Empa
Überlandstrasse 129
CH-8600 Dübendorf
T +41 44 823 55 11
F +41 44 821 62 44
www.empa.ch

Materials Science & Technology

ISOLMANT-TECNASFALTI SRL
Via Umbria 8
I-20098 San Giuliano Milanese

# Test Report
# Nr. 449619.4e
**int. No. 632.5640**

| | | | |
|---|---|---|---|
| Test assignment: | **Measurement of the impact sound insulation of a floor covering placed under a prefabricated plate** partially according to EN ISO 140-8 (1997) and according to EN ISO 717-2 (1996) | | |
| Test object: | **ISOLMANT BiPlus under a plate of 120 mm** (Layout: see sketch, Side 2) | | |
| Client ref.: | Hr. Scholbe | | |
| Order dated of: | 28.05.2008 | | |
| Test object received: | 03.06.2008 | EMPA-ref.: | 564004 |
| Installation of test object: | 17.06.2008 | Performed by: | M. Würzer |
| Test performed: | 18.06.2008 | Performed by: | M. Würzer |
| Number of pages: | 2 | | |
| Attachments: | 1: Test procedure<br>2: Technical expressions | | |

In this test the elastic floor covering is placed on a concrete ceiling and it is covered by a prefabricated plate of reinforced concrete of 120 mm thickness. The plate is 1.6 times 1.9 m (3 $m^2$). This test setup deviates from the Standard EN ISO 140-8 in two aspects: The size of the specimen is smaller than 10 $m^2$ and the use of a perfectly flat, prefabricated plate does not correspond to the specific mounting installation conditions of a floor covering on a building site (paragraphs 5.3.2 and 5.3.3.2). Thus, deviations between the present test and the measurements of a larger floor installed in a building may occur. The single-number quantities are calculated in accordance with the Standard EN ISO 717-2 (1996). The details of the measurement procedure, the description of the test facilities and measurement equipment used as well as calibration data are to be found in the internal quality assurance document SOP-177-4 (Nr. 1668). The description of the test specimen and the results are presented on page 2. The numerical data represent the official values. These values are limited to the objects actually measured in the EMPA facility; they cannot necessarily be applied to a series. The measurement accuracy for $L_{n,r,w}$ and $\Delta L_w$ is given as the standard deviation in accordance with previous experience with the test facility and equipment used. It amounts to ± 1 dB.

---

Swiss Federal Laboratories for Materials Testing and Research, Laboratory of Acoustics
Dübendorf, 29 July, 2008

Expert:
M. Würzer

Vice head of Laboratory:
R. Bütikofer

STS 068

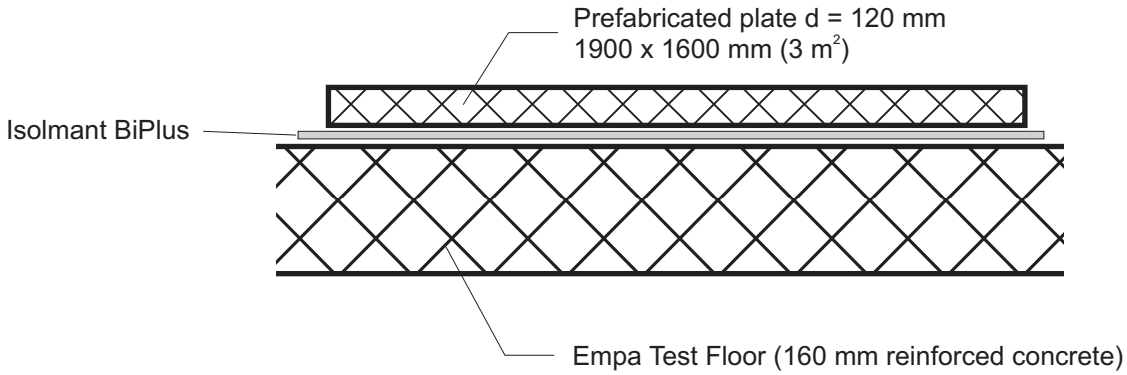
# Impact sound insulation



Object: Product name: ISOLMANT BiPlus

Product description:
5 mm Isolmant, physically cross-linked closed-cell PE-foam with ca. 1 mm fleece laminated on top and ca. 3 mm needle punched non-woven on bottom side

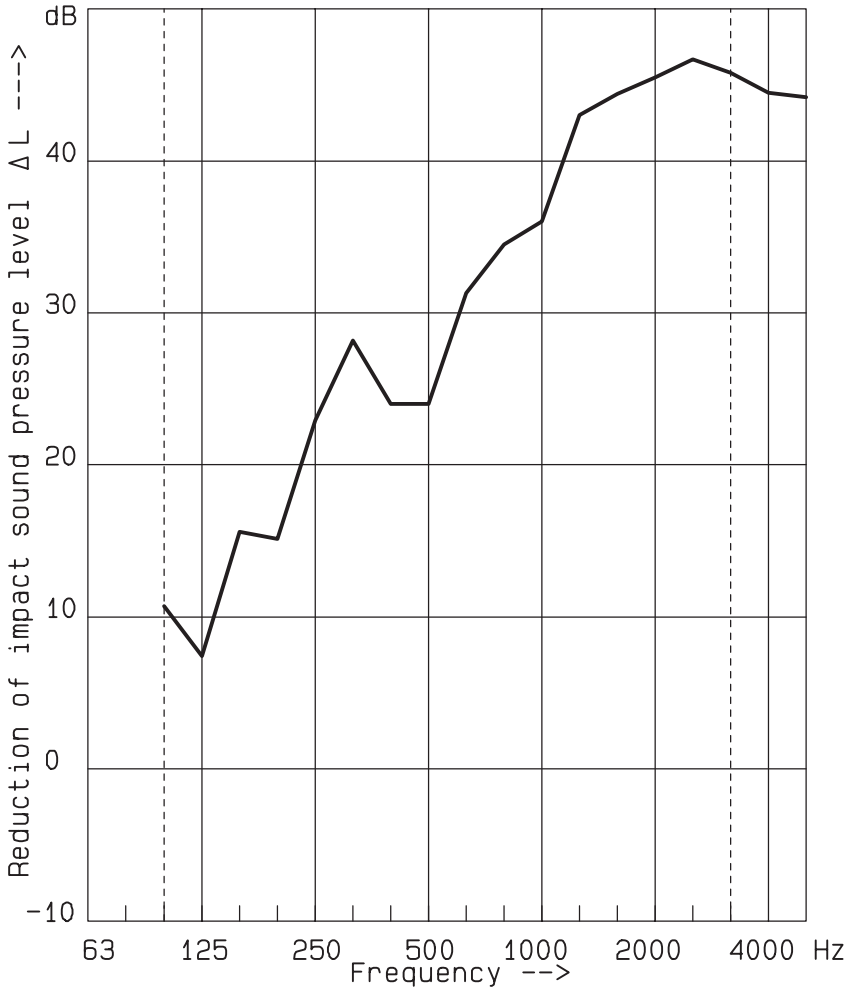
Test: EMPA Duebendorf, test stand no. 11, volume: 52 m³ Date: 18.06.2008
Sample size: 1,90 x 1,60 m
Thickness of the prefabricated plate: 120 mm
Temperature: 21 °C Relative humidity: 54 %




$L_{n,r,w}$ = 46 dB
Max.dev.: 12 dB at 125 Hz
$\Delta L_w$ = 32 dB $C_{I,r}$ = 2 dB
$\Delta L_{lin}$ = 19 dB $C_{I,\Delta}$ = -13 dB

| Frequency [Hz] | ΔL [dB] | $L_{n,r}$ [dB] |
|---|---|---|
| 100 | 10.7 | 56.3 |
| 125 | 7.4 | 60.1 |
| 160 | 15.6 | 52.4 |
| 200 | 15.1 | 53.4 |
| 250 | 22.9 | 46.1 |
| 315 | 28.2 | 41.3 |
| 400 | 24.0 | 46.0 |
| 500 | 24.0 | 46.5 |
| 630 | 31.3 | 39.7 |
| 800 | 34.5 | 37.0 |
| 1000 | 36.0 | 36.0 |
| 1250 | 43.0 | 29.0 |
| 1600 | 44.4 | 27.6 |
| 2000 | 45.5 | 26.5 |
| 2500 | 46.7 | 25.3 |
| 3150 | 45.8 | 26.2 |
| 4000 | 44.5 | 27.5 |
| 5000 | 44.2 | 27.8 |

Δ L: Reduction of impact sound pressure level




Methode: EN ISO 140-8 (1997)
Rating: EN ISO 717-2 (1996)
Deviation from ISO 140: sample size
Source: standard tapping machine Receiver: 1/3 octave filters

# Impact sound insulation of elastic layers, covered by a prefabricated plate

Measurement on the test floor of the EMPA test facility

**Measurement similar to EN ISO 140 - 8 (1997):**

**Elastic layers** are tested in this kind of short test procedure using a prefabricated plate of either 50, 70 100 or 120 mm thickness, which is placed on the elastic layer. The extension of the plate is 1.6 by 1.9 m.
**This test set up deviates** from EN ISO Standard 140-8 **in two aspects:** first, the tested specimen is small (3 $m^2$ instead of at least 10 $m^2$, see EN ISO 140-8, clause 5.3.3.2), and second the prefabricated plate is put on the layer, instead of pouring fluid concrete on the layer, which may modify the quality of the contact. Hence, results deviating from a standard test may be possible. In all other aspects, the requirements of EN ISO 140-8 are fulfilled. This type of test is reasonable for informative tests and for the comparison between different variants of a product.
The standardized tapping machine is positioned in six positions on the plate. In the receiving room the impact sound pressure levels are measured with a moving microphone during 64 seconds. A one-third octave band analyzer measures the averaged sound levels in the third octave bands from 100 to 5000 Hz. If required, the levels are corrected to account for the background noise. The six individual measurements are then averaged energetically for each one-third octave band and converted with the reverberation time measurements to the **normalized impact sound pressure level $L_n$** for a receiving room having 10 $m^2$ of equivalent sound absorption area.

The normalized impact sound pressure level of the bare floor $L_{n,0}$ is measured using the identical procedure.

**Conversion using the Reference Floor:**

To compare the measurement results obtained in different test laboratories, the normalized impact sound pressure level $L_n$, which is determined on the bare floor of the given laboratory, is referred to the reference floor defined in ISO 717-2 in the following way: the reduction of impact sound level $\Delta L$ (= $L_{n,0}$ - $L_n$) is subtracted from the sound level of the reference floor. This quantity is designated by the index r ("reference floor"): **$L_{n,r}$**.

**Evaluation according to EN ISO 717-2:**

A single-number quantity describing the impact sound transmission, the **"weighted normalized impact sound pressure level of the reference floor with the floor covering" $L_{n,r,w}$** is defined from the frequency-dependent levels according to the following specifications.

The curve $L_{n,r}$ is evaluated using the standardized reference curve in the frequency range 100 to 3150 Hz by shifting the reference curve in 1 decibel steps until the mean unfavorable deviation is as large as possible but not more than 2.0 dB. This mean deviation is calculated as follows: Only the unfavorable deviations are added together, i.e., the values of $L_{n,r}$ which exceed those of the shifted curve. Then, the sum is divided by the total number (16) of measurement frequencies. The value $L_{n,r,w}$ corresponds to the shifted reference curve at 500 Hz.

The **smaller** the "weighted normalized impact sound pressure level of the reference floor with the floor covering" **$L_{n,r,w}$**, the better is the **impact sound insulation**.

The improvement of the impact sound insulation on the reference floor due to the floor covering is described by the **"weighted reduction in impact sound pressure level"** (or the **"weighted impact sound improvement index"**) **$\Delta L_{W.}$** This represents the difference between the weighted impact sound levels of the reference floor without and with the floor covering.

The **larger** the "weighted reduction in impact sound pressure level" **$\Delta L_W$**, the greater is the improvement of the impact sound insulation due to the floor covering.

**Additional evaluations according to EN ISO 717 - 2 (1996), Annex A:**

Using the unweighted, energetic sum of the one-third octave band levels from 100 to 2500 Hz for the reference floor with and without the test specimen ($L_{n,r,sum}$ and $L_{n,r,0,sum}$) two single-number quantities are calculated:

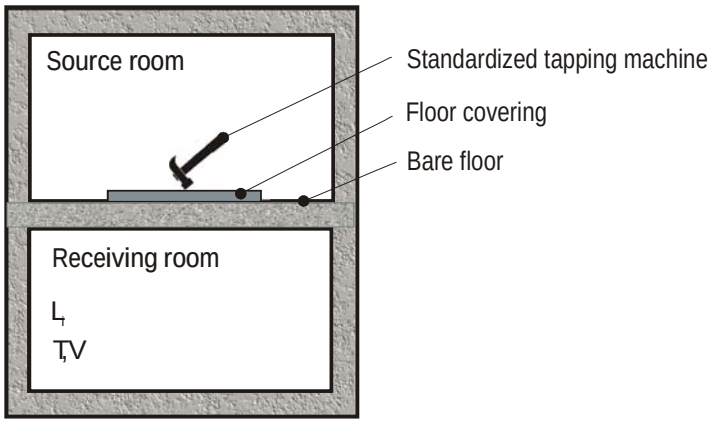
- The single-number quantity **$\Delta L_{lin}$** is the difference between the total levels (rounded to integer numbers) of the reference floor a) without the specimen (= 82 dB) and b) with the specimen.
- The spectrum adaptation term **$C_{I,\Delta}$** is the difference between $\Delta L_{lin}$ and $\Delta L_W$.

# Impact Sound Insulation - technical terms

**Floor coverings:** measurement in the test facility at Empa

Pertinent standards: measurement: EN ISO 140 - 8 (1997)
rating: EN ISO 717 - 2 (1996)

**Test configuration:**




| | | | |
|---|---|---|---|
| Average impact sound pressure level in the receiving room | $L_i$ | | dB * |
| Reverberation time in the receiving room | T | | s * |
| Volume of the receiving room | V | | $m^3$ |
| Reference equivalent absorption area | $A_0$ | = 10 | $m^2$ |
| Equivalent absorption area in the receiving room | A | = $0.16 \cdot \frac{V}{T}$ | $m^2$ * |
| Normalized impact sound pressure level of bare floor | $L_{n,0}$ | = $L_{i,0} + 10 \lg \frac{A}{A_0}$ | dB * |
| Normalized impact sound press. level of bare floor **with floor covering** | $L_n$ | = $L_i + 10 \lg \frac{A}{A_0}$ | dB * |
| **Reduction of impact sound pressure level**; improvement of impact sound insulation of the bare floor due to the floor covering | **$\Delta L$** | **= $L_{n,0} - L_n$** | dB * |
| Normalized impact sound pressure level of the reference floor (defined in EN ISO 717-2) | $L_{n,r,0}$ | | dB * |
| **Normalized impact sound pressure level of the reference floor with floor covering** | **$L_{n,r}$** | **= $L_{n,r,0} - \Delta L$** | dB * |

* values for each 1/3 octave band (100 - 5000 Hz)

**Weighted normalized impact sound pressure level**

| | | | |
|---|---|---|---|
| - of the bare floor with floor covering | $L_{n,w}$ | | dB |
| - of the reference floor | $L_{n,r,0,w}$ | = 78 | dB |
| **- of the reference floor with floor covering** | **$L_{n,r,w}$** | | dB |
| **Weighted reduction in impact sound pressure level** or **Weighted impact sound improvement index** | **$\Delta L_w$** | = $L_{n,r,0,w} - L_{n,r,w}$ | dB |

**Spectrum adaptation terms (**according to EN ISO 717-2 (1996) Annex A)

| | | | |
|---|---|---|---|
| Linear overall level of the reference floor (100 - 2500 Hz) | $L_{n,r,0,sum}$ | = 82 | dB |
| Linear overall level of $L_{n,r}$ (100 - 2500 Hz) | $L_{n,r,sum}$ | | dB |
| Impact sound reduction, calculated from linear overall levels | **$\Delta L_{lin}$** | = $L_{n,r,0,sum} - L_{n,r,sum}$ | dB |
| Spectrum adaptation term for $\Delta L_w$ | **$C_{I,\Delta}$** | = $\Delta L_{lin} - \Delta L_w$ | dB |
| Spectrum adaptation term for $L_{n,r,w}$ | **$C_{I,r}$** | = $L_{n,r,sum} - 15 - L_{n,r,w}$ | dB |