



ASA/ANSI S3.41-2015

Reaffirmed by ANSI June 5, 2020

AMERICAN NATIONAL STANDARD

Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI)

Secretariat:

Acoustical Society of America

Approved on July 14, 2015:

American National Standards Institute, Inc.

Abstract

This Standard specifies the characteristics of acoustic signals to be used for audible emergency evacuation and audible evacuation signals with relocation instructions. It applies to the audible signal only and not to the signaling system components or equipment. The audible emergency signal is intended to draw the attention of all persons within the signal reception area to an emergency situation (fire, gas leaks, explosion, nuclear radiation, etc.) requiring immediate evacuation from the area. This Standard specifies parameters of the audible emergency signal, i.e., the temporal pattern, the required sound pressure level at all places within the intended signal reception area and the spectral content for certain applications, in order for the audible emergency signal to be recognizable.

AMERICAN NATIONAL STANDARD

**Audible Emergency Evacuation (E2) and Evacuation
Signals with Relocation Instructions (ESRI)**

ANSI/ASA S3.41-2015

Accredited Standards Committee S3, Bioacoustics

Standards Secretariat
Acoustical Society of America
1305 Walt Whitman Road, Suite 300
Melville, NY 11747

The American National Standards Institute, Inc. (ANSI) is the national coordinator of voluntary standards development and the clearinghouse in the U.S.A. for information on national and international standards.

The Acoustical Society of America (ASA) is an organization of scientists and engineers formed in 1929 to increase and diffuse the knowledge of acoustics and to promote its practical applications.



AMERICAN NATIONAL STANDARD

**Audible Emergency Evacuation (E2) and Evacuation
Signals with Relocation Instructions (ESRI)**

Secretariat:

Acoustical Society of America

Approved on July 14, 2015 by:

American National Standards Institute, Inc.

Abstract

This Standard specifies the characteristics of acoustic signals to be used for audible emergency evacuation and audible evacuation signals with relocation instructions. It applies to the audible signal only and not to the signaling system components or equipment. The audible emergency signal is intended to draw the attention of all persons within the signal reception area to an emergency situation (fire, gas leaks, explosion, nuclear radiation, etc.) requiring immediate evacuation from the area. This Standard specifies parameters of the audible emergency signal, i.e., the temporal pattern, the required sound pressure level at all places within the intended signal reception area and the spectral content for certain applications, in order for the audible emergency signal to be recognizable.

AMERICAN NATIONAL STANDARDS ON BIOACOUSTICS

The Acoustical Society of America (ASA) provides the Secretariat for Accredited Standards Committees S1 on Acoustics, S2 on Mechanical Vibration and Shock, S3 on Bioacoustics, S3/SC 1 on Animal Bioacoustics, and S12 on Noise. These committees have wide representation from the technical community (manufacturers, consumers, trade associations, organizations with a general interest, and government representatives). The standards are published by the Acoustical Society of America as American National Standards after approval by their respective Standards Committees and the American National Standards Institute (ANSI).

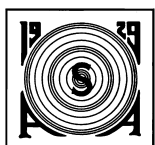
These standards are developed and published as a public service to provide standards useful to the public, industry, and consumers, and to Federal, State, and local governments.

Each of the Accredited Standards Committees (operating in accordance with procedures approved by ANSI) is responsible for developing, voting upon, and maintaining or revising its own Standards. The ASA Standards Secretariat administers Committee organization and activity and provides liaison between the Accredited Standards Committees and ANSI. After the Standards have been produced and adopted by the Accredited Standards Committees, and approved as American National Standards by ANSI, the ASA Standards Secretariat arranges for their publication and distribution.

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered and that a concerted effort be made towards their resolution.

The use of an American National Standard is completely voluntary. Their existence does not in any respect preclude anyone, whether he or she has approved the Standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the Standards.

NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this Standard.



Acoustical Society of America
ASA Secretariat
1305 Walt Whitman Road, Suite 300
Melville, New York 11747
Telephone: 1 (631) 390-0215
Fax: 1 (631) 923-2875
E-mail: asastds@acousticalsociety.org

© 2015 by Acoustical Society of America. This standard may not be reproduced in whole or in part in any form for sale, promotion, or any commercial purpose, or any purpose not falling within the provisions of the U.S. Copyright Act of 1976, without prior written permission of the publisher. For permission, address a request to the Standards Secretariat of the Acoustical Society of America.

Contents

1	Scope and purpose	1
1.1	Scope	1
1.2	Purpose	1
2	Normative references	1
3	Terms, definitions and acronyms	2
3.1	Terms and definitions	2
3.2	Acronyms	2
4	Requirements for the audible emergency evacuation signal	2
4.1	General requirements	2
4.2	Temporal pattern	3
4.3	Recognition	4
4.4	Duration	4
5	Requirements for audible alert signals	4
6	Sound pressure level	5
7	Determination of low-frequency signal format	5
8	Mid frequencies	5
	Annex A (informative) Examples of the application of the temporal pattern to audible signals	6
	Bibliography	9

Figures

Figure 1	– Temporal Pattern	3
Figure A.1	– Temporal pattern imposed on signaling 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)	6
Figure A.2	– Temporal pattern imposed on electronic sounders emitting sweep frequency or saw-tooth tones	6
Figure A.3	– Temporal pattern imposed on electronic sounders emitting a two-tone high-low or low-high signal	7
Figure A.4	– Temporal pattern imposed on a single-stroke bell or a chime	7
Figure A.5	– Example of complex signal permitted by 4.2.3.	8

Foreword

[This Foreword is for information only, and is not a part of the American National Standard ANSI/ASA S3.41-2015 American National Standard Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI). As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the standard.]

This standard comprises a part of a group of definitions, standards, and specifications for use in bioacoustics. It was developed and approved by Accredited Standards Committee S3 Bioacoustics, under its approved operating procedures. Those procedures have been accredited by the American National Standards Institute (ANSI). The Scope of Accredited Standards Committee S3 is as follows:

Standards, specifications, methods of measurement and test, and terminology in the fields of psychological and physiological acoustics, including aspects of general acoustics which pertain to biological safety, tolerance and comfort.

This standard is a revision of ANSI/ASA S3.41-1990 (R 2008), which has been technically revised. In this revision, ANSI/ASA S3.41-1990 American National Standard Audible Emergency Signal has been updated to provide basis material for, and coordinate with, newer UL/ULC (Underwriters Laboratories and Underwriters Laboratories of Canada) and NFPA (National Fire Protection Association) standards.

One of the significant changes in audible signals since the last revision of this standard is the advent of the low-frequency (520 Hz \pm 10%) sounders. These appliances are designed to wake occupants with greater effectiveness than mid-frequency appliances. Work has also been done on the spectral component of this signal and is documented in Clause 7 (from UL).

While the 520 Hz signals may wake occupants with greater effectiveness, the working group suggests that there is not enough research to support the elimination of the mid-range frequency audible signal (see Clause 8). The mid-range audible signal is generally accepted as being effective by being piercing and irritating, which it is designed to be. The mid-range audible signal will “drive” occupants out of the area.

The use of multiple frequencies may be beneficial to people with hearing losses at certain frequencies. If they have threshold shifts at low frequencies, a mid-frequency signal may help and likewise for the inverse.

ANSI/ASA S3.41-1990 was essentially the same as ISO 8201:1987. This document is substantially different as described above. Additional information on auditory danger signals is given in ISO 7731:2003. (See Bibliography.)

At the time this Standard was submitted to Accredited Standards Committee S3, Bioacoustics, for approval, the membership was as follows:

C.J. Struck, *Chair*
P.B. Nelson, *Vice-Chair*

S.B. Blaeser, *Secretary*

Acoustical Society of AmericaC.J. Struck
.....P.B. Nelson (Alt.)

American Academy of AudiologyC. Schweitzer
.....T. Ricketts (Alt.)

American Academy of Otolaryngology, Head and Neck Surgery, Inc.	R.A. Dobie
.....	A. Kim (Alt.)
American Industrial Hygiene Association	T.K. Madison
.....	D. Driscoll (Alt.)
American Speech-Hearing-Language Association	L.A. Wilber
.....	N. DiSarno (Alt.)
Beltone/GN Resound	S. Petrovic
Council for Accreditation in Occupational Hearing Conservation	L.D. Hager
Diagnostics Group	T. McColley
.....	P. Dobrowski (Alt.)
ETS – Lindgren Acoustic Systems	S. Dunlap
.....	D. Winker (Alt.)
Etymotic Research, Inc.	M.C. Killion
.....	J.K. Stewart (Alt.)
Food and Drug Administration	S-C Peng
G.R.A.S. Sound & Vibration	B. Schustrich
.....	J. Soendergaard (Alt.)
Hearing Industries Association	A. Bopp
.....	M. Jones (Alt.)
NEMA, Signaling Protection & Communication Section (3SB)	J. McNamara
.....	R. Reiswig (Alt.)
National Hearing Conservation Association	G.L. Poling
.....	R. Danielson (Alt.)
National Institute for Occupational Safety and Health	M.R. Stephenson
.....	W.J. Murphy (Alt.)
National Institute of Standards and Technology	R.P. Wagner
.....	S. Fick (Alt.)
National Park Service	M. McKenna
.....	K. Frstrup (Alt.)
Natus Medical, Inc.	Y. Hekimoglu
Ocean Conservation Research	M. Stocker
Starkey Laboratories	D.A. Preves
.....	T.H. Burns (Alt.)
U.S. Air Force	R.L. McKinley
.....	B.D. Simpson (Alt.)
U.S. Army Aeromedical Research Laboratory	W. Ahroon
U.S. Army CERL	D.K. Delaney
.....	M.J. White (Alt.)

U.S. Army Research Laboratory, Human Research and Engineering DirectorateA. Scharine
..... A. Fouts (Alt.)

University of Cincinnati Animal Audiology Clinic/Bioacoustics Lab..... P.M. Scheifele
..... D.K. Brown (Alt.)

Individual Experts of the Accredited Standards Committee S3, Bioacoustics, were:

R.F. Burkard
M.D. Burkhard
A.J. Campanella

R.L. McKinley
V. Nedzelnitsky

P.D. Schomer
C.J. Struck
L.A. Wilber

Working Group S3/WG 88, Standard Audible Emergency Evacuation and Other Signals, which assisted Accredited Standards Committee S3, Bioacoustics, in the development of this standard, had the following membership:

A. Berezowski, Chair

D. Finnegan
J. McNamara
W.J. Murphy

C.V. Pavlovic
R.P. Schifiliti

R.S. Schlauch
M. Stoops
P. Tran

Suggestions for improvements of this standard will be welcomed. They should be sent to Accredited Standards Committee S3, Bioacoustics, in care of the Standards Secretariat of the Acoustical Society of America, 1305 Walt Whitman Road, Suite 300, Melville, New York 11747. Telephone: 631-390-0215; FAX: 631-923-2875; E-mail: asastds@acousticalsociety.org.

American National Standard

Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI)

1 Scope and purpose

1.1 Scope

This Standard specifies the characteristics of acoustic signals to be used for audible emergency evacuation (E2) and audible evacuation signals with relocation instructions (ESRI). It applies to the audible signal only and not to the signaling system components or equipment. The use of these signals either as the only audible means of signaling or as a part of a voice message is subject to the requirements of governing laws, codes or other standards.

This Standard specifies parameters of the audible emergency signal, i.e., the temporal pattern, the required sound pressure level at all places within the intended signal reception area, and the spectral content for certain applications, in order for the audible emergency signal to be recognizable.

This Standard applies to:

- the audible signal that is used alone as a general evacuation signal (E2 application) for a building or area, or
- the audible evacuation signal component of a pre-recorded or system-generated voice message that is played in a building or area to signal general evacuation (E2 application), or
- the audible signal component of a pre-recorded or system-generated voice message that is played in a building or area to signal instructions to evacuate one area and relocate to another area of a building (ESRI application).

This Standard does not apply to audible signals that are applied for any use other than E2 or ESRI signals. This Standard does not apply to warning signals, to situations covered by national regulations for public disaster control, to alarm systems onboard ships, or to signals from all outdoor moving vehicles, such as police cars, fire engines, and ambulances.

1.2 Purpose

The audible emergency signal is intended to draw the attention of all persons within the signal reception area to an emergency situation (fire, gas leaks, explosion, nuclear radiation, etc.) requiring immediate evacuation from the area.

The primary audience of this document is the fire protection community. This consists of building and fire code officials, inspectors, fire protection engineers, architects, designers, technicians and equipment manufacturers.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

UL 464-2014 (draft) *Audible Signaling Devices for Fire Alarm and Signaling Systems Including Accessories*