INTERNATIONAL STANDARD

ISO 717-2

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

Part 2: Impact sound insulation

Acoustique — Évaluation de l'isolement acoustique des immeubles et des éléments de construction —
Partie 2: Protection contre le bruit de choc

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 717-2 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*.

This third edition cancels and replaces the second edition (ISO 717-2:1996), which has been technically revised. It also incorporates the Amendment ISO 717-2:1996/Amd. 1:2006.

The purpose of this revised version is to:

— allow weighting steps of 0,1 dB to be used for expression of uncertainty;

— update references.

ISO 717 consists of the following parts, under the general title *Acoustics — Rating of sound insulation in buildings and of building elements*:

— *Part 1: Airborne sound insulation*

— *Part 2: Impact sound insulation*

Introduction

Methods of measurement of impact sound insulation in buildings and of building elements have been standardized in ISO 10140-3 and ISO 140-7. These methods give values for the impact sound insulation which are frequency dependent. The purpose of this part of ISO 717 is to standardize a method whereby the frequency-dependent values of impact sound insulation can be converted into a single number characterizing the acoustical performance.

The method has been widely used since 1968. However, since there is some evidence that it could be improved, a spectrum adaptation term is added and it is recommended that experience be gathered with this.

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

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

Part 2: Impact sound insulation

1 Scope

This part of ISO 717:

a) defines single-number quantities for impact sound insulation in buildings and of floors;

b) gives rules for determining these quantities from the results of measurements carried out in one-third-octave bands in accordance with ISO 10140-3 and ISO 140-7, and in octave bands in accordance with that option in ISO 140-7 for field measurements only;

c) defines single-number quantities for the impact sound reduction of floor coverings and floating floors calculated from the results of measurements carried out in accordance with ISO 10140-3;

d) specifies a procedure for evaluating the weighted reduction in impact sound pressure level by floor coverings on lightweight floors.

The single-number quantities in accordance with this part of ISO 717 are intended for rating impact 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 rating of results from measurements carried out over an enlarged frequency range is described in Annex A.

A method for obtaining single-number quantities for bare heavy floors according to their performance in combination with floor coverings is described in Annex B.

An example of the calculation of a single-number quantity is given in Annex C.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 140-7:1998, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 7: Field measurements of impact sound insulation of floors*

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

ISO 10140-3:2010, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 3: Measurement of impact sound insulation*

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

3 Terms and definitions

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

3.1
single-number quantity for impact sound insulation rating derived from one-third-octave band measurements
value of the relevant reference curve at 500 Hz after shifting it in accordance with the method specified in this part of ISO 717

Note 1 to entry: This quantity is expressed in decibels.

3.2
single-number quantity for impact sound insulation rating derived from octave band measurements
value of the relevant reference curve at 500 Hz after shifting it in accordance with the method specified in this part of ISO 717, reduced by 5 dB

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 impact sound insulation properties of building elements and in Table 2 for impact sound insulation between rooms in buildings.

Note 2 to entry: In order to distinguish clearly between values with and without flanking transmission, primed symbols (e.g. L'_n) are used to denote values obtained with flanking transmission.

Note 3 to entry: This quantity is expressed in decibels.

3.3
weighted reduction in impact sound pressure level
difference between the weighted normalized impact sound pressure levels derived with a bare heavy reference floor or with a lightweight reference floor without and with a floor covering, obtained in accordance with the method specified in this part of ISO 717

Note 1 to entry: The quantity derived with a bare heavy reference floor is denoted by ΔL_w and is expressed in decibels.

Note 2 to entry: The quantity derived with a bare heavy reference floor is denoted by $\Delta L_{t,w}$ and is expressed in decibels. According to the type of reference floor it may be denoted by $\Delta L_{t1,w}$, $\Delta L_{t2,w}$, $\Delta L_{t3,w}$.

3.4
spectrum adaptation term
C_I
value, in decibels, to be added to the single-number quantity to take account of the unweighted impact sound level, thereby representing the characteristics of typical walking noise spectra

3.5
equivalent weighted normalized impact sound pressure level of a bare heavy floor
sum of the weighted normalized impact sound pressure level of the bare floor under test with the reference floor covering and the weighted reduction in impact sound pressure level of the reference floor covering obtained in accordance with the method specified in this part of ISO 717

Note 1 to entry: This quantity is denoted by $L_{n,eq,0,w}$ and is expressed in decibels.

Table 1 — Single-number quantities of impact sound insulation properties of floors

Derived from one-third-octave band values		Defined in	
Single-number quantity	**Term and symbol**		
Weighted normalized impact sound pressure level, $L_{n,w}$	Normalized impact sound pressure level, L_n	ISO 10140-3:2010	Formula (1)

Table 2 — Single-number quantities of impact sound insulation between rooms in buildings

Derived from one-third-octave band values or octave-band values		Defined in	
Single-number quantity	Term and symbol		
Weighted normalized impact sound pressure level, $L'_{n,w}$	Normalized impact sound pressure level, L'_n	ISO 140-7:1998	Formula (2)
Weighted standardized impact sound pressure level, $L'_{nT,w}$	Standardized impact sound pressure level, L'_{nT}	ISO 140-7:1998	Formula (3)

4 Procedure for evaluating single-number quantities for impact sound insulation rating

4.1 General

The values obtained in accordance with ISO 10140-3 and ISO 140-7 are compared with reference values (see 4.2) at the frequencies of measurement within the range 100 Hz to 3 150 Hz for measurements in one-third-octave bands or 125 Hz to 2 000 Hz for measurements in octave bands.

The comparison shall be carried out in accordance with 4.3.

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 Figures 1 and 2.

NOTE The reference values for the octave bands 125 Hz to 1 000 Hz are equivalent to the energetic sum (rounded to integers) of these for the relevant one-third-octave band values. The reference value for the octave band 2 000 Hz has been reduced to take care of the one-third-octave band 3 150 Hz, which (for bare heavy floors) may contribute considerably to the unfavourable deviations.

4.3 Method of comparison

4.3.1 Measurements in one-third-octave bands

To evaluate the results of a measurement of L_n, L'_n or L'_{nT} in one-third-octave bands, the measurement data shall be given to one decimal place.[1)] Shift the reference curve in increments of 1 dB (0,1 dB for the purpose of 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.

An unfavourable deviation at a particular frequency occurs when the results of measurements exceed the reference value. Only the unfavourable deviations shall be taken into account.

The value, in decibels, of the reference curve at 500 Hz, after shifting it in accordance with this procedure, is $L_{n,w}$, $L'_{n,w}$ or $L'_{nT,w}$ respectively.

1) The different parts of ISO 140 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 shall 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]

Table 3 — Reference values for impact sound

Frequency	Reference values dB	
Hz	One-third-octave bands	Octave bands
100 125 160	62 62 62	67
200 250 315	62 62 62	67
400 500 630	61 60 59	65
800 1 000 1 250	58 57 54	62
1 600 2 000 2 500	51 48 45	49
3 150	42	

4.3.2 Measurements in octave bands

To evaluate the results of a measurement of L'_{n} or $L'_{\mathrm{n}T}$ in octave bands, the measurement data shall be given to one decimal place.[1)] Shift the reference curve in increments of 1 dB (0,1 dB for the purpose of expression of uncertainty) towards the measured curve until the sum of unfavourable deviations is as large as possible but not more than 10,0 dB.

The value, in decibels, of the reference curve at 500 Hz, after shifting it in accordance with this procedure and then reducing it by 5 dB is $L'_{\mathrm{n,w}}$ or $L'_{\mathrm{n}T,\mathrm{w}}$, respectively.

An unfavourable deviation at a particular frequency occurs when the results of measurements exceed the reference value. Take into account only the unfavourable deviations.

4.4 Statement of results

The appropriate single-number quantity shall be given with reference to this part of ISO 717. The results of measurements shall also be given in the form of a diagram as specified in ISO 10140-3 and ISO 140-7.

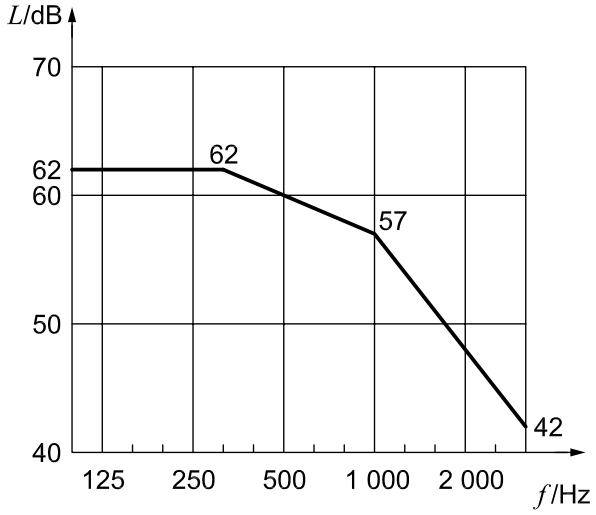
The uncertainty of the weighted single-number quantities may also be stated. In this case the numbers shall be given to one decimal place.

EXAMPLE

$$L_{\mathrm{n,w}} = 53{,}2\ \mathrm{dB} \pm 0{,}8\ \mathrm{dB}$$

Spectrum adaptation terms do not have uncertainty values of their own.

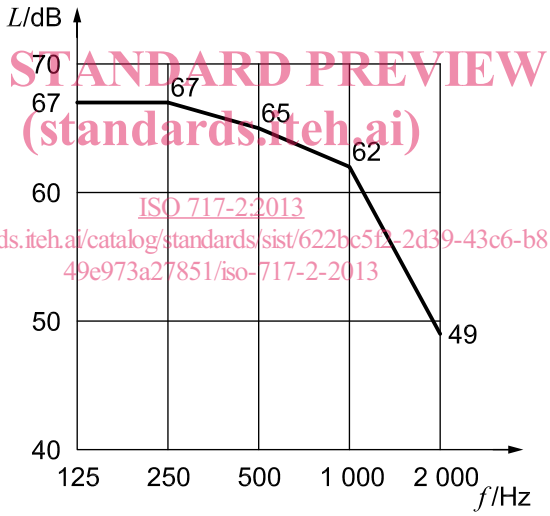
For field measurements in accordance with ISO 140-7, it shall be stated whether the single-number quantity is calculated from measuring results in one-third-octave bands or octave bands. In general, there can be differences between single-number quantities calculated from one-third-octave or octave band measurements of about ±1 dB. Ratings based on one-third-octave band measurements are preferred.



Key

L	reference value	f	frequency

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



Key

L	reference value	f	frequency

Figure 2 — Curve of reference values for impact sound, octave bands

5 Procedure for evaluating the weighted reduction in impact sound pressure level by floor coverings on bare heavy floors

5.1 General

The reduction of impact sound pressure level (improvement of impact sound insulation), ΔL, of floor coverings when tested on a homogeneous concrete slab floor as described in ISO 10140-1 is independent of the normalized impact sound pressure level of the bare floor, $L_{n,0}$. However, the weighted normalized impact sound pressure levels of the floor with and without a floor covering depend to some extent on $L_{n,0}$. In order to obtain comparable values for ΔL_w between laboratories, it is therefore necessary to relate the measured values of ΔL to a reference floor.