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Acoustics — Measurement of sound insulation in buildings and of building elements using sound intensity —

Part 1: Laboratory measurements

*Acoustique — Mesurage par intensité de l'isolation acoustique des
immeubles et des éléments de construction —*

Partie 1: Mesurages en laboratoire



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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 3.

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 part of ISO 15186 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15186-1 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*.

ISO 15186 consists of the following parts, under the general title *Acoustics — Measurement of sound insulation in buildings and of building elements using sound intensity*:

- *Part 1: Laboratory measurements*
- *Part 2: Field measurements*
- *Part 3: Laboratory measurements at low frequencies*

Annexes A and B of this part of ISO 15186 are for information only.

Acoustics — Measurement of sound insulation in buildings and of building elements using sound intensity —

Part 1: Laboratory measurements

1 Scope

This part of ISO 15186 specifies a sound intensity method to determine the sound reduction index and the element-normalized level difference of building elements. The method can be used as an alternative to ISO 140-3 and ISO 140-10 respectively. One important use is when the traditional ISO 140-3 method fails because of high flanking transmission.

The reproducibility of this intensity method is estimated to be equal to or better than that of ISO 140-3.

NOTE Some information about the accuracy with which this part of ISO 15186 can reproduce the sound reduction index measured according to ISO 140-3 is given in annex A.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 15186. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 15186 are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 140-1, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 1: Requirements for laboratory test facilities with suppressed flanking transmission.*

ISO 140-3, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 3: Laboratory measurements of airborne sound insulation of building elements.*

ISO 140-10, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 10: Laboratory measurement of airborne sound insulation of small building elements.*

ISO 9614-1:1993, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Measurement at discrete points.*

IEC 60942, *Sound calibrators.*

IEC 61043, *Electroacoustics — Instruments for the measurement of sound intensity — Measurement with pairs of pressure sensing microphones.*

3 Terms and definitions

For the purposes of this part of ISO 15186, the following terms and definitions apply.

3.1

average sound pressure level in a source room

L_{p1}

ten times the logarithm to the base 10 of the ratio of the space and time average of the sound pressure squared to the square of the reference sound pressure, the space average being taken over the entire room with the exception of those parts where the direct radiation of a sound source or the near field of the boundaries (wall, window, etc.) is of significant influence

NOTE 1 This quantity is given in decibels.

NOTE 2 For a complete definition, see ISO 140-3.

3.2

sound reduction index

R

ten times the logarithm to the base 10 of the ratio of the sound power W_1 incident on the test specimen to the sound power W_2 transmitted through the specimen

$$R = 10 \lg \left(\frac{W_1}{W_2} \right) \text{ dB} \quad (1)$$

NOTE The expression "sound transmission loss" is also in use.

3.3

sound intensity

I

time-averaged rate of flow of sound energy per unit area oriented normal to the local particle velocity; this is a vectorial quantity which is equal to

$$\vec{I} = \frac{1}{T} \int_0^T p(t) \cdot \vec{u}(t) \cdot dt \quad (2)$$

where

$p(t)$ is the instantaneous sound pressure at a point, in pascals;

$\vec{u}(t)$ is the instantaneous particle velocity at the same point, in metres per second;

T is the averaging time, in seconds

NOTE Sound intensity is measured in watts per square metre.

3.4

normal sound intensity

I_n

component of the sound intensity in the direction normal to a measurement surface defined by the unit normal vector $\vec{n}$:

$$I_n = \vec{I} \cdot \vec{n} \quad (3)$$

where $\vec{n}$ is the unit normal vector directed out of the volume enclosed by the measurement surface

3.5

normal sound intensity level

L_{In}

ten times the logarithm to the base 10 of the ratio of the unsigned value of the normal sound intensity to the reference intensity I_0 , as given by: