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Acoustics — Laboratory measurement of the reduction of transmitted impact noise by floor coverings on a small floor mock-up —

Part 1:
Heavyweight compact floor

Acoustique — Mesurage en laboratoire de la réduction de la transmission du bruit de choc par les revêtements de sol sur un plancher normalisé de dimensions réduites —

Partie 1: Plancher lourd

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ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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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 16251-1 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*.

ISO 16251 consists of the following parts, under the general title *Acoustics — Laboratory measurement of the reduction of transmitted impact noise by floor coverings on a small floor mock-up*:

— *Part 1: Heavyweight compact floor*

— *Part 2: Lightweight compact floor*

Introduction

The improvement of impact sound reduction is the main quantity for describing the acoustic behaviour of floor coverings. Its determination is described in ISO 10140 and requires the use of a special test facility. This facility consists of two rooms of at least 50 m^3 each, separated by an approximately 14 cm thick concrete slab or a special timber joist floor. Manufacturers of floor coverings see the advantage of having their own test facilities but the investment often cannot be afforded by the small- and medium-sized enterprises. This International Standard aims to reduce the effort for the determination of the impact sound reduction. A standardized test method is provided, which yields results comparable to those gained with ISO 10140.

Acoustics — Laboratory measurement of the reduction of transmitted impact noise by floor coverings on a small floor mock-up —

Part 1:
Heavyweight compact floor

1 Scope

This part of ISO 16251 specifies a laboratory measurement method to determine the improvement of impact sound insulation by a floor covering when laid on a standard concrete floor mock-up and excited by a standard tapping machine. The method is restricted to soft, flexible floor coverings, which transmit impact sound mainly "locally" into the floor, i.e. through the area close to the points of excitation, so that the size of the flooring specimen does not have an influence on the results. Examples for such floors are carpets, PVC floor coverings, and linoleum. These floor coverings correspond to 'category I' of ISO 10140-1, Annex H.

The results only provide information about the noise radiated. A subjective classification of the quality of the floor coverings is not intended.

The method is kept as close as possible to ISO 10140 and yields the same results within the range of uncertainty and within the range of application.

This part of ISO 16251 provides the measurement method. Product test codes may contain further requirements concerning the specimens, such as temperature range, the number of test specimens or special mounting conditions.

NOTE If other than soft, flexible floorings are tested (like laminate floors e.g.), one has to face increased deviations from results of the ISO 10140 method due to the dependency on the specimen size.

2 Normative references

The following referenced documents are indispensable for the application 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 (all parts), *Acoustics — Measurement of sound insulation in buildings and of building elements*

ISO 717-2:1996, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 2: Impact sound insulation*

ISO 5348, *Mechanical vibration and shock — Mechanical mounting of accelerometers*

ISO 16063 (all parts), *Methods for the calibration of vibration and shock transducers*

IEC 61260, *Electroacoustics — Octave-Band and Fractional-Octave-Band Filters*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms and definitions

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

3.1
Vibratory acceleration level
L_a
value given by equation (1):

$$L_a = 10 \lg \frac{1}{T_m} \int_0^{T_m} \frac{a(t)^2 \, dt}{a_0^2} \, dB \qquad (1)$$

where:

T_m is the integration time, in seconds,

a is the acceleration, in m/s^2,

a_0 is the reference acceleration (1 × 10^{-6} m/s^2);

3.2
Improvement of impact sound insulation
ΔL
reduction of the vibratory acceleration level resulting from installation of the test floor covering for a given one-third octave band

NOTE 1 TO ENTRY It is expressed in decibels.

3.3
Locally reacting floor coverings
floor coverings, where the impact is transmitted into the bearing floor predominantly through the area directly excited by the hammers of the tapping machine

NOTE 2 TO ENTRY Thus the improvement of impact sound insulation does not depend on the size of the specimen.

4 Principle

The method in this part of ISO 16251 directly stems from ISO 10140, where the test set-up consists of two rooms above each other, separated by a standard concrete floor, on which the flooring to be tested is applied. In this International Standard, the two rooms are removed and the concrete floor is replaced by a small concrete plate of similar thickness (see Annex A). This plate is structurally decoupled from the surroundings by elastic suspensions. As in ISO 10140, a standard tapping machine is used as an impact source and two sound levels "in the lower room" are determined, once with and once without the specimen on the plate. However, instead of the sound pressure level in the lower room, the structure borne sound level at the lower surface of the concrete plate is determined. It is assumed that for locally reacting floor coverings the structure borne sound level difference equals the impact sound reduction according to ISO 10140.

In this part of ISO 16251, structure borne sound levels are expressed in terms of acceleration levels. Nevertheless the same procedures can be applied when measuring velocity or displacement levels instead.

5 Equipment

5.1 Test setup

The setup is shown in Annex A. It consists of a concrete slab, which is softly supported at its four corners. The area of each elastic support shall not exceed 10 cm × 10 cm. The vertical resonance of the concrete slab on the elastic bearings shall lie below 20 Hz.

The size of the slab shall be (120 ± 5) cm ×(80 ± 5) cm × (20 ± 1) cm. It shall be homogeneous and of uniform thickness. It shall be ensured that the surface of the slab is flat to ± 1 mm in a horizontal line from edge to edge, and sufficiently hard to endure the impacts of the tapping machine. A screed is allowed to provide sufficient flatness.

5.2 Instruments

The vibratory acceleration is measured by one or more accelerometers. The signals generated by the accelerometers shall be amplified, filtered in third-octave bands and indicated as r.m.s. values. The structure-borne noise shall be measured with a sound level meter or an equivalent measurement system complying at least with the requirements for a class 1 instrument as specified in IEC 61672-1 with the microphone replaced by the accelerometer. The filters shall be in accordance with IEC 61260, class 1.

The tapping machine shall meet the requirements given in ISO 10140.

The vibration calibration shall comply with the requirements of IEC 16063.

Because of the dynamic characteristics of the acceleration signals, some measurement chains may produce erroneous results, although meeting all above-mentioned specifications for accelerometers, sound level meters, and filters. Before using a measurement chain for the first time, the correct functioning of the chain has to be ensured, for example by a comparison with measurements according to ISO 10140.

6 Test procedure

6.1 Installing the specimens

The test specimens shall be big enough to place the whole tapping machine on it, but not larger than the upper surface of the concrete slab. The manufacturer's installation instructions shall be applied, paying attention especially to the edges of the specimens to avoid lifting.

6.2 Placement of tapping machine and accelerometers

The accelerometer(s) shall be rigidly attached to the lower surface of the concrete slab (screwed, glued or using beeswax). Incorrect measurements may be caused by poor fixing and cable routing or by environmental conditions such as strong electric or magnetic fields, temperature or temperature transients. For details see ISO 5348 and the recommendations of the manufacturer of the equipment.

At least four accelerometer positions shall be used. They shall be uniformly but randomly distributed over the lower surface of the slab, avoiding symmetric lines and keeping away at least 10 cm from the edges of the slab.

The tapping machine shall be used in at least two positions, avoiding symmetry and parallelism to the edges of the plate and with a minimum distance of 30 cm from each other. No hammer shall be closer to the edges of the plate than 10 cm. If placed on a specimen, the tapping machine must stand on it with all its feet.