IS : 11050 (Part 2)-1984
ISO 717/2-1982

UDC 699'84 : 534'833'522'4

Indian Standard

RATING OF SOUND INSULATION IN BUILDINGS AND OF BUILDING ELEMENTS

PART 2 IMPACT SOUND INSULATION

(ISO Title : Acoustics — Rating of Sound Insulation in Buildings and of Building Elements — Part 2 : Impact Sound Insulation)

National Foreword

This Indian Standard (Part 2) which is identical with ISO 717/2-1982 ' Acoustics — Rating of sound insulation in buildings and of building elements — Part 2 : Impact sound insulation ', issued by the International Organization for Standardization (ISO), was adopted by the Indian Standards Institution on the recommendation of Acoustics Sectional Committee and approved by the Electronics and Telecommunication Division Council.

In the adopted standard certain terminology and conventions are not identical with those used in Indian Standards, attention is especially drawn to the following :

Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

Cross Reference

In this Indian Standard, the following International Standards are referred to. Please read in their respective place the following Indian Standard :

International Standards	*Indian Standards*
ISO 140 Acoutics — Measurement of sound insulation in buildings and of building elements :	IS : 9901 Measurement of sound insulation in buildings and of building elements :
Part 6 : Laboratory measurements of impact sound insulation of floors	Part 6 Laboratory measurements of impact sound insulation of floors (Technically equivalent)
Part 7 : Field measurements of impact sound insulation of floors	Part 7 Field measurements of impact sound insulation of floors (Technically equivalent)
Part 8 : Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a standard floor	Part 8 Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a standard floor (Technically equivalent)

Adopted 15 October 1984

Gr 4

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

0 Introduction

Methods of measurement of impact sound insulation in buildings and of building elements have been standardized in ISO 140/6, ISO 140/7 and ISO 140/8. 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.

1 Scope and field of application

This part of ISO 717

— defines single-number quantities for the impact sound insulation in buildings and of floors, and

— gives rules for determining these quantities from the results of measurements carried out in one-third octave bands according to ISO 140/6 and ISO 140/7.

The single-number quantities according to this part of ISO 717 are intended for rating the impact sound insulation and for simplifying the formulation of acoustical requirements in building codes. The required numerical values of the single-number quantities can be specified according to varying needs.

Methods for obtaining single-number quantities

— for floor coverings from the results of measurements carried out in one-third octave bands according to ISO 140/8, and

— for bare concrete floors according to their performance in combination with soft floor coverings

are described in annexes A and B.

Annexes A and B do not form an integral part of this part of ISO 717.

2 References

ISO 140, *Acoustics — Measurement of sound insulation in buildings and of building elements*

Part 6 : Laboratory measurements of impact sound insulation of floors.

Part 7 : Field measurements of impact sound insulation of floors.

Part 8 : Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a standard floor.

3 Definitions

3.1 single-number quantity of impact sound insulation rating : The value, in decibels, of the reference curve at 500 Hz after shifting it according to the method laid down in this part of ISO 717.

Terms and symbols for the single-number quantity used depend on the type of measurement. They 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 — In order to distinguish clearly between values with and without flanking transmission, primed symbols (for example L'_n) are used to denote values obtained with flanking transmission.

3.2 margin : The shifting of the reference curve, necessary in order to satisfy the deviation requirement laid down in this part of ISO 717. The margin is expressed in decibels and is positive when the reference curve has to be shifted in the favourable direction and negative if it has to be shifted in the unfavourable direction.

The **impact sound protection margin** is denoted by M_i or M'_i.

NOTE — The following relations exist between the single-number quantities listed in table 1 and the margins :

$$M_i = 60 \text{ dB} - L_{n,w}$$

or

$$M'_i = 60 \text{ dB} - L'_{n,w}$$

4 Procedure for evaluating single-number quantities

4.1 General

The values obtained according to ISO 140/6 and ISO 140/7 are compared with reference values (see 4.2) at the frequencies of measurement within the range of 100 to 3 150 Hz.

The comparison is carried out according to 4.3.

4.2 Reference values

The set of reference values used for comparison with measurement results is specified in table 3 and shown in the figure.

4.3 Method of comparison

To evaluate the results of a measurement of L_n, L'_n or L'_{nT} in one-third octave bands (preferably given to one decimal place), the reference curve is shifted in steps of 1 dB towards the measured curve until the mean unfavourable deviation, calculated by dividing the sum of the unfavourable deviations by the total number (i.e. 16) of measurement frequencies, is as large as possible but not more than 2,0 dB. An unfavourable deviation at a particular frequency occurs when the result of measurements **exceeds** the reference value. Only the unfavourable deviations are taken into account.

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

In addition, the maximum unfavourable deviation at any frequency shall be recorded, if it exceeds 8,0 dB.

5 Statement of results

The appropriate single-number quantity and/or the corresponding margin shall be given with reference to this part of ISO 717. Also, the maximum unfavourable deviation shall be reported, if it exceeds 8,0 dB.

The results of measurements shall also be given in the form of a diagram as specified in ISO 140/6 and ISO 140/7, and shall include the shifted reference curve exemplified in the figure.

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

Single-number quantity	Symbol	Derived from one-third octave band values			
		name	symbol	defined in ISO 140 part	defined in ISO 140 formula
Weighted normalized impact sound pressure level	$L_{n,w}$	normalized impact sound pressure level	L_n	6	(2)
	$L'_{n,w}$ *		L'_n	6 7	(2) (2)

* Formerly known as "impact sound index, I_i".

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

Single-number quantity	Symbol	Derived from one-third octave band values			
		name	symbol	defined in ISO 140 part	defined in ISO 140 formula
Weighted standardized impact sound pressure level	$L'_{nT,w}$	standardized impact sound pressure level	L'_{nT}	7	(3)

Table 3 — Reference values for impact sound[1)]

Frequency	Reference value
Hz	dB
100	62
125	62
160	62
200	62
250	62
315	62
400	61
500	60
630	59
800	58
1 000	57
1 250	54
1 600	51
2 000	48
2 500	45
3 150	42

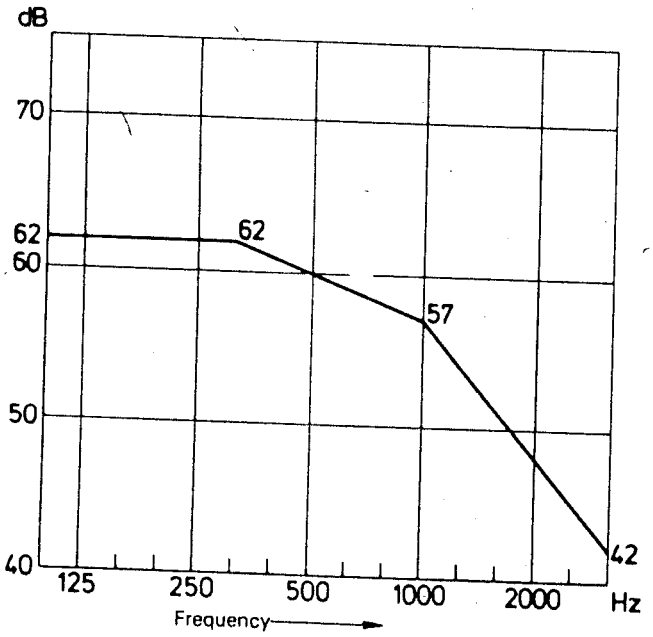

Figure — Curve of reference values for impact sound

1) These reference values are 5 dB lower than the corresponding reference values given in ISO/R 717. In this part of ISO 717, the evaluation of the single-number quantity for impact sound insulation has been restricted to one-third octave band measurements. As a consequence, the adjustment to octave band levels (by adding 5 dB) has been dropped.

In this way the impact sound protection margin M_i according to this part of ISO 717 and the impact protection margin M_i according to ISO/R 717 have the same numerical value. However, the numerical value for $L'_{n,w}$ will be 5 dB less than the impact sound index I_i previously used in ISO/R 717.

Annex A

Recommended procedure for evaluating the weighted impact sound improvement index of floor coverings

(This annex does not form part of the standard.)

A.1 Definition

weighted impact sound improvement index : Difference of the weighted normalized impact sound pressure levels of a reference floor without and with a floor covering obtained according to the method laid down in this part of ISO 717. This quantity is denoted by ΔL_w.

A.2 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 is independent of the normalized impact sound pressure level of the bare floor $L_{n,0}$. However, the weighted impact sound improvement index ΔL_w depends to some extent on $L_{n,0}$. In order to obtain similar values for ΔL_w between laboratories it is therefore necessary to relate the measured values of ΔL to a reference floor.

A.3 Reference floor

The reference floor is defined by the values for the normalized impact sound pressure level $L_{n,r,0}$ in table 4.

Table 4 — Normalized impact sound pressure level of the reference floor

Frequency	$L_{n,r,0}$
Hz	dB
100	67
125	67,5
160	68
200	68,5
250	69
315	69,5
400	70
500	70,5
630	71
800	71,5
1 000	72
1 250	72
1 600	72
2 000	72
2 500	72
3 150	72

The weighted normalized impact sound pressure level of the reference floor $L_{n,w,r,0}$, evaluated according to clause 4, is 78 dB.

NOTE — In ISO 140/8, a standard floor is described, on which the test floor covering is installed. It consists of a homogeneous reinforced concrete slab of thickness 120 ± 20 mm. The values given in table 4 represent a straight-line idealisation of the normalized impact sound pressure level of such a standard floor, levelling off, as in the practical case, at frequencies about 1 000 Hz.

A.4 Calculation

The weighted impact sound improvement index ΔL_w is calculated according to the following formulae :

$$L_{n,r} = L_{n,r,0} - \Delta L$$

$$\Delta L_w = L_{n,w,r,0} - L_{n,w,r}$$

$$= 78 \text{ dB} - L_{n,w,r}$$

where

ΔL is the reduction of impact sound pressure level measured according to ISO 140/8;

$L_{n,r,0}$ is the defined normalized impact sound pressure level of the reference floor (see table 4);

$L_{n,r}$ is the calculated normalized impact sound pressure level of the reference floor with the floor covering under test;

$L_{n,w,r}$ is the calculated weighted normalized impact sound pressure level of the reference floor with the floor covering under test.

$L_{n,w,r}$ is obtained from $L_{n,r}$ according to 4.3.

A.5 Statement of results

See clause 5.

Annex B

Recommended procedure for evaluating the equivalent weighted normalized impact sound pressure level of bare concrete floors

(This annex does not form part of the standard.)

B.1 Definition

equivalent weighted normalized impact sound pressure level of a bare concrete floor : Sum of the weighted normalized impact sound pressure level of the bare floor under test with the reference floor covering and the weighted impact sound improvement index of the reference floor covering obtained according to the method laid down in this part of ISO 717. This quantity is denoted by $L_{n,w,eq,0}$.

B.2 General

For the rating of impact sound properties of floors in general the weighted normalized impact sound pressure level $L_{n,w}$ or $L'_{n,w}$ is used. However, a bare concrete floor is seldom used without a floor covering. In view of this a more realistic rating of the bare floor is obtained by taking into account the influence of a reference floor covering. The equivalent weighted normalized impact sound pressure level of the bare floor $L_{n,w,eq,0}$ thus determined can be used to calculate the weighted normalized impact sound pressure level $L_{n,w}$ of this bare floor with a floor covering with known ΔL_w :

$$L_{n,w} = L_{n,w,eq,0} - \Delta L_w$$

Conversely, when using this bare floor the required weighted impact sound improvement index ΔL_w of a floor covering, necessary for meeting a given specification for the finished floor, can be determined.

B.3 Reference floor covering

The reference floor covering is defined by the values for the reduction of impact sound pressure level (improvement of impact sound insulation) ΔL_r in table 5.

Table 5 — Reduction of impact sound pressure level of the reference floor covering

Frequency	ΔL_r
Hz	dB
100	0
125	0
160	0
200	2
250	6
315	10
400	14
500	18
630	22
800	26
1 000	30
1 250	30
1 600	30
2 000	30
2 500	30
3 150	30

The weighted sound improvement index of the reference floor covering ΔL_w, evaluated according to annex A, is 19 dB.

NOTE — The values given in table 5 represent a straight-line idealisation of the general shape of the improvement of impact sound insulation of a floor covering, with a slope of 12 dB per octave.

B.4 Calculation

The equivalent weighted normalized impact sound pressure level of bare concrete floors $L_{n,w,eq,0}$ is calculated according to the following formulae :

$$L_{n,1} = L_{n,0} - \Delta L_r$$

$$L_{n,w,eq,0} = L_{n,w,1} + \Delta L_{w,r}$$

$$= L_{n,w,1} + 19 \text{ dB}$$

where

$L_{n,1}$ is the calculated normalized impact sound pressure level of the floor under test with the reference floor covering;

$L_{n,0}$ is the normalized impact sound pressure level of the bare floor under test measured according to ISO 140/6;

ΔL_r is the defined reduction of impact sound pressure level of the reference floor covering (see table 5);

$L_{n,w,1}$ is the calculated weighted normalized impact sound pressure level of the floor under test with the reference floor covering.

$L_{n,w,1}$ is obtained from $L_{n,1}$ according to 4.3.

B.5 Statement of results

See clause 5.

Printed at Simco Printing Press, Delhi, India