FINAL DRAFT

INTERNATIONAL STANDARD

ISO/FDIS 717-1

ISO/TC **43**/SC **2**

Secretariat: DIN

Voting begins on:
2020-09-16

Voting terminates on:
2020-11-11

Acoustics — Rating of sound insulation in buildings and of building elements —

Part 1: Airborne sound insulation

Acoustique — Évaluation de l'isolement acoustique des immeubles et des éléments de construction —

Partie 1: Isolement aux bruits aériens

ISO/CEN PARALLEL PROCESSING

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

Reference number
ISO/FDIS 717-1:2020(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 126, *Acoustic properties of building elements and of buildings,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 717-1:2013), which has been technically revised.

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

— ISO 10140-1:2016, Annex G relocated into this document;

— smoothed reference spectra of the sound reduction index of the basic elements relocated from ISO 10140-5:2010, Annex B into this document;

— references updated.

A list of all parts in the ISO 717 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Methods of measurement of airborne sound insulation of building elements and in buildings have been standardized e.g. in ISO 10140-2 and ISO 16283-1. The purpose of this document is to standardize a method whereby the frequency-dependent values of airborne sound insulation can be converted into a single number characterizing the acoustical performance.

References to standards which provide data for single-number evaluation are meant to be examples and therefore are not complete.

Acoustics — Rating of sound insulation in buildings and of building elements —

Part 1:
Airborne sound insulation

1 Scope

This document

a) defines single-number quantities for airborne sound insulation in buildings and of building elements such as walls, floors, doors, and windows,

b) takes into consideration the different sound level spectra of various noise sources such as noise sources inside a building and traffic outside a building, and

c) gives rules for determining these quantities from the results of measurements carried out in one-third-octave or octave bands for example in accordance with ISO 10140-2 and ISO 16283-1.

The single-number quantities in accordance with this document are intended for rating airborne sound insulation and for simplifying the formulation of acoustical requirements in building codes. An additional single-number evaluation in steps of 0,1 dB is indicated for the expression of uncertainty (except for spectrum adaptation terms). The required numerical values of the single-number quantities are specified according to varying needs. The single-number quantities are based on results of measurements in one-third-octave bands or octave bands.

For laboratory measurements made in accordance with ISO 10140-2, single-number quantities are calculated using one-third-octave bands only.

The rating of results of measurements carried out over an enlarged frequency range is dealt with in Annex B.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10140-1:2016, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 1: Application rules for specific products*

ISO 10140-2:2010, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurement of airborne sound insulation*

ISO 10140-5:2010, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 5: Requirements for test facilities and equipment*

ISO 10848-2:2017, *Acoustics — Laboratory and field measurement of flanking transmission for airborne, impact and building service equipment sound between adjoining rooms — Part 2: Application to Type B elements when the junction has a small influence*

ISO 15186-1:2000, *Acoustics — Measurement of sound insulation in buildings and of building elements using sound intensity — Part 1: Laboratory measurements*

ISO 16283-1:2014, *Acoustics — Field measurement of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation*

ISO 16283-1:2014/Amd 1:2017, *Acoustics — Field measurement of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation — Amendment 1*

ISO 16283-3:2016, *Acoustics — Field measurement of sound insulation in buildings and of building elements — Part 3: Façade sound insulation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
single-number quantity
<for airborne sound insulation rating> value, in decibels, of the reference curve at 500 Hz after shifting it in accordance with the method specified in this document

Note 1 to entry: Terms and symbols for the single-number quantity used depend on the type of measurement. Examples are listed in Table 1 for airborne sound insulation properties of building elements and in Table 2 for airborne sound insulation in buildings. In general, new single-number quantities are derived in a similar way.

3.2
spectrum adaptation term
value, in decibels, to be added to the single-number rating (e.g. R_w) to take account of the characteristics of particular sound spectra

Note 1 to entry: Two sound spectra are defined (in one-third-octave bands and in octave bands) in this document.

Note 2 to entry: Annex A gives information on the purpose of introducing these two spectrum adaptation terms C and C_{tr}.

4 Procedure for evaluating single-number quantities

4.1 General

The values obtained in accordance with e.g. ISO 10140-2 and ISO 16283-1 are compared with reference values (see 4.2) at the frequencies of measurement within the range 100 Hz to 3 150 Hz for one-third-octave bands and 125 Hz to 2 000 Hz for octave bands.

The comparison shall be carried out as specified in 4.4.

Furthermore, two spectrum adaptation terms shall be calculated (see 4.5) based on two typical spectra within the frequency range as quoted above. These two terms may optionally be supplemented by additional spectrum adaptation terms covering (if need be and if measured data are available) a wider frequency range between 50 Hz and 5 000 Hz.

Table 1 — Single-number quantities of airborne sound insulation properties of building elements

Derived from one-third-octave band values		Defined in	
Single-number quantity	**Term and symbol**		
Weighted sound reduction index, R_w	Sound reduction index, R	ISO 10140-2:2010	Formula (2)
Weighted normalized flanking level difference, $D_{n,f,w}$	Normalized flanking level difference, $D_{n,f}$	ISO 10848-2:2017	Subclause 3.1
Weighted element-normalized level difference, $D_{n,e,w}$	Element-normalized level difference, $D_{n,e}$	ISO 10140-2:2010	Formula (5)
Weighted joint sound insulation index, $R_{s,w}$	Joint sound insulation index, R_s	ISO 10140-1:2016, Annex J	Formula (J.1).
Weighted intensity sound insulation index, $R_{I,W}$	Intensity sound insulation index, R_I	ISO 15186-1:2000	Formula (7)

Table 2 — Single-number quantities of airborne sound insulation in buildings

Derived from one third octave band values or octave band values		Defined in	
Single-number quantity	**Term and symbol**		
Weighted apparent sound reduction index, R'_w	Apparent sound reduction index, R'	ISO 16283-1:2014/ Amd 1:2017	Formula (4)
Weighted apparent sound reduction index, $R'_{45°,w}$	Apparent sound reduction index, $R'_{45°}$	ISO 16283-3: 2016	Subclause 3.12
Weighted apparent sound reduction index, $R'_{tr,s,w}$	Apparent sound reduction index, $R'_{tr,s}$	ISO 16283-3: 2016	Subclause 3.13
Weighted normalized level difference, $D_{n,w}$	Normalized level difference, D_n	ISO 10140-2:2010	Formula (5)
Weighted standardized level difference, $D_{nT,w}$	Standardized level difference, D_{nT}	ISO 16283-1:2014	Formula (2)
Weighted standardized level difference, $D_{ls,2m,nT,w}$ or $D_{tr,2m,nT,w}$	Standardized level difference, $D_{ls,2m,nT}$ or $D_{tr,2m,nT}$	ISO 16283-3:2016	Subclause 3.15
Weighted normalized level difference, $D_{ls,2m,n,w}$ or $D_{tr,2m,n,w}$	Normalized level difference, $D_{ls,2m,n}$ or $D_{tr,2m,n}$	ISO 16283-3:2016	Subclause 3.16

4.2 Reference values

The set of reference values used for comparison with measurement results shall be as given in Table 3. The reference curves are shown in Figure 1 and Figure 2.

Table 3 — Reference values for airborne sound

Frequency	Reference values dB	
Hz	One-third-octave bands	Octave bands
100	33	
125	36	36
160	39	
200	42	
250	45	45
315	48	
400	51	
500	52	52
630	53	
800	54	
1 000	55	55
1 250	56	
1 600	56	
2 000	56	56
2 500	56	
3 150	56	

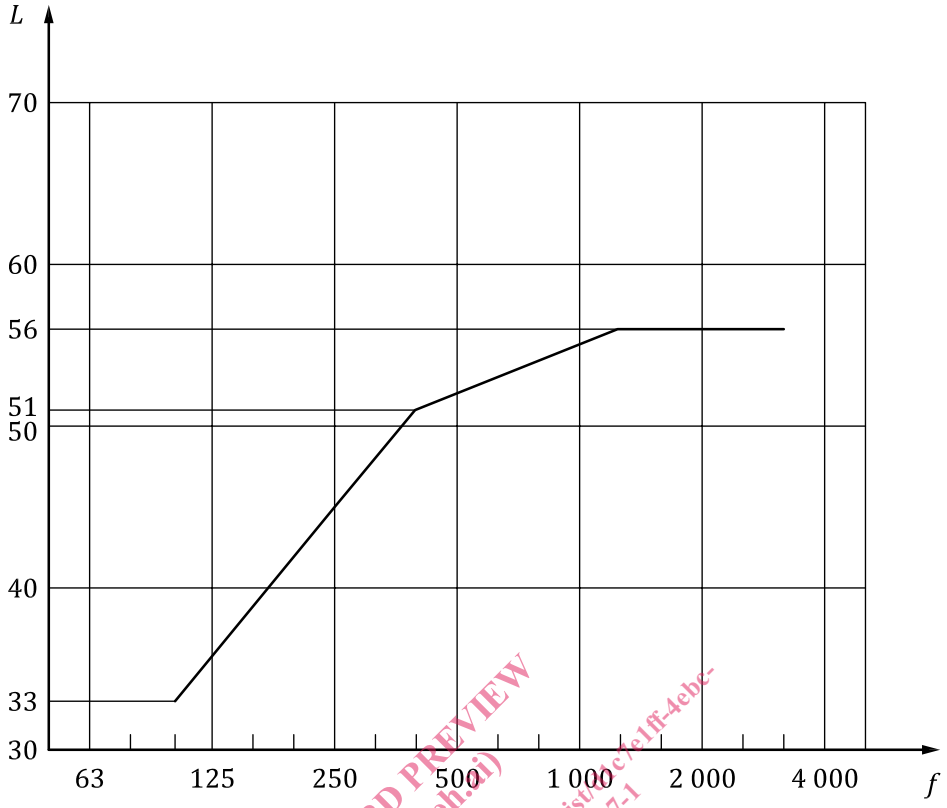
4.3 Sound spectra

The set of sound spectra in one-third-octave bands and octave bands to calculate the spectrum adaptation terms shall be as given in Table 4 and shown in Figure 3 and Figure 4. The spectra are A-weighted and the overall spectrum level is normalized to 0 dB.

4.4 Method of comparison

To evaluate the results of a sound insulation measurement in one-third-octave bands (or octave bands), the measurement data shall be given to one decimal place[1)]. Shift the relevant reference curve in increments of 1 dB (0,1 dB for the expression of uncertainty) towards the measured curve until the sum of unfavourable deviations is as large as possible, but not more than 32,0 dB (measurement in 16 one-third-octave bands) or 10,0 dB (measurement in 5 octave bands).

1) ISO 10140-2 and ISO 16283-1 state that the results shall be reported “to one decimal place”. However, if the octave or one-third-octave values have been reported with more than one decimal digit, the values should be reduced to one decimal place before use in the calculation of the single number rating. This is done by taking the value in tenths of a decibel closest to the reported values: XX,XYZ ZZ ... is rounded to XX,X if Y is less than 5 and to XX,X + 0,1 if Y is equal to or greater than 5. Software developers should ensure that this reduction applies to the true input values and not only to the displayed precision (as shown on the screen or printed on paper). Generally this can be implemented by the following sequence of instructions: multiply the (positive) number XX,XYZ ZZ ... by 10 and add 0,5, take the integer part and then divide the result by 10. For further details see ISO 80000-1[1].



Key

f frequency

L reference value

Figure 1 — Curve of reference values for airborne sound, one-third-octave bands