Cords, Drapes, And Other Furnishings Away From Heater." The marking shall be in letters not less than 1/8 inch (3.2 mm) in height and shall be of a permanent type.

54.19 Readily visible means visible from a point 5 feet (1.52 m) above the floor and between 1 and 4 feet (0.30 and 1.22 m) away from the wall with the heater positioned as in the Continuous-Operation Test.

54.20 Each individual heating element or unit that is a part of a heater and is replaceable in the field shall be marked with its electrical ratings in amperes or watts, and also in volts.

54.21 A heater or accessory whose acceptable performance depends upon its proper location or position shall be marked (such as "TOP" or "BOTTOM") to indicate the way in which it is to be installed or used, unless such position is obvious from the external appearance of the heater.

54.22 If the design of equipment contemplates disassembly by means of a tool for the purpose of cleaning or similar servicing by the user (including replacement of a thermal cutoff) and, if such disassembly involves the exposure of persons to accidental contact with any enclosed or protected live part, the heater shall be marked with a warning that such servicing should be done only while the equipment is disconnected from the supply circuit. See also 4.9.

54.23 If the servicing or replacement of a component of a heater or accessory in the field requires the removal or disconnection of any safety device, a caution marking shall appear on or adjacent to that device, calling attention to the fact that it should be repositioned in the proper location. The manufacturer's instructions provided with the equipment shall call specific attention to this feature.

54.24 If a portable heater, which is intended to be shipped with the legs detached or in other than the intended operating position, is not tested with the legs detached or in the shipping position, see exception to 29.1, it shall be marked in a location where visible with the heater in its intended operating position with the following statement or equivalent: "CAUTION – Fire Hazard – Do Not Operate Without Legs Attached" (or "...Without Legs In Intended Operation Position"). The marking shall be in letters not less than 1/8 inch (3.2 mm) in height.

54.25 If any point within a terminal box or wiring compartment of a permanently connected heater in which field-installed conductors are intended to be connected (including such conductors themselves) attains a temperature more than 60°C (140°F) during the Continuous-Operation Test, the heater shall be marked in accordance with 54.26. The statement shall be legible and so located that it will be visible during installation and examination of the supply-wiring connections.

54.26 The marking mentioned in 54.25 depends on the size of the supply conductors required and on the temperature measured in the Continuous Operation Test. See Table 54.1.

- a) If the equipment is to be connected only to a single size branch circuit, the marking is to be "FOR SUPPLY CONNECTIONS USE NO. ____ AWG OR LARGER WIRES SUITABLE FOR AT LEAST ____°C." or an equivalent statement.
- b) If the branch circuit size is 15 amperes, the wire size marking may be omitted.
- c) If the equipment may be connected as intended to branch circuits of various ratings, (because of system installations, multiple power supplies, or other reason) the marking is to be "FOR SUPPLY CONNECTIONS, USE WIRES SUITABLE FOR AT LEAST ____°C. SEE TABULATION BELOW FOR WIRE SIZE." or an equivalent statement.
- d) Unless the equipment is marked in accordance with 54.29 to indicate that only copper conductors are to be used, the markings in (a) and (c), above, are to indicate the correct wire sizes for both copper and aluminum (or copper-clad aluminum) conductors.

UL 1042

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● Electric Baseboard Heating Equipment



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April 11, 1994

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Electric Baseboard Heating Equipment

UL 1042, Fourth Edition

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THIS EDITION OF THE STANDARD IS NOW IN EFFECT.

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover portable and fixed electric baseboard heating equipment rated at 600 volts or less, to be employed in ordinary locations in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 Baseboard heating equipment includes baseboard heaters and baseboard heater accessories.

1.3 Electric baseboard heating equipment intended for use in a hazardous location is judged on the basis of compliance with the requirements in this standard, together with those recognized requirements applicable to usage in hazardous locations.

1.4 Any air heating appliance sold or recommended for use as a baseboard heater, irrespective of its dimensions or other characteristics, is to be identified as a baseboard heater. It will be categorized as a fixed or portable baseboard heater in accordance with the following:

a) Fixed – A heater is identified as a fixed baseboard heater if:

1) The heater is less than 6 inches (150 mm) in overall depth, the ratio of the overall length to the overall height is more than two to one, and the heater can be installed completely within a space of 18 inches (460 mm) above the floor; or

2) The heater enclosure is intended to be connected to other heater enclosures to form a system.

Exception: A heater intended for ceiling mounting or suspended mounting or marked "Do Not Install Less Than 6 Feet From Floor" is not considered to be a baseboard heater even if it meets the specifications in (1) or (2) above.

b) Portable – A portable heater is identified as a baseboard heater if, excluding projections of guard or feet, it is less than 5 inches (130 mm) in depth and if the ratio of its overall length to its height without the handle is as follows:

Maximum height of heater, feet (mm)	Ratio of length to height
2 (610)	More than 2 to 1
Over 2 (610)	More than 3 to 1

Exception: A portable radiant heater which has a visible glowing heating element and which is not sold or recommended for use as a baseboard heater may be excluded as a baseboard heater even if it meets the dimensional specifications in (b) above. Such a heater may be judged under the requirements for movable air heaters in the Standard for Movable and Wall- or Ceiling-Hung Electric Room Heaters, UL 1278. For this determination, a radiant heater is one in which the visible portion of the heating element attains a temperature of at least 650°C (1200°F) under normal conditions of operation.

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 involve a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable level of safety as originally anticipated by the intent of this Standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard cannot be judged to comply with this Standard. Where considered appropriate, revision of requirements may be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

2 Units of Measurement

2.1 If a value for measurement as given in these requirements is followed by an equivalent value in other units, the second value may be only approximate. The first stated value is the requirement.

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

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

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

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

3.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

3.5 Unless indicated otherwise, all voltage and current values mentioned in this standard are rms.

CONSTRUCTION

4 Frame and Enclosure

4.1 The enclosure of baseboard heating equipment shall prevent molten metal, burning insulation, flaming particles, or the like from falling on flammable materials, including the surface upon which the enclosure is supported.

4.2 The enclosure of baseboard heating equipment designed for permanent installation, that is, intended for permanent connection to the power supply, shall be provided with means and instructions for mounting in the intended manner. Any fittings such as brackets, hangers, or the like, necessary for mounting shall be furnished with the equipment.

4.3 The requirement in 4.1 necessitates use of a barrier of nonflammable material:

a) Under a motor unless:

- 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) Open main winding,
 - ii) Open starting winding, and
 - iii) Starting switch short-circuited.
- 3) The motor is provided with a thermal motor protector (a protective device that is sensitive to both temperature and current) that will prevent the temperature of the motor windings from becoming more than 125°C (255°F) under the maximum load under which the motor will run without causing the protector to cycle, and from becoming more than 150°C (300°F) with the rotor of the motor locked.

b) Under wiring, unless it is of the flame-retardant type. Neoprene-, asbestos-, or thermoplastic-insulated wires are considered to be of this type.

It will also necessitate that a switch, transformer, relay, solenoid, or the like be individually and completely enclosed except at terminals, unless it can be shown that failure of the component would not result in a risk of fire, or unless there are no openings in the bottom of the enclosure. An opening in the bottom of the enclosure is not acceptable if it is located directly below field- or factory-made splices or overload or overcurrent protective devices.

4.4 Except as indicated in 4.5, if openings are provided in the enclosure of a heater or in an externally mounted component intended for permanent connection to the power supply, they shall be so located that they will not vent into concealed spaces of a building structure such as into hollow spaces in the wall, when the equipment is installed as intended.

4.5 The requirement in 4.4 does not apply to an opening for a mounting screw or nail or for a manufacturing operation (such as paint drainage) if:

- a) No such opening has a dimension more than 17/64 inch (6.7 mm) or an area more than 0.055 square inch (34.5 mm²), and
- b) There is no more than one mounting-screw hole for each 12 inches (300 mm) of length or fraction thereof in baseboard heating equipment intended for recessed installation.

4.6 Except as noted in 4.7 an opening for ventilation in the enclosure, other than in the bottom, of a heater and an opening associated with the dissipation of heated air from the element shall be provided with one or more baffles that will prevent the emission of flame, molten metal, burning insulation, or the like from the heater.

4.7 In a compartment other than one that houses an overload or overcurrent protective device, the baffles mentioned in 4.6 may be omitted if:

- a) No ventilating opening in a vertical wall, other than one associated with the dissipation of heated air from the elements during normal operation of the heater, is more than 3/8 inch (9.5 mm) in width, or
- b) The heater is so constructed that it is suitable for the purpose, as shown by appropriate investigation.

4.8 Cast- and sheet-metal enclosures shall conform with the requirements of Tables 4.1 – 4.3.

Exception: A sheet steel enclosure may have a lesser thickness than specified in Table 4.1 but not less than 0.020 inch (24 MSG) (0.51 mm) when it is determined that the enclosure of lesser thickness due to its shape and use of reinforcing members affords the required protection.

4.9 Among the factors that shall be taken into consideration when judging the acceptability of nonmetallic materials are resistance to:

- a) Mechanical damage,
- b) Impact,
- c) Moisture absorption,
- d) Combustion, and
- e) Distortion at temperatures to which the material may be subjected under conditions of normal or abnormal use.

4.10 A polymeric material used for the frame or enclosure shall comply with the applicable requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

Exception: The abnormal operation tests in UL 1042 may be conducted in lieu of the Abnormal Operation Test, Section 35, and Severe Conditions Test, Section 24, of UL 746C.

4.11 Sheet metal to which a wiring system is to be connected in the field shall have an average thickness no less than 0.032 inch (0.81 mm) if uncoated steel, no less than 0.034 inch (0.86 mm) if galvanized steel, and no less than 0.045 inch (1.14 mm) if nonferrous.

4.12 At points where the face of an attachment-plug receptacle projects through it, the enclosure shall have a thickness no less than:

- a) 0.032 inch (0.81 mm) if of ferrous metal,
- b) 0.045 inch (1.14 mm) if of nonferrous metal, and
- c) 0.10 inch (2.5 mm) if of insulating material, except that an enclosure of insulating material may be of lesser thickness if so formed or reinforced as to provide adequate physical strength. The insulating material shall be nonflammable.

Table 4.1
Minimum thickness of sheet metal for electrical
enclosures — carbon steel or stainless steel

Without supporting frame ^a		With supporting frame or equivalent reinforcing ^a		Minimum thickness in inches (mm)	
Maximum width ^b	Maximum length ^c	Maximum width ^b	Maximum length	Uncoated (MSG)	Metal coated (GSG)
Inches (cm)	Inches (cm)	Inches (cm)	Inches (cm)		
4.0 (10.2)	Not limited	6.25 (15.9)	Not limited	0.020 ^d (0.51)	0.023 ^d (0.58)
4.75 (12.1)	5.75 (14.6)	6.75 (17.1)	8.25 (21.0)	(24)	(24)
6.0 (15.2)	Not limited	9.5 (24.1)	Not limited	0.026 ^d (0.66)	0.029 ^d (0.74)
7.0 (17.8)	8.75 (22.2)	10.0 (25.4)	12.5 (31.8)	(22)	(22)
8.0 (20.3)	Not limited	12.0 (30.5)	Not limited	0.032 (0.81)	0.034 (0.86)
9.0 (22.9)	11.5 (29.2)	13.0 (33.0)	16.0 (40.6)	(20)	(20)
12.5 (31.8)	Not limited	19.5 (49.5)	Not limited	0.042 (1.07)	0.045 (1.14)
14.0 (35.6)	18.0 (45.7)	21.0 (53.3)	25.0 (63.5)	(18)	(18)
18.0 (45.7)	Not limited	27.0 (68.6)	Not limited	0.053 (1.35)	0.056 (1.42)
20.0 (50.8)	25.0 (63.5)	29.0 (73.7)	36.0 (91.4)	(16)	(16)

^a A supporting frame is a structure of angle or channel or a folded rigid section of sheet metal which is rigidly attached to and has essentially the same outside dimensions as the enclosure surface and which has sufficient torsional rigidity to resist the bending moments which may be applied via the enclosure surface when it is deflected. Construction that is considered to have equivalent reinforcing may be accomplished by designs that will produce a structure which is as rigid as one built with a frame of angles or channels. Construction considered to be without supporting frame includes:

- 1) Single sheet with single formed flanges (formed edges),
- 2) A single sheet which is corrugated or ribbed, and
- 3) An enclosure surface loosely attached to a frame, that is, with spring clips.

^b The width is the smaller dimension of a rectangular sheet metal piece which is part of an enclosure. Adjacent surfaces of an enclosure may have supports in common and be made of a single sheet.

^c For panels which are not supported along one side, for example, side panels of boxes, the length of the unsupported side shall be limited to the dimensions specified unless the side in question is provided with a flange at least 1/2 inch (12.7 mm) wide.

^d Sheet steel for an enclosure intended for outdoor use shall comply with the requirements for outdoor use equipment.