

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

Part 3: Laboratory measurement of airborne sound insulation of building elements

The European Standard EN ISO 140-3:1995, with the incorporation of amendment A1:2004, has the status of a British Standard

ICS 17.140.40

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee EPC/1, Acoustics, upon which the following bodies were represented:

- Association of Consulting Engineers
- British Broadcasting Corporation
- British Occupational Hygiene Society
- British Telecommunications plc
- Department of the Environment (Building Research Establishment)
- Department of Health
- Department of Trade and Industry (National Physical Laboratory)
- Health and Safety Executive
- Institute of Acoustics
- Institute of Occupational Hygienists
- Institute of Sound and Vibration Research
- Institution of Electrical Engineers
- Royal Institute of British Architects
- Society of Environmental Engineers

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Access Flooring Association
- Aggregate Concrete Block Association
- Association of Building Component Manufacturers
- Association of Building Engineers
- Association of Manufacturers of Domestic Unvented Supply Systems Equipment
- Autoclaved Aerated Concrete Products Association
- Brick Development Association
- British Bathroom Council
- British Ceramic Research Ltd.
- British Precast Concrete Federation Ltd.
- Calcium Silicate Brick Association Ltd.
- Concrete Block Association
- Concrete Society
- Gypsum Products Development Association
- Heriot-Watt University
- Hevac Association
- Institute of Physics
- Sound and Communications Industries Federation
- Suspended Ceilings Association

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National foreword

This British Standard has been prepared by Technical Committee EPC/1 and is the official English language version of EN ISO 140-3:1995, including amendment A1:2004, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 3: Laboratory measurement of airborne sound insulation of building elements*, published by the European Committee for Standardization (CEN), which is identical with ISO 140-3:1995 *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 3: Laboratory measurement of airborne sound insulation of building elements*, published by the International Organization for Standardization (ISO). This supersedes the standard BS 2750-3:1980 which is withdrawn.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

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English version

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(includes amendment A1:2004)
(ISO 140-3:1995 + A1:2004)

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construction — Partie 3: Mesurage en
laboratoire de l'affaiblissement des bruits
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Akustik — Messung der Schalldämmung in
Gebäuden und von Bauteilen —
Teil 3: Messungen der Luftschalldämmung von
Bauteilen in Prüfständen
(enthält Änderung A1:2004)
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This European Standard was approved by CEN on 1995-01-11, and amendment A1 was approved by CEN on 2004-08-08. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CEN

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Foreword

The text of the International Standard ISO 140-3:1995 has been prepared by Technical Committee ISO/TC 43, Acoustics, in collaboration with CEN/TC 126, Acoustic properties of building products and of buildings. It has been submitted to Parallel Vote and has been approved on 1995-01-11 as a European Standard.

This European Standard shall be given the status of a National Standard, either by publication of an identical text or by endorsement, at the latest by November 1995, and conflicting national standards shall be withdrawn at the latest by June 1997.

According to CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

NOTE Normative references to international publications are listed in Annex ZA (normative).

Foreword to amendment A1

This document (EN ISO 140-3:1995/A1:2004) has been prepared by Technical Committee CEN/TC 126, Acoustic properties of building elements and of buildings, the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 43, Acoustics.

This Amendment to the European Standard EN ISO 140-3:1995 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2005, and conflicting national standards shall be withdrawn at the latest by June 2005.

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Introduction

Evaluation of the results of a European Inter Laboratory Test in 1998 showed that the requirements given in ISO 140-1 are inadequate for lightweight twin partitions therefore Annex H has been added.

1 Scope

This part of ISO 140 specifies a laboratory method of measuring the airborne sound insulation of building elements such as walls, floors, doors, windows, façade elements and façades, except those classified as small building elements (for which a measuring method is specified in ISO 140-10¹⁾).

The results obtained can be used to design building elements with appropriate acoustic properties, to compare the sound insulation properties of building elements and to classify such elements according to their sound insulation capabilities.

The measurements are performed in laboratory test facilities in which transmission of sound on flanking paths is suppressed. Results of measurements made in accordance with this part of ISO 140 therefore shall not be applied directly in the field without accounting for other factors affecting sound insulation, especially flanking transmission and loss factor.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 140. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 140 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 140-1:—²⁾, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 1: Requirements for laboratory test facilities with suppressed flanking transmission.*

ISO 140-2:1991, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 2: Determination, verification and application of precision data.*

ISO 354:1985, *Acoustics — Measurement of sound absorption in a reverberation room.*

ISO 717-1:—³⁾, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation.*

IEC 225:1966, *Octave, half-octave and third-octave band filters intended for the analysis of sounds and vibrations.*

IEC 651:1979, *Sound level meters.*

IEC 804:1985, *Integrating-averaging sound level meters.*

IEC 942:1988, *Sound calibrators.*

3 Definitions

For the purposes of this part of ISO 140, the following definitions apply.

3.1

average sound pressure level in a room

ten times the common logarithm of the ratio of the space and time average of the squared sound pressure 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 (walls, etc.) is of significant influence

This quantity is denoted by L and is expressed in decibels.

If a continuously moving microphone is used, L is determined by

$$L = 10 \lg \frac{\frac{1}{T_m} \int_0^{T_m} p^2(t) dt}{p_0^2} \quad \text{dB} \quad \dots(1)$$

¹⁾ ISO 140-10:1991, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 10: Laboratory measurement of airborne sound insulation of small building elements.*

²⁾ To be published. (Revision of ISO 140-1:1990)

³⁾ To be published. (Revision of ISO 717-1:1982)

where

- p is the sound pressure, in pascals;
- p_0 is the reference sound pressure and is equal to 20 µPa;
- T_m is the integration time, in seconds.

If fixed microphone positions are used, L is determined by

$$L = 10 \lg \frac{p_1^2 + p_2^2 + \dots + p_n^2}{np_0^2} \text{ dB} \quad \dots(2)$$

where $p_1, p_2, \dots, p_n$ are r.m.s. sound pressures at n different positions in the room. In practice, usually the sound pressure levels L_i are measured. In this case L is determined by

$$L = 10 \lg \frac{1}{n} \sum_{i=1}^n 10^{L_i/10} \text{ dB} \quad \dots(3)$$

where L_i are the sound pressure levels L_1 to L_n at n different positions in the room.

3.2

sound reduction index

ten times the common logarithm of the ratio of the sound power W_1 which is incident on a partition under test to the sound power W_2 transmitted through the specimen

This quantity is denoted by R and is expressed in decibels.

$$R = 10 \lg \frac{W_1}{W_2} \text{ dB} \quad \dots(4)$$

In this part of ISO 140 the sound reduction index is evaluated from

$$R = L_1 - L_2 + 10 \lg \frac{S}{A} \text{ dB} \quad \dots(5)$$

where

- L_1 is the average sound pressure level in the source room, in decibels;
- L_2 is the average sound pressure level in the receiving room, in decibels;
- S is the area of the test specimen, in square metres, which is equal to the free test opening;
- A is the equivalent sound absorption area in the receiving room, in square metres.

NOTE 1 The derivation of equation (5) from equation (4) assumes that the sound fields are perfectly diffuse and that the sound radiated into the receiving room is transmitted only through the specimen.

NOTE 2 The expression "sound transmission loss" (TL) is also in use in English-speaking countries. It is equivalent to "sound reduction index".

3.3

apparent sound reduction index

ten times the common logarithm of the ratio of the sound power W_1 which is incident on a partition under test to the total sound power transmitted into the receiving room if, in addition to the sound power W_2 transmitted through the specimen, the sound power W_3 , transmitted by flanking elements or by other components, is significant

This quantity is denoted by R' and is expressed in decibels.

$$R' = 10 \lg \left(\frac{W_1}{W_2 + W_3} \right) \text{ dB} \quad \dots(6)$$