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Alarm systems — Audible emergency evacuation signal — Requirements

Systèmes d'alarme — Signal sonore d'évacuation d'urgence — Exigences

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Foreword

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This document was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This second edition cancels and replaces the first edition (ISO 8201:1987), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the evacuation signal temporal pattern has been modified to allow for the use of signals from voice alarm evacuation systems.

This corrected version of ISO 8201:2017 incorporates the following corrections:

— the title of the document has been corrected from *Acoustics — Audible and other emergency evacuation signals* to *Alarm systems — Audible emergency evacuation signal — Requirements*.

Introduction

There has been a growing interest in the past decade in the development of an international audible signal which, when heard, would unequivocally mean “evacuate the building immediately”.

In searching for an appropriate audible signal, it was considered that levels of background noise and frequency patterns are so variable, particularly in the industry, that no signalling device would be able to “penetrate” all background noises and frequency patterns. For this reason, it seemed prudent to select the kind of sound best able to audibly “penetrate” a particular background noise in a given building and then make that sound unique and understandable by imposing on it a standard recognizable pattern of “on” and “off” times.

It is frequently found that, whatever sounding device is already in place in a building, it is there because it has been shown to be successful. Consequently, all that is needed in many cases is to impose a standardized temporal pattern on the existing sounding devices. For new buildings, a signal that can “penetrate” the background noise inside that building should be selected and then the standardized temporal pattern is imposed on that signal.

An additional advantage of using a standardized temporal pattern as the distinguishing characteristic of the audible emergency evacuation signal is that the temporal pattern can be applied to visual and tactile signals to aid those who have impaired hearing. Visual and tactile signals incorporating the temporal pattern can also be applied in areas where the background noise is so intense that no signal is capable of “penetrating” audibly.

This document is one of a series of standards covering danger signals. Other standards include ISO 7731, ISO 11428 and ISO 11429.

Alarm systems — Audible emergency evacuation signal — Requirements

1 Scope

This document specifies the requirements for an audible emergency evacuation signal intended to indicate without ambiguity, to all persons within the reception area of the signal, that an emergency situation (fire, gas leaks, explosion, nuclear radiation, etc.) requires immediate evacuation.

Two acoustic parameters of the audible emergency evacuation signal are defined: the temporal pattern and the required sound pressure level at all places within the intended reception area of the signal.

NOTE Recognition of the signal does not require the specification of its spectral content, which can be selected to satisfy specific site requirements.

The signal specified in this document is intended to be used in buildings, including but not limited to schools, hotels, residential buildings, public institutions and work places (such as factories and offices) The signal can also be used in outside areas.

This document is not applicable to warning signals, to signals for public disaster control or to alarm systems on board ships or in outdoor moving vehicles, such as police cars, fire engines and ambulances.

The individual signalling-system components of the signal are also out of the scope of this document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Requirements

4.1 General

The audible emergency evacuation signal shall only be used for evacuation. Its use shall be restricted to emergencies where it is desired to have all the occupants in the signal reception area evacuate the building immediately.

Where the evacuation plan requires sequential evacuation with only the affected zones or floors having to be immediately evacuated, the audible emergency evacuation signal shall only be used for the zones or floors to be immediately evacuated. It shall not be used when the planned action during the emergency is not evacuation, but relocation of the occupants from the affected area to a safe area inside the building or for their protection in the place where they find themselves (e.g. high-rise buildings, health care facilities and penal institutions).

4.2 Temporal pattern

The audible emergency evacuation signal shall consist of a “three-pulse” temporal pattern applied to any appropriate sounding device, preferably by means of central control. The pattern shall consist of an “on” phase (a) lasting 0,5 s ± 10 % followed by an “off” phase (b) lasting 0,5 s ± 10 %, repeated once, followed by a further “on” phase (a) lasting 0,5 s ± 10 % followed by an “off” phase (c) lasting 1,5 s ± 10 % (see Figure 1).

Annex A gives examples of application of the temporal pattern to commonly used audible signals.

A single-stroke bell or chime sounded at “on” intervals lasting 1 s ± 10 % with a 2 s ± 10 % “off” interval after each third “on” stroke shall be acceptable (see Figure A.4).

NOTE The examples given for frequency shift [see Figure A.2 a) and b) and Figure A.3 a) and b)] may be preferred in those countries where electronic sounders are used for the design of future systems unless specific psychoacoustic or technical reasons require other solutions, such as amplitude or frequency modulation of the “on” pulse.

4.3 Recognition

In order to avoid possible confusion, it shall be ensured that the character of the “three-pulse” audible emergency evacuation signal can clearly be distinguished from other signals (e.g. alarm signal) used in the signal reception area (see ISO 7731).

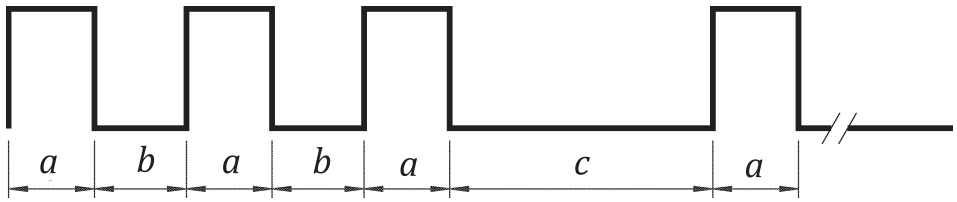
If, during an emergency, an alarm signal is used to alert the occupants in zones or floors which are not going to be evacuated, the alarm signal shall also be significantly different from the “three-pulse” character of the audible emergency evacuation signal.

4.4 Sound pressure level

At all places within the signal reception area, the A-weighted sound pressure level during the “on” phases of the audible emergency evacuation signal, measured with the time-weighting characteristic *F* (Fast) (see IEC 61672-1 and IEC 61672-2), shall exceed the highest A-weighted sound pressure level of the background noise averaged over a continuous period of 60 s by, at least 10 dB and shall not be less than 65 dB (see ISO 7731).

If the audible emergency evacuation signal is intended to rouse sleeping occupants, the minimum A-weighted sound pressure level of the signal shall be not less than 75 dB at the bedhead with all doors closed.

NOTE This signal level may not be adequate to awaken all sleeping occupants.



Key

a phase signal is “on” for 0,5 s ± 10 %

b phase signal is “off” for 0,5 s ± 10 %

c phase signal is “off” for 1,5 s ± 10 % (c = 3*a* = 3*b*)

NOTE The total cycle lasts for 4 s ± 10 %.

Figure 1 — Temporal pattern

4.5 Duration

The duration of the audible emergency evacuation signal shall correspond to the period of time appropriate for the evacuation of the building or outdoor area, but shall not be less than 180 s.

It shall be possible to silence periodically the audible emergency evacuation signal by interrupting the signal for 15 s or less for the purpose of occupant voice communication or for orientation of the blind and visually impaired.

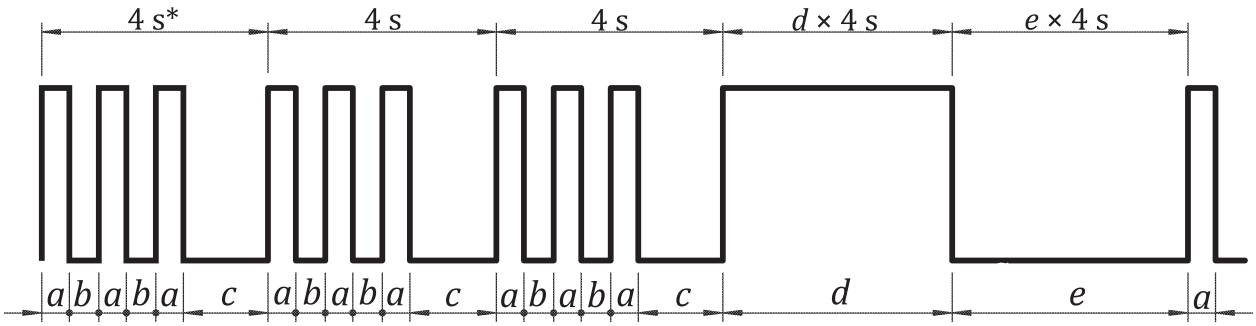
4.6 Supplementary instructions

A key word or phrase (e.g. FIRE!, GET OUT, etc.) may be inserted for supplementary instruction during the "off" phase (c). The key word or phrase shall be entirely contained within the specified time limit (c) (see Figure 1) so that the temporal pattern as shown in Figure 1 is maintained.

Supplementary voice message instructions may be added to the evacuation pattern. If this is the case, the sequence shall consist of the "three-pulse" temporal pattern repeated three times, followed by the supplementary instructions followed by a final "off" phase lasting, at least, 4 s ±10 % but not exceeding 8 s (see Figure 2).

The complete cycle should not exceed 30 s.

NOTE The voice message is allocated 1, 2, 3 or 4 time slots of 4 s.



Key

a 0,5 s tone

b 0,5 s silence

c 1,5 s silence

d pre-recorded speech message where *d* is more than 4 s and does not exceed 12 s

e silence period where *e* is 1 or 2 time slots of 4 s

* First 4 s pattern.

Figure 2 — Evacuation signal cycle with pre-recorded message

4.7 Visual and/or tactile signals

Additional visual and tactile signals shall be provided to back up the audible emergency evacuation signal if the averaged A-weighted sound pressure level of the background noise is higher than 110 dB.

The temporal pattern described in 4.2 shall be imposed on tactile emergency evacuation signals.

Visual signals shall be operated at a rate that considers the potential for causing epileptic seizures.

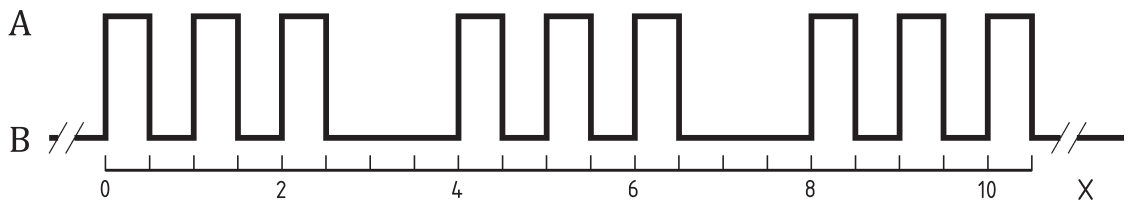
Annex A
(informative)

Examples of application of the temporal pattern to commonly used audible signals

This annex outlines some examples of the application of the temporal pattern to audible signals in common use.

Example 1 (see Figure A.1)

Temporal pattern imposed on signalling equipment that emits a steady sound, such as a single frequency (tone) or a combination of two or more frequencies when actuated (electromechanical horns, buzzers, vibrating bells and electronic sounders).



Key

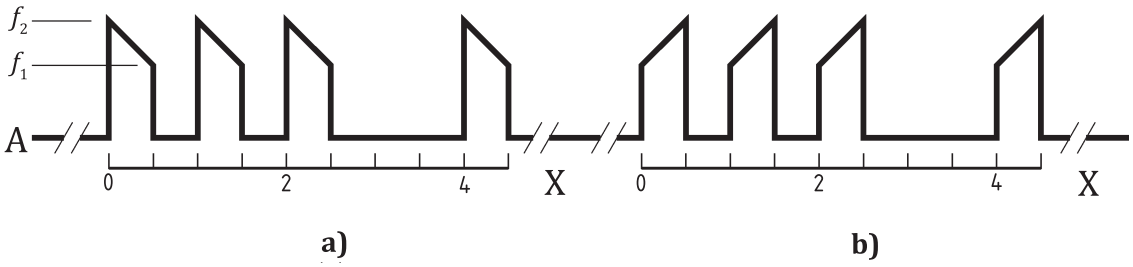
A on
B off
X time, in s

Figure A.1 — Example 1

Example 2 [see Figure A.2 a) and b)]

Temporal pattern imposed on electronic sounders emitting sweep frequency or saw-tooth tones.

NOTE In Figure A.2 a), the signal frequency begins with the higher frequency, f_2, and falls to the lower frequency, f_1, within one pulse phase [and vice-versa for Figure A.2 b)].



a) **b)**

Key

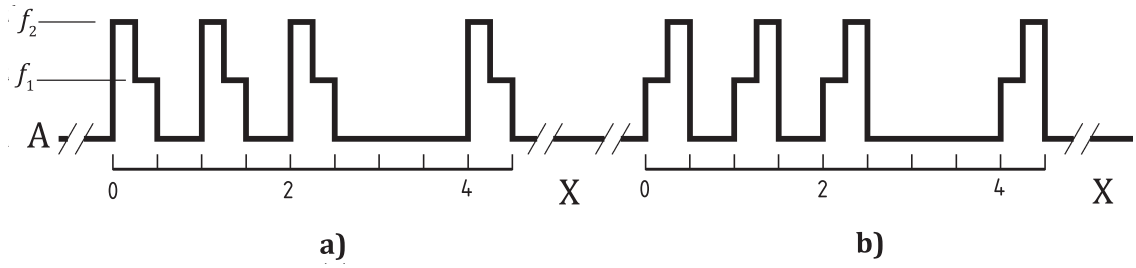
A off
X time, in s

Figure A.2 — Example 2

Example 3 [see Figure A.3 a) and b)]

Temporal pattern imposed on electronic sounders emitting a two-tone high-low or low-high signal.

NOTE In Figure A.3 a), the signal frequency begins with the higher frequency, f_2, for part of the "on" pulse phase and ends with the lower frequency, f_1, for the remainder of the pulse [and vice-versa for Figure A.3 b)].



Key

A off

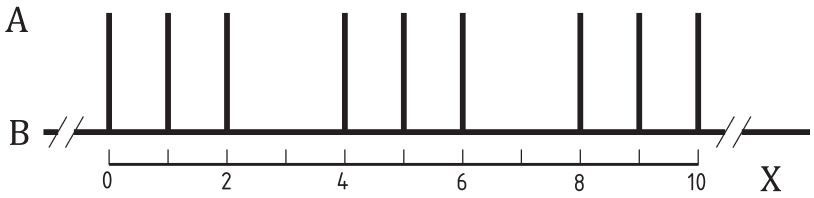
X time, in s

Figure A.3 — Example 3

Example 4 (see Figure A.4)

Temporal pattern imposed on a single-stroke bell or a chime.

NOTE In Figure A.4, the "on" phase represents the time when the striker mechanism is actuated. The sound produced by the bell or chime will continue at a level which decreases until the striker mechanism is re-actuated.



Key

A on

B off

X time, in s

Figure A.4 — Example 4

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[1] ISO 7731, *Ergonomics — Danger signals for public and work areas — Auditory danger signals*

[2] ISO 11428, *Ergonomics — Visual danger signals — General requirements, design and testing*

[3] ISO 11429, *Ergonomics — System of auditory and visual danger and information signals*

[4] IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

[5] IEC 61672-2, *Electroacoustics — Sound level meters — Part 2: Pattern evaluation tests*

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