



UL 1480

STANDARD FOR SAFETY

Speakers for Fire Alarm and Signaling Systems, Including Accessories

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UL Standard for Safety for Speakers for Fire Alarm and Signaling Systems, Including Accessories, UL 1480

Seventh Edition, Dated May 26, 2023

Summary of Topics

This Seventh Edition of UL 1480 dated May 26, 2023 has been issued to incorporate changes from proposals dated May 31, 2022 and October 28, 2022.

The requirements are substantially in accordance with Proposal(s) on this subject dated May 31, 2022 and October 28, 2022.

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Seventh Edition

Speakers for Fire Alarm and Signaling Systems, Including Accessories

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ANSI/UL 1480-2023



Commitment for Amendments

This Standard is issued jointly by ULSE Inc. (ULSE) and ULC Standards. Amendments to this Standard will be made only after processing according to the Standards writing procedures by ULSE and ULC Standards.

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Preface

This is the common ULSE and ULC Standard for Speakers for Fire Alarm and Signaling Systems, Including Accessories. It is the fifth edition of CAN/ULC 541 and Seventh edition of UL 1480.

This Joint Standard was prepared by UL Standards & Engagement Inc. (ULSE), ULC Standards, and the NEMA Technical Harmonization Committee on Notification Appliances. The standard was formally approved by the ULSE Technical Committee on Signal Appliances and the ULC Technical Committee on Fire Alarm and Life Safety Equipment and Systems. The efforts and support of the NEMA Technical Harmonization Committee, ULSE Technical Committee, and ULC Technical Committee are gratefully acknowledged.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

Annexes [A](#), [B](#) and [C](#) are identified as normative and form a mandatory part of this Standard.

Annex [D](#) is identified as informative and is for informational purposes only.

Note: Although the intended primary application of this Standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

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INTRODUCTION

1 Scope

1.1 These requirements apply to speakers, rated at 300 V or less, for fire alarm and signaling systems intended for indoor and/or outdoor installation:

a) In Canada only: in accordance with CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations, and with ULC-S524, Standard for Installation of Fire Alarm Systems.

b) In the United States only: in accordance with the National Electrical Code, NFPA 70, and the National Fire Alarm and Signaling Code, NFPA 72.

1.2 These requirements apply to speakers for use in ordinary (non-hazardous or non-corrosive) locations.

1.3 This Standard also covers protective covers and other accessories used with speakers.

1.4 Speakers for use in hazardous or corrosive locations shall comply with the requirements of this Standard and the applicable requirements:

a) In Canada only: CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations, with respect to the hazard or category classification.

b) In the United States only: the National Electrical Code, NFPA 70.

1.5 Each product or device referred to as a speaker in this Standard is a speaker assembly suitable for separate installation as a component of a fire alarm system.

1.6 A supplementary visual signal, incorporated as part of a speaker which is intended for fire alarm application shall comply with the requirements of this Standard and the applicable requirements of the Standard for Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories, ULC 526 and UL 1638.

1.7 Speakers intended for use with fire alarm systems and having integral amplifiers shall comply with the requirements in this standard in addition to the applicable requirements in:

a) In Canada only: ULC 527, Standard for Control Units for Fire Alarm Systems.

b) In the United States only: UL 864, Control Units and Accessories for Fire Alarm Systems.

1.8 Speakers intended for installations requiring a low frequency (520 Hz) notification to awaken sleeping persons shall also be evaluated to:

a) In Canada only: ULC 527, Control Units for Fire Alarm Systems.

b) In the United States only: UL 864, Standard for Control Units and Accessories for Fire Alarm Systems.

1.9 Speakers intended for use in air-handling spaces (plenums) shall comply with the requirements in this standard and the requirements in:

a) In Canada only: ULC-S142, Standard Method of Fire Test for Heat and Visible Smoke Release for Discrete Products.

b) In the United States only: UL 2043, Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

1.10 These requirements do not cover the following:

- a) Speakers intended for personal or private consumer use;
- b) Speakers which are intended for commercial or professional audio applications; and
- c) Speakers intended for security applications.

2 Components

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

2.2 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.

2.3 A component shall be used in accordance with rating(s) established by its manufacturer for the intended conditions of use.

3 Units of Measurement

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

4 Referenced Publications

4.1 Any undated reference to a code or standard appearing in the requirements of this Standard shall be interpreted as referring to the latest edition of that code or standard.

4.2 The following publications are referenced in this Standard:

ASA S12.51/ISO 3741, *Determination of sound power levels and sound energy levels of noise sources using sound pressure – Precision methods for reverberation test rooms*

ASTM B86, *Specifications for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings*

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

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

CTA-CEB 19, *Recommended Loudspeaker Safety Practices*

CSA 6.19, *Residential carbon monoxide alarming devices*

CSA C22.1, *Canadian Electrical Code, Part I, Safety Standard for Electrical Installations*

CSA C22.2 No. 0.4, *Bonding of Electrical Equipment*

CSA C22.2 No. 0.15, *Adhesive Labels*

CSA C22.2 No. 0.17, *Evaluation of Properties of Polymeric Materials*

CSA C22.2 No. 77, *Motors with Inherent Overheating Protection*

CSA C22.2 No. 198.1, *Extruded Insulating Tubing*

CSA C22.2 No. 60065, *Audio, Video, and Similar Electronic Apparatus – Safety Requirements*

CSA C22.2 No. 60086-4, *Primary Batteries- Part 4: Safety of Lithium Batteries*

IEC 61672-1, *Electroacoustics – Sound Level Meters – Part 1: Specifications*

ISO 8201, *Alarm Systems – Audible emergency evacuation signal*

NBC, *National Building Code of Canada*

NFPA 70, *National Electrical Code*

NFPA 72, *National Fire Alarm and Signaling Code*

UL 94, *Test for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 224, *Extruded Insulating Tubing*

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

UL 796, *Printed Wiring Boards*

UL 864, *Control Units and Accessories for Fire Alarm Systems*

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 1642, *Lithium Batteries*

UL 2043, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*

UL 2054, *Household and Commercial Batteries*

UL 60065, *Audio, Video, and Similar Electronic Apparatus – Safety requirements*

UL 60086-4, *Primary Batteries – Part 4: Safety of Lithium Batteries*

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*

ULC-S142, *Fire Test for Heat and Visible Smoke Release for Discrete Products*

ULC-S524, *Installation of Fire Alarm Systems*

ULC 525, *Audible Signal Devices for Fire Alarm and Signaling Systems, Including Accessories*

ULC 526, *Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories*

ULC 527, *Control Units for Fire Alarm Systems*

5 Glossary

For the purpose of this Standard, the following definitions apply:

5.1 **CONSTANT TEMPERATURE** – Temperature is considered to be constant when three successive readings indicate no change when taken at intervals of 10 % of the previously elapsed duration of the test, but not less than at 5 min intervals.

5.2 **CREST FACTOR** – The ratio of the peak or maximum value to the root-mean-square (rms) value.

5.3 **DECIBEL (dB)** – One-tenth of a bel, the number of decibels denoting the ratio of the two amounts of power being ten times the logarithm to the base 10 of this ratio.

NOTE: The abbreviation dB is commonly used for the term decibel, and is determined as follows:

$$n = 10 \log_{10} \frac{P_1}{P_2} \text{ dB}$$

where:

P_1 and P_2 = The two values of power, expressed in the same unit (e.g. sound pressure level)

n = Value in decibels

5.4 **DUTY CYCLE** – The ratio of the sum of all pulse durations to the total period, during a specified period of operation.

5.5 **DWELLING UNIT** – A suite operated as a housekeeping unit, used or intended to be used as a domicile by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.

NOTE: Definition of this term is consistent with that used in the National Building Code of Canada.

5.6 **EMERGENCY WARNING** – A system used to provide information and instructions to people in a building, area, site, or other space using intelligible voice communications methods. An Emergency Warning System is used to notify occupants that an emergency exists.

5.7 **FIRMWARE** – A control program that is embedded in the notification appliance.

5.8 FREE FIELD – An environment in which a sound wave may propagate in all directions without obstructions or reflections within the frequency range of interest.

5.9 MANUFACTURER'S PUBLISHED INSTRUCTIONS – Published installation and operating documentation provided for each product or component. The documentation includes directions and necessary information for the intended installation, maintenance, and operation of the product or component.

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5.10 PINK NOISE – Broadband noise whose energy content is inversely proportional to frequency -3 dB per octave or -10 dB per decade.

5.11 PRIMARY BATTERY – A battery which can only be discharged once. It is not designed to be rechargeable and must be protected from a charging current.

5.12 PRIVATE MODE – Mode of operation 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-alarm and signaling system.

5.13 PUBLIC MODE – Mode of operation intended to notify occupants or inhabitants in the area protected by the fire-alarm and signaling system.

5.14 REFERENCE AXIS – The "reference axis" of a signaling device is a line passing through the reference point coincident with the geometrical axis of the sound propagation pattern. For symmetrical structures, the reference axis is usually perpendicular to a plane passing through the edge of the sound source or opening of a horn.

5.15 REFERENCE POINT – The "reference point" of a signaling device is a point on the outside of the signaling device in line with the geometrical center of the sound source projected perpendicular to a plane passing through the edge of the sound source. For horn type speaker, the "reference point" is the geometrical center of the opening of the horn.

5.16 RESONANCE – Condition of peak vibratory response where a small change in excitation frequency causes a decrease in system response.

5.17 SECONDARY BATTERY – A battery that is intended to be discharged and recharged many times in accordance with the manufacturer's recommendations.

5.18 SOFTWARE – A program that is used to program a notification appliance's function and or its performance through the device's firmware.

5.19 SOUND – Energy that is transmitted by pressure waves in air or other materials and is the objective cause of the sensation of hearing. Commonly called noise if it is unwanted.

5.20 SOUND LEVEL METER – An electronic instrument for measuring the RMS level of sound in accordance with an accepted national or international standard.

5.21 **SOUND PRESSURE** – A fluctuating pressure superimposed on the static pressure by the presence of sound. The unqualified term means the root-mean-square sound pressure. In air, the static pressure is barometric pressure.

5.22 **SOUND PRESSURE LEVEL (SPL)** – Ten times the common logarithm of the ratio of the square of the sound pressure under consideration to the square of the standard reference pressure of 20 μPa . The quantity obtained is expressed in decibels.

5.23 **SPECIAL TOOL** – A device not normally carried by the public (e.g. a key), normally provided by the manufacturer, to deter unauthorized access to the equipment.

NOTE: This is intended to deter unauthorized access to the equipment, while being available on site either at a defined location or from a "responsible person" familiar with and having knowledge of the equipment.

5.24 **TROUBLE SIGNAL** – A visual, audible, or transmitted signal indicating a fault condition associated with a notification appliance.

6 Control Unit Interface

6.1 A speaker incorporating circuitry for functional interfacing with a control unit for purposes such as supervision, point addressing, multiplexing, synchronization, wireless communication etc., shall also comply with the applicable functional requirements of standards such as:

a) In Canada only:

- 1) ULC 525; and
- 2) ULC-S545.

b) In the United States only:

- 1) UL 864; and
- 2) UL 985.

7 Audible Signal Pattern

7.1 Format for fire alarm signals

7.1.1 Speakers used for fire alarm signals whose signal format is not controlled by a control unit shall be capable of reproducing a 3 pulse signal temporal pattern conforming with [Figure B2.1](#) in Annex [B](#), either internally or when pulsed from an external source.

7.2 Format for carbon monoxide signals

7.2.1 Speakers used for carbon monoxide alarms and whose signal format is not controlled by a control unit, shall be capable of reproducing a 4 pulse signal temporal pattern either internally or when pulsed from an external source. Refer to [Figure B3.1](#) in Annex [B](#).

CONSTRUCTION

8 General

8.1 The construction of a speaker shall comply with the construction requirements contained in this section, unless, where permitted by test, the construction is determined to be equivalent to these

requirements. A means of determining construction equivalence shall comply with the requirements in CTA-CEB 19.

8.2 Unless otherwise indicated, the construction requirements specified for a product shall also apply to any accessories with which it is to be used.

9 Enclosures

9.1 General

9.1.1 The frame and enclosure of a speaker shall be sufficiently strong and rigid to resist the abuses to which it is likely to be subjected without adversely affecting its performance due to total or partial collapse with attendant reduction of spacings, loosening or displacement of parts and development of other conditions which could impair operation of the speaker and increase the risk of fire or electrical shock. Refer to Section [38](#), Mechanical Strength Tests for Enclosures.

9.1.2 Electrical parts or hazardous moving parts of a speaker shall be located or enclosed to provide protection from unintentional contact with uninsulated live parts.

9.1.3 A speaker intended to be installed on an outlet box or similar mounting enclosure, is to be judged with respect to compliance of the combination with the requirements of [9.1.1](#) and [9.1.2](#).

9.1.4 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.

9.1.5 The enclosure of a speaker 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 device.

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

9.1.7 A speaker intended for either flush or surface mounting in a back box shall use a standard enclosure that has been evaluated for the intended use or an enclosure that complies with the requirements of this standard.

9.1.8 A speaker need not be furnished with a back box where means for attachment to a standard outlet box are provided and the spacings comply with Section [15](#), Spacings.

9.1.9 The mounting means of a speaker to an enclosure shall be accessible without disassembly of any components not identified in the installation instructions of the speaker. The mounting means shall be independent of those means used for securing components or parts of the assembly. Removal of a complete assembly is not considered to be disassembly of a component.

9.1.10 An enclosure shall be constructed to minimize the possibility of emission of flame, molten metal, flaming or glowing particles, or flaming drops. See Section [28](#), Abnormal Operation and Burnout Test.

9.1.11 A speaker of less than 23 kg (50.7 lb) mass may be arranged for mounting to an outlet box provided that, if the speaker mass is more than 11 kg (24-1/4 lb), it is plainly marked as specified in Section [46](#), Markings, General.

9.1.12 A speaker of more than 23 kg (50.7 lb) mass shall incorporate space or a compartment for field wiring and shall be provided with means for physical mounting and support by other than an outlet box.

9.2 Cast metal enclosures

9.2.1 The thickness of cast metal for an enclosure shall be as indicated in [Table 9.1](#).

Exception: Cast metal of lesser thickness may be employed if, consideration being given to the shape, size, and function of the enclosure, it provides equivalent mechanical strength. See Section [38](#), Mechanical Strength Tests for Enclosures.

Table 9.1
Cast Metal Enclosures

Use, or dimensions of area involved	Minimum thickness			
	Die-cast metal,		Cast metal of other than the die-cast type,	
	mm	(in)	mm	(in)
Area of 155 cm ² (24 in ²) or less and having no dimension greater than 152 mm (6 in)	1.6	(1/16 ^a)	3.2	(1/8)
Area greater than 155 cm ² (24 in ²) or having any dimension greater than 152 mm (6 in)	2.4	(3/32)	3.2	(1/8)
At a threaded conduit hole	6.4	(1/4)	6.4	(1/4)
At an unthreaded conduit hole	3.2	(1/8)	3.2	(1/8)

^a The area limitation for metal 1.6 mm (1/16 in) in thickness may be obtained by the provision of reinforcing ribs subdividing a larger area.

9.2.2 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 3.5 or more than 5 threads in the metal, and the construction shall be such that a standard conduit bushing can be properly attached.

9.2.3 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 3.5 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.

9.2.4 A speaker assembly designed to be supported by rigid conduit shall be of sufficient strength to be able to support 5 times the weight of the speaker assembly and comply with Section [38](#), Mechanical Strength Test for Enclosures. When provided with a conduit hub, or the equivalent, the hub shall have not less than 5 full threads.

9.2.5 Die-cast metal for other than flush boxes is permitted when it complies with one of the alloy specifications given in ASTM B86.

9.3 Sheet metal enclosures

9.3.1 The thickness of sheet metal employed for the enclosure of an speaker shall be not less than that indicated in [Table 9.2](#).

Exception: Sheet metal of lesser thickness may be employed if, consideration being given to the shape, size, and function of the enclosure, it provides equivalent mechanical strength. See Section [38](#), Mechanical Strength Tests for Enclosures.

Table 9.2
Minimum 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,		mm (in)
	mm	(in)	cm ²	(in ²)	mm	(in)	mm	(in)	
A	76.2	(3)	39 ^a	(6)	0.64 ^b	(0.025)	0.53 ^b	(0.021)	0.58 ^c (0.023)
B	203	(8)	232	(36)	0.76 ^{b,d}	(0.030)	0.69 ^{b,d}	(0.027)	0.91 ^d (0.036)
C	305	(12)	581	(90)	0.86 ^d	(0.034)	0.81 ^d	(0.032)	1.14 ^d (0.045)

^a Volume of enclosure not more than 197 cm³ (12 in³).

^b Sheet steel for an enclosure intended for outdoor use (rain-tight) is required to be not less than 0.91 mm (0.036 in) in thickness if zinc coated and not less than 0.81 mm (0.032 in) 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 0.74 mm (0.029 in) 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 0.53 mm (0.021 in) [0.64 mm (0.025 in) 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 0.74 mm (0.029 in).

9.3.2 A plate or plug closure for an unused conduit opening or other hole in the enclosure shall have a thickness not less than:

- a) 0.36 mm (0.014 in) for steel or 0.43 mm (0.017 in) for nonferrous metal for a hole having a 6.4 mm (1/4 in) maximum dimension; and
- b) 0.69 mm (0.027 in) for steel or 0.81 mm (0.032 in) for nonferrous metal for a hole having a 35 mm (1-3/8 in) maximum dimension.

9.3.3 A hole larger than 35 mm (1-3/8 in) diameter shall have a closure whose thickness is not less than that required for the enclosure of the speaker or shall have a standard knockout seal. Such plates or plugs shall be securely mounted.

9.3.4 A knockout in a sheet metal enclosure shall be secured but shall be capable of being removed without undue deformation of the enclosure. See Section 38, Mechanical Strength Tests for Enclosures.

9.3.5 A knockout shall be provided with a surrounding surface area of sufficient size to permit seating of a conduit bushing, and shall be so located 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 indicated under Section 15, Spacings

9.3.6 A sheet metal member to which a wiring system is to be connected in the field shall have a thickness not less than 0.81 mm (0.032 in) for uncoated steel, of not less than 0.86 mm (0.040 in) for galvanized steel, and not less than 1.14 mm (0.045 in) for nonferrous metal.

9.3.7 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 1.35 mm (0.053 in).

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