



UL 464

Underwriters Laboratories Inc. Standard for Safety

Audible Signal Appliances



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UL Standard for Safety for Audible Signal Appliances, UL 464

Ninth Edition, Dated August 14, 2009

Summary of Topics

The following changes in requirements are included in this new edition of UL 464.

1. New Section for Protective Covers and Accessories

2. Revision to Marking Requirements

3. Revision to the Salt Spray Test, Outdoor Use

4. Revisions to Tables Regarding Test Voltages

5. Deletion of the Dust Test

6. Revisions to the Temperature Test

7. Revision to the Endurance Test

8. Addition of the Jarring Test

The changes to requirements are substantially in accordance with Proposal(s) on this subject dated February 20, 2009.

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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

The following table lists the future effective dates with the corresponding item.

Future Effective Date	References
January 16, 2012	Table 17.1 and paragraphs 19.2, 21.1.1, 21.1.2, 21.1.3, 21.1.4, 21.2.4, 39.12, 40.1, 41.1, 41.2, 42.1, 42.2, 43.1, 44.1, 45.1

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INTRODUCTION

1 Scope

1.1 These requirements cover electrically and electronically operated bells, buzzers, horns, and similar audible signal appliances, rated 300 volts or less, for general or fire-protective signaling service and intended for indoor or outdoor locations or both in accordance with the National Electrical Code, NFPA 70, and the National Fire Alarm Code, NFPA 72.

1.2 These requirements cover audible signal appliances for use in ordinary locations. Audible signal appliances for use in hazardous locations, as defined in the National Electrical Code, NFPA 70, are judged on the basis of their compliance with these requirements and further appropriate examination and tests to determine if they are acceptable for such use.

1.3 These requirements do not cover door bells, buzzers, and chimes used in household and similar applications and intended for operation on Class 2 signal circuits as defined in the National Electrical Code, NFPA 70.

1.4 A supplementary visual signal, incorporated as part of an audible signal appliance which is intended for fire alarm application, is covered by the applicable requirements in this standard, and in the Standard for Visual Signaling Appliances – Private Mode Emergency and General Utility Signaling, UL 1638, or in the Standard for Signaling Devices for the Hearing Impaired, UL 1971.

1.5 A supplementary visual signal, incorporated as part of an audible signal appliance which is intended for general signaling (nonfire alarm service), is covered by the applicable requirements of this standard.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, 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.

2.1.2 A component is not required to comply with a specific requirement that:

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

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

2.1.4 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.

2.2 Units of measurement

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

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

2.3 Undated references

2.3.1 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.

2.4 Electrical circuits terminology

2.4.1 For the purpose of these requirements, electrical circuit characteristics are defined as follows:

- a) Low-Voltage Circuit – A circuit involving a potential of not more than 30 volts alternating current, [42.4 volts (AC) peak or direct current (DC)], and supplied from a circuit whose power is limited to a maximum of 100 volt-amperes.
- b) High-Voltage Circuit – A circuit having circuit characteristics in excess of those of a low-voltage circuit.

2.4.2 The term "appliance" as used in this standard refers to any equipment covered by this standard.

3 Fire Alarm Versus General Signaling Service

3.1 Appliances not intended to be connected to a fire alarm system shall be evaluated for general signaling service.

3.2 Appliances intended for fire-protective signaling service are classified by operation for Public or Private Mode use. Appliances for Public Mode operation are intended to notify occupants or inhabitants of the area covered by the fire-protective signaling system. Appliances for Private Mode use are intended to notify only those persons directly concerned with the implementation and direction of emergency action initiation and procedure in the area protected by the fire-protective signaling system.

3.3 Audible signal appliances intended for fire alarm service shall comply with additional requirements for construction, marking, and performance. The differences in the test programs are indicated in Table 3.1. Differences in construction and marking are included in the applicable sections.

Table 3.1
Audible signal appliance tests

Required tests	Fire alarm service	General signaling service
Indoor use appliances		
Current input	X	X
Overvoltage and undervoltage (current)	—	X
Temperature	X	X
Electric shock current	X	X
Endurance	X	X
Corrosion – H ₂ S, CO ₂ – SO ₂	X	—
Humidity	X	X
Transient (electronic appliances)	X	X
Burnout	X	X
Audibility	X	X
Dielectric voltage-withstand	X	X
Dust	X	—
Vibration (electronic appliances)	X	X
Polarity reversal (polarized appliances)	X	—
Locked rotor (motor operated appliances)	X	X
Test of polymeric materials		
Aging – 7 days 70°C	X	X
Distortion – 1 hour 90°C	X	—
Tests of elastomeric materials	X	X
Variable ambient	X	—
Outdoor use appliances		
Rain	X	X
Variable temperature	X	—
Corrosion (H ₂ S, CO ₂ – SO ₂ , salt spray)	X	—
Humidity	X	X

CONSTRUCTION

4 Enclosures

4.1 General

4.1.1 Electrical parts of an appliance shall be located or enclosed so that protection against contact with uninsulated live parts is provided.

4.1.2 An appliance intended to be installed on a flush-device box, cutout box, or similar device, is to be judged with respect to compliance of the combination with the requirements of 4.1.1.

4.1.3 An operating part, such as a gear mechanism, light-duty relay, or similar device, shall be protected against mechanical damage and fouling by dust or other material which impairs its intended operation.

4.1.4 The enclosure of an appliance shall be provided with means for mounting in the intended manner. Any fittings, such as brackets, hangers, or similar hardware required for mounting shall be furnished with the appliance. The mounting means shall be accessible without disassembly of any operating part of the appliance. The removal of a completely assembled panel, cover, or similar part, to mount the appliance is not considered to be disassembly of an operating part.

4.1.5 An enclosure shall have provision for the connection of metal-clad cable, conduit, or nonmetallic sheathed cable. An enclosure without such provision is permitted when:

- a) It is furnished with definite instructions indicating the sections of the enclosure which are intended to be drilled in the field for the connection of raceways,
- b) The appliance is intended for mounting on an outlet box, or
- c) The enclosure is intended for use with a low-voltage rated appliance for general signaling use.

4.1.6 A cover or other detachable part of the enclosure shall be secured in place with means not requiring use of a tool for removal. Using only snap-catch fastenings to secure this part is not permitted.

4.1.7 Except as noted in 4.1.8, an appliance intended for either flush or surface mounting in a back box shall be provided with a back box of sheet metal of a thickness as specified in Table 4.1 or 4.2.

Table 4.1
Thickness of sheet metal

Maximum dimensions of enclosure					Minimum thickness of sheet metal				
					Steel				Copper, brass or aluminum,
Group	Length or width,		Area,		Zinc-coated,		Uncoated,		inch (mm)
	inch	(mm)	inch ²	(cm ²)	inch	(mm)	inch	(mm)	
A	3	76.2	6 ^a	39	0.025	0.64 ^b	0.021	0.53 ^b	0.023 0.58 ^c
B	8	203	36	232	0.030	0.76 ^{b,d}	0.027	0.69 ^{b,d}	0.036 0.91 ^d
C	12	305	90	581	0.034	0.86 ^d	0.032	0.81 ^d	0.045 1.14 ^d

^a Volume of enclosure not more than 12 cubic inches (197 cm³).

^b Sheet steel for an enclosure intended for outdoor use (rain-tight) is required to be not less than 0.036 inch (0.91 mm) in thickness if zinc coated and not less than 0.032 inch (0.81 mm) in thickness if uncoated.

^c Sheet copper, brass, or aluminum for an enclosure intended for outdoor use (rain-tight) is required to be not less than 0.029 inch (0.74 mm) in thickness.

^d For a cover in Group B or C having a supporting frame or equivalent reinforcing and not intended for outdoor use, the thickness of sheet steel may be less than that specified in the table but shall be not less than 0.021 inch (0.53 mm) [0.025 inch (0.64 mm) if zinc coated], and the thickness of copper, brass, or aluminum may be less than that specified in the table but shall be not less than 0.029 inch (0.74 mm).

Table 4.2
Cast-metal electrical enclosures

Use, or dimensions of area involved	Minimum thickness			
	Die-cast metal,		Cast metal of other than the die-cast type,	
	inch	(mm)	inch	(mm)
Area of 24 square inches (155 cm ²) or less and having no dimension greater than 6 inches (152 mm)	1/16 ^a	1.6	1/8	3.2
Area greater than 24 square inches (155 cm ²) or having any dimension greater than 6 inches (152 mm)	3/32	2.4	1/8	3.2
At a threaded conduit hole	1/4	6.4	1/4	6.4
At an unthreaded conduit hole	1/8	3.2	1/8	3.2
^a The area limitation for metal 1/16 inch (1.6 mm) in thickness may be obtained by the provision of reinforcing ribs subdividing a larger area.				

4.1.8 An appliance with means for attachment to a standard outlet box, having spacings after mounting on such a box as required in Spacings, Section 11, is not required to have a back box.

4.1.9 Space shall be provided within a terminal or wiring compartment to permit the use of a standard conduit bushing on conduit connected to the compartment when a bushing is required for installation.

4.2 Cast metal

4.2.1 The thickness of cast metal used for an enclosure shall be as indicated in Table 4.2. Cast metal having a thickness 1/32 inch (0.8 mm) less than that indicated in the table may be employed if the surface under consideration is curved, ribbed, or otherwise reinforced, or if the shape or size of the surface is such that equivalent mechanical strength is provided.

4.2.2 Die-cast metal for other than flush boxes is permitted when it complies with one of the alloy specifications given in Specifications for Zinc-Alloy Die Castings, ANSI/ASTM B86-98.

4.2.3 Compliance of a zinc-base alloy die casting with the requirement of 4.2.2 is to be determined by the Standard Method of Spectrochemical Analysis of Zinc-Base Alloys and High-Grade Zinc by the Solution Residue-DC Arc Technique, ASTM E27-81.

4.2.4 If threads for the connection of conduit are tapped all the way through a hole in an enclosure wall, there shall be not less than 3-1/2 nor more than five threads in the metal, and the construction shall be such that a standard conduit bushing is capable of being attached.

4.2.5 If threads for the connection of conduit are tapped only part of the way through a hole in an enclosure wall, there shall be not less than five full threads in the metal, and there shall be a smooth, rounded inlet hole which shall afford protection to the conductors equivalent to that provided by a standard conduit bushing.

4.3 Sheet metal

4.3.1 The thickness of sheet metal employed for the enclosure or mechanism cover of an appliance shall be not less than the applicable value specified in Table 4.1.

4.3.2 At any point where conduit or metal-clad cable is to be attached, sheet metal shall be of such thickness or shall be so formed or reinforced that it has a stiffness at least equivalent to that of an uncoated flat steel sheet having a minimum thickness of 0.053 inch (1.35 mm).

4.3.3 A plate or plug closure for an unused conduit opening or other hole in the enclosure shall have a thickness not less than 0.027 inch (0.69 mm), when of ferrous metal, or 0.032 inch (0.81 mm), when of nonferrous metal for a hole having a maximum dimension not exceeding 1-3/8 inch (34.9 mm).

4.3.4 A closure for a hole larger than 1-3/8 inch (34.9 mm) diameter shall have a thickness equal to that required for the enclosure of the appliance. When not of such thickness, a standard knockout seal shall be used. Such plates or plugs shall be mechanically secured.

4.3.5 A knockout in a sheet metal enclosure shall be secured and shall be capable of being removed without deformation of the enclosure.

4.3.6 A knockout shall be provided with a surrounding surface adequate for seating of a conduit bushing and shall be located so that a bushing employed at any knockout likely to be used during installation will not result in spacings between uninsulated live parts and the bushing of less than those specified in Spacings, Section 11.

4.3.7 An enclosure intended for recessed mounting shall have no nonfunctional openings on any of the enclosed sides.

4.4 Nonmetallic

4.4.1 An enclosure or parts of an enclosure of nonmetallic material shall have the mechanical strength and durability and be formed so that operating parts are protected against damage. The enclosure shall have the mechanical strength at least equivalent to that of a sheet metal enclosure of the minimum thickness specified in Table 4.1. See also the Polymeric Materials Test, Section 25.

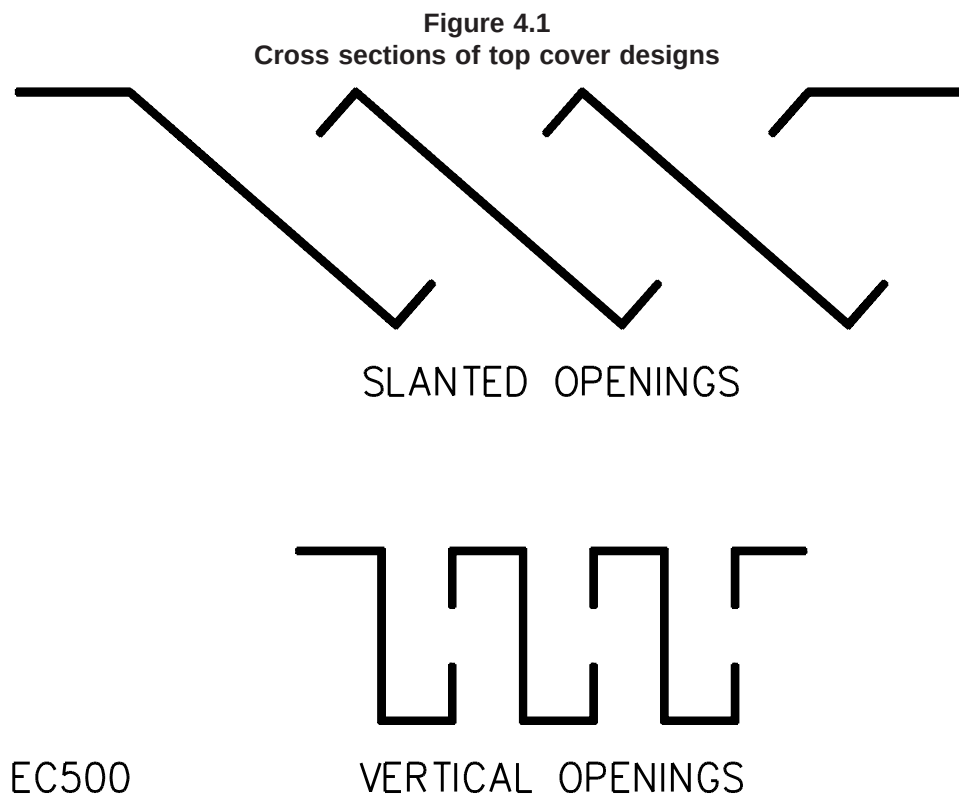
4.4.2 The continuity of any grounding system to which an appliance is capable of being connected shall not rely on the dimensional integrity of the nonmetallic material.

4.5 Ventilating openings

4.5.1 An opening for a gong-shell striker or similar part shall be not larger than is required for the operation of the appliance.

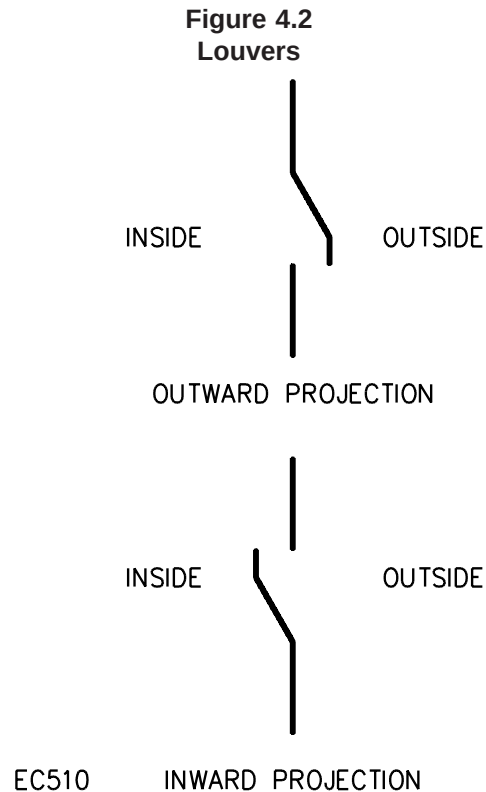
4.5.2 Openings in an enclosure, that are required for the proper acoustic performance of an appliance (including perforated holes, louvers, and openings protected by means of wire screening, expanded metal, or perforated covers) and provide access to the sound-producing element, shall be of such size or shape that no opening will permit passage of a rod having a diameter of 17/64 inch (6.7 mm).

4.5.3 Openings in the top of the enclosure shall be so constructed and of such size to prevent entry of foreign objects. See Figure 4.1 for examples of acceptable top cover designs.



4.5.4 Openings in the sides and front of the enclosure shall be so located and of such size to reduce the likelihood of entry of a foreign object and personnel contact with internal parts. Louvers shall be shaped to deflect external falling objects outward. See Figure 4.2 for examples of louver designs.

4.5.5 An enclosure intended for recessed mounting and having a front panel intended to be flush with the surface of the wall shall have no openings that vent into concealed spaces of a building structure, such as into hollow spaces in the wall, when the product is mounted as intended.



4.5.6 With reference to 4.5.2, the wires of a screen shall be not less than 16 AWG (1.3 mm²). Except as noted in 4.5.7, perforated sheet steel and sheet steel employed for expanded-metal mesh shall be not less than 0.042 inch (1.07 mm) in average thickness, 0.046 inch (1.17 mm) if zinc coated.

4.5.7 Expanded-metal mesh, 0.021 inch (0.53 mm) thick or 0.024 inch (0.61 mm) thick if zinc-coated, may be used when all of the following conditions are met:

- a) The mesh openings are not more than 1/4 square inch (1.6 cm²) in area,
- b) The maximum dimension of the overall opening so protected is not greater than 3 inches (76.2 mm), and
- c) Indentation of the guard or enclosure does not impair performance or reduce spacings below the required values as given in Spacings, Section 11, between uninsulated live parts, or between uninsulated movable parts.

5 Electric Shock

5.1 Any part that is exposed only during operator servicing shall not present a risk of electric shock. See the Electric Shock Current Test, Section 18.

5.2 Each terminal provided for the connection of an external antenna shall be conductively connected to the supply circuit grounded conductor. The conductive connection shall have a maximum resistance of 5.2 megohms, a minimum wattage rating of 1/2 watt, and shall be effective with the power switch in either the on or off position.

Exception: The conductive connection is not required to be provided if such a connection is established in the event of electrical breakdown of the antenna isolating means, the breakdown does not result in a risk of electric shock and, in a construction employing an isolating power transformer, the resistance of the conductive connection between the supply circuit and chassis does not exceed 5.2 megohms.

5.3 The maximum value of 5.2 megohms specified in 5.2 is to include the maximum tolerance of the resistor value used; that is, a resistor rated 4.2 megohms with 20 percent tolerance or a resistor rated 4.7 megohms with a 10 percent tolerance is acceptable. A component comprised of a capacitor with a built-in shunt resistor that complies with the requirements of the Standard for Capacitors and Suppressors for Radio- and Television- Type Appliances, UL 1414, may be rated a minimum of 1/4 watt.

5.4 The insertion in any socket of any vacuum tube or its glass or metal equivalent of like designation used in the product shall not result in a risk of electric shock.

6 Protection Against Corrosion

6.1 Ferrous metal parts other than bearings and similar parts where such protection is impractical, shall be protected against corrosion by enameling, galvanizing, sherardizing, plating, or other equivalent means.

Exception No. 1: Parts such as washers, screws, bolts, and similar parts, are not required to be protected against corrosion if corrosion of such unprotected parts will not result in a risk of fire or electric shock or in unintentional contact with moving parts that can cause injury to persons.

Exception No. 2: Parts made of stainless steel, polished or treated, do not require additional protection against corrosion.

6.2 The requirements of 6.1 apply to all enclosures of sheet steel or cast iron, and to all springs and other parts upon which intended mechanical operation depends. Bearing surfaces shall be of materials and construction that reduce the likelihood of binding due to corrosion.

7 Field Wiring System Connections

7.1 General

7.1.1 An appliance shall be provided with wiring terminals or leads for the connection of conductors of at least the size required by the National Electrical Code, NFPA 70, corresponding to the electrical rating of the appliance.

7.1.2 Except for appliances intended for series duty connection, duplicate terminals or leads, or equivalent means to achieve electrical supervision, shall be provided for each incoming and outgoing alarm indicating circuit connection to an appliance intended and marked for fire alarm service. A common terminal may be used for connection of both incoming and outgoing wires, provided that the design and construction of the terminal does not permit an uninsulated section of a single conductor to be looped around the terminal and serve as two separate connections, thereby precluding supervision of the connection in the event that the wire becomes dislodged from under the terminal. A notched clamping plate under a single securing screw is acceptable, only if separate conductors of an indicating circuit are intended to be inserted in each notch. This arrangement shall be supplemented by additional marking in the wiring area or on the installation wiring diagram specifying the intended connection to the terminals. See 39.1(e).

7.2 Compartment

7.2.1 The field wiring compartment area shall provide space for completing all wiring connections without damage to wire insulation or to internal components. There shall be space within the compartment to permit the use of a standard conduit bushing on conduit connected to the compartment when a bushing is required.

7.2.2 Internal components in the wiring area and wire insulation shall be protected from sharp edges by insulating or metal barriers having smooth, rounded edges, or the word "CAUTION" and the following or equivalent instructions shall be marked in the wiring area: "When Making Installation, Route Field Wiring Away From Sharp Projections, Corners, And Internal Components."

7.2.3 The inspection location of an outlet box or compartment in which field wiring connections are to be made shall be such that inspection of the connections is possible after the appliance is installed as intended. The removal of not more than two mounting screws, or equivalent arrangement to view the field wiring connections, is deemed to comply with this requirement.

7.3 Terminals or leads

7.3.1 The terminals to which wiring connections are made shall consist of binding screws with terminal plates having upturned lugs or the equivalent to hold the wires in position. Other terminal connections may be provided if found to be equivalent.

7.3.2 If a wire binding screw is employed at a field wiring terminal, the screw shall be not smaller than No. 8 (4.2 mm diameter), except that a No. 6 (3.5 mm diameter) screw may be used for the connection of a 14 AWG (2.1 mm²) or smaller conductor. The screw shall thread into metal and shall be of a nonferrous metal or plated steel.

7.3.3 A terminal plate tapped for a wire binding screw shall be of metal not less than 0.050 inch (1.27 mm) thick for a No. 8 (4.2 mm diameter) or larger screw, and not less than 0.030 inch (0.76 mm) thick for a No. 6 (3.5 mm diameter) screw. The plate shall have not less than two full threads in the metal and may have the metal extruded at the tapped hole for the binding screw so as to provide two full threads.

7.3.4 A lead provided for field connections shall be not less than 6 inches (152 mm) long, provided with strain relief, and not smaller than 18 AWG (0.82 mm²). The insulation, if rubber or thermoplastic, shall not be less than 1/32 inch (0.8 mm) thick.

7.3.5 The leads of an appliance that is not intended for outlet-box mounting and is not provided with a terminal or wiring compartment shall enter the enclosure, if of metal, through separate holes in insulating material that provide a spacing of not less than 1/4 inch (6.4 mm) between the conductors, and not less than 1/2 inch (12.7 mm) between the conductors and the plane of support of the appliance. Otherwise, the leads shall enter the enclosure through a nipple or other means for the attachment of conduit.

7.4 Grounding terminals and leads

7.4.1 For an appliance intended for connection to a high-voltage source of supply, only by means of other than a metal-enclosed wiring system, such as nonmetallic-sheathed cable, all of the following shall be provided:

- a) An equipment grounding terminal or lead, the size of which shall be the same as that of the supply terminal or lead, but in no case less than 18 AWG (0.82 mm²),
- b) A marking to indicate the system or systems for which it is intended, and
- c) Reliable connection of the grounding means to all exposed dead metal parts that are likely to become energized, and all dead metal parts within the enclosure that are exposed to contact during servicing and maintenance.

7.4.2 The surface of an insulated lead intended solely for the connection of an equipment grounding conductor shall be green, with or without one or more yellow stripes. No other leads visible to the installer, other than the grounding conductors, shall be so identified.

7.4.3 A field wiring terminal intended for connection of an equipment grounding conductor shall be plainly identified, with the marking G, GR, GROUND, GROUNDING, by the symbol ⊕ or the equivalent, or by a marking on a wiring diagram provided on the appliance. The field wiring terminal shall be located so that it is unlikely to be removed during servicing of the appliance.