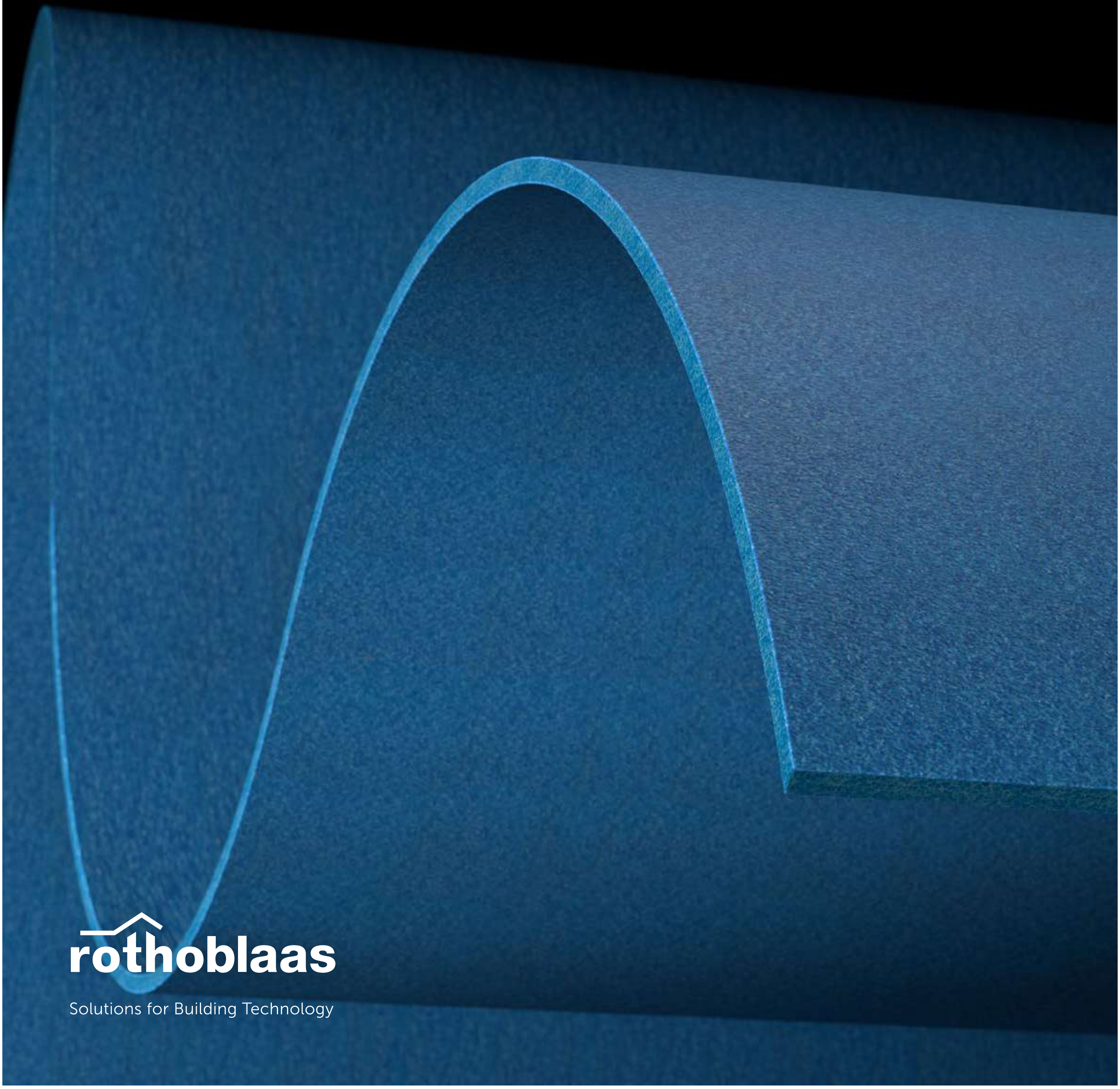
# SILENT FLOOR PE

TECHNICAL MANUAL



rothoblaas

Solutions for Building Technology

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# ACOUSTIC PROBLEMS OF FLOORS

### WHAT IS IMPACT NOISE?

When it comes to floors, impact noise is the main acoustic problem because it constantly affects them. When a body impacts on the floor structure, the noise quickly spreads throughout the building either by air, affecting the nearest rooms, or by structure, propagating into the most distant rooms.

### WHAT IS AIRBORNE NOISE?

Airborne noise is generated in the air and, after an initial airborne phase, is transported both by air and by structure. This is a problem that affects both walls and floors, but if we are talking about floors, the most important problem is certainly impact noise.

## HERE IS THE SOLUTION

In order to be able to minimise the discomfort caused by impact noise, a stratigraphic package should be designed consisting of layers of different materials that are disconnected from each other and are able to dissipate the energy transmitted by the impact.

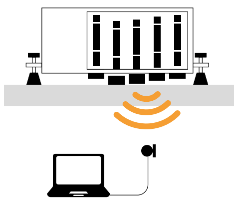
### MASS-SPRING-MASS SYSTEM

A floating screed system such as the one shown in the images below can be schematised with a mass-spring-mass system, in which the structural floor represents the mass, the impact-absorbing product is equivalent to the spring, and the upper screed with the floor constitutes the second mass of the system. In this context, "resilient layer" is defined as the element with the spring function characterised by its own *dynamic stiffness s'*.


## HOW IS THE IMPACT NOISE LEVEL MEASURED?

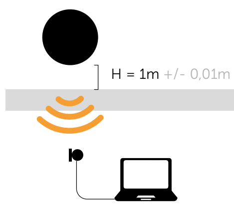
The impact noise level is a measure of the disturbance perceived in a room when an impact noise source is activated in the upper room. It can be measured both on site and in the laboratory. Clearly, ideal conditions exist in the laboratory for the effects of lateral transmission to be neglected, as the laboratory itself is constructed so that the walls are decoupled from the ceiling.

### *TAPPING MACHINE* method



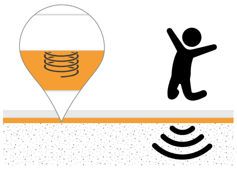
*The TAPPING MACHINE is used to simulate "light" and "hard" impacts, such as walking with heeled shoes or the impact caused by falling objects.*

### *RUBBER BALL* method



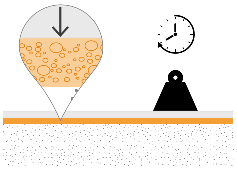

*The RUBBER BALL is used to simulate "soft" and "heavy" impacts, such as a barefoot walk or a child jumping.*

## HOW TO CHOOSE THE BEST PRODUCT



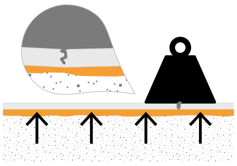
### DYNAMIC STIFFNESS – **s'**

Expressed in MN/m³, it is measured according to EN 29052-1 and expresses the deformation capacity of a material that is subjected to a dynamic stress. Consequently, it indicates the ability to dampen the vibrations generated by an impact noise.
The measurement method involves, first, measuring the *apparent dynamic stiffness* $s'_t$ of the material and then correcting it, if necessary, to obtain the *real dynamic stiffness s'*. Dynamic stiffness depends in fact on the *flow resistivity r*, which is measured in the lateral direction of the sample. If the material has specific flow resistivity values, the apparent dynamic stiffness must be corrected by adding the contribution of the gas contained within the material: air.



### VISCOUS SLIDING UNDER COMPRESSION – **CREEP**

Expressed as a percentage, it is measured according to EN 1606 and represents the long-term deformation of a material under constant load to be simulated. The measurement in the laboratory must be carried out over a period of at least 90 days.

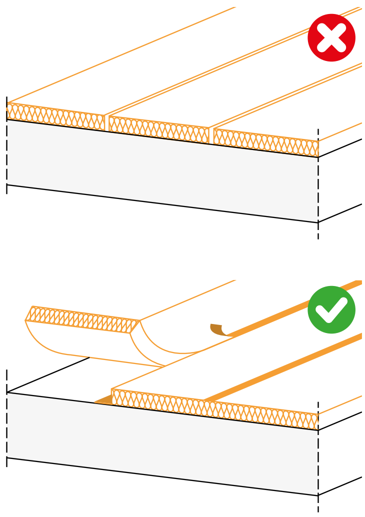


### COMPRESSIBILITY - **c**

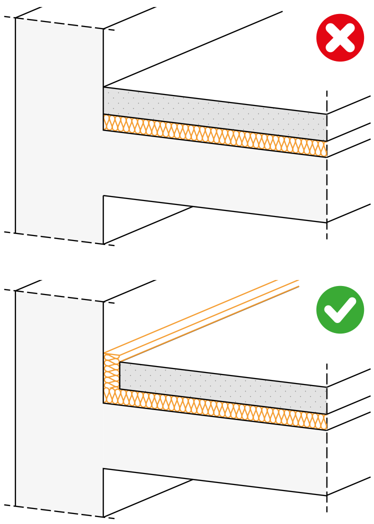
The compressibility class expresses the behaviour of a material while subjected to screed loading. During measurement, the product is subjected to different loads and its thickness is measured. The compressibility measurement is carried out to understand what loads the underscreed product can withstand, in order to avoid cracking and splitting of screeds.

## CORRECT INSTALLATION

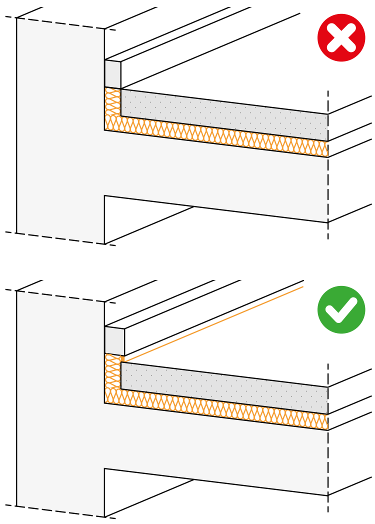
The technological solution of the floating screed is one of the most widely used and one of the most effective, but in order to achieve satisfactory results it is important that the system is designed and implemented correctly.



*The resilient layer must be continuous because any gap would represent an acoustic bridge. When installing underscreed mats, care must be taken not to create discontinuities.*



*It is important to use the SILENT EDGE perimeter strip to ensure that the resilient layer is continuous around the entire perimeter of the room. The SILENT EDGE should only be trimmed after the floor has been installed and grouted.*



*The skirting board must be installed after the SILENT EDGE has been cut, ensuring that it is always suitably raised from the floor.*

## IIC vs $L_W$

**IIC** stands for **Impact Insulation Class** and is the value obtained by subtracting the noise level measured in the receiving room from the noise level measured in the source room. Impact Insulation Class, sometimes referred to as Impact Isolation Class, measures the resistance of the floor construction assembly against the propagation of impact-generated noise.

# SILENT FLOOR PE

RESILIENT UNDERSCREED MEMBRANE MADE OF CLOSED CELL PE

### CLOSED CELL

Thanks to the grid of closed cell polyethylene, the foil will not permanently deform and remains effective over time.

### COST-PERFORMANCE

Composition of the mixture optimised to provide both good performance and low cost.

### VERSATILE

This product is a versatile solution in any application where a light and flexible resilient product is required.

## COMPOSITION

closed cell expanded polyethylene

## CODES AND DIMENSIONS

| CODE | H [m] | L [m] | thickness [mm] | A [$m^2$] | |
|---|---|---|---|---|---|
| SILFLOORPE6 | 1,55 | 50 | 5 | 77,5 | 4 |
| SILFLOORPE10 | 1,30 | 50 | 10 | 65 | 2 |

## SEVERAL USES

The format and composition offer various uses in the construction field, also as under floor.

## STABLE

The grid of polyethylene foam is durable and does not suffer from issues associated with chemical actions or incompatibility of materials.

## PRODUCT STRATIGRAPHY COMPARISON

| thickness | dynamic stiffness | load | estimate $\Delta L_w$ according to formula C.4 of EN ISO 12354-2 |
|---|---|---|---|
| 5 mm | 43 $MN/m^3$ | 125 $kg/m^2$ | 24,9 dB |
| | | 200 $kg/m^2$ | 27,5 dB |
| | | 250 $kg/m^2$ | 28,8 dB |
| 10 mm | 41 $MN/m^3$ | 125 $kg/m^2$ | 25,2 dB |
| | | 200 $kg/m^2$ | 27,8 dB |
| | | 250 $kg/m^2$ | 29,1 dB |

# SILFLOORPE6

## TECHNICAL DATA

| Properties | standard | value |
|---|---|---|
| Thickness | - | 5 mm |
| Surface mass m | - | 0,15 kg/m$^2$ |
| Apparent dynamic stiffness $s'_t$ | EN 29052-1 | 43 MN/m$^3$ |
| Dynamic stiffness s' | EN 29052-1 | 43 MN/m$^3$ |
| Theoretical estimate of impact sound pressure level attenuation $\Delta L_w$[1] | ISO 12354-2 | 24,9 dB |
| System resonance frequency $f_0$[2] | ISO 12354-2 | 93,8 Hz |
| Impact sound pressure level attenuation $\Delta L_w$[3] | ISO 10140-3 | 19 dB |
| Thermal resistance $R_t$ | - | 0,13 m$^2$K/W |
| Water vapour transmission Sd | - | 24,1 m |
| Water vapour resistance factor μ | EN 12086 | 5000 |
| Density ρ | - | 30 kg/m$^3$ |
| Resistance to airflow r | ISO 9053 | > 100.0 kPa·s·m$^{-2}$ |
| Thermal conductivity λ | - | 0,038 W/m·K |
| VOC emission classification | French decree no. 2011-321 | A+ |

(1) $\Delta L_w$= (13 lg(m'))-(14,2 lg(s'))+20,8 [dB] with m'= 125 kg/m$^2$.
(2) $f_0$= 160 √(s'/m') with m'= 125 kg/m$^2$.
(3) Measured in the laboratory on 200 mm CLT floor. See the manual for more information on configuration.

## EN ISO 12354-2 ANNEX C | ESTIMATE $\Delta L_W$ (formula C.4) E ΔL (formula C.1)

The following tables show how the attenuation in dB ($\Delta L_W$ e ΔL) of SILFLOORPE6 varies as the load m' (i.e., the surface mass of the layers with which SILFLOORPE6 is loaded) changes.

SILFLOORPE6

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **s't or s'** | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | [MN/m$^3$] |
| | **load m'** | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 | [kg/m$^2$] |
| | **$\Delta L_w$** | 19,7 | 22,0 | 23,6 | 24,9 | 25,9 | 26,8 | 27,5 | 28,2 | 28,8 | 29,3 | 29,8 | [dB] |
| | **$f_0$** | 148,4 | 121,2 | 104,9 | 93,8 | 85,7 | 79,3 | 74,2 | 69,9 | 66,4 | 63,3 | 60,6 | [Hz] |
| | | **ΔL** in frequency | | | | | | | | | | | |
| [Hz] | **100** | -5,1 | -2,5 | -0,6 | 0,8 | 2,0 | 3,0 | 3,9 | 4,7 | 5,3 | 6.0 | 6,5 | [dB] |
| [Hz] | **125** | -2,2 | 0,4 | 2,3 | 3,7 | 4,9 | 5,9 | 6,8 | 7,6 | 8,3 | 8,9 | 9,4 | [dB] |
| [Hz] | **160** | 1,0 | 3,6 | 5,5 | 7,0 | 8,1 | 9,1 | 10,0 | 10,8 | 11,5 | 12,1 | 12,7 | [dB] |
| [Hz] | **200** | 3,9 | 6,5 | 8,4 | 9,9 | 11,0 | 12,1 | 12,9 | 13,7 | 14,4 | 15,0 | 15,6 | [dB] |
| [Hz] | **250** | 6,8 | 9,4 | 11,3 | 12,8 | 14,0 | 15,0 | 15,8 | 16,6 | 17,3 | 17,9 | 18,5 | [dB] |
| [Hz] | **315** | 9,8 | 12,4 | 14,3 | 15,8 | 17,0 | 18,0 | 18,8 | 19,6 | 20,3 | 20,9 | 21,5 | [dB] |
| [Hz] | **400** | 12,9 | 15,6 | 17,4 | 18,9 | 20,1 | 21,1 | 22,0 | 22,7 | 23,4 | 24,0 | 24,6 | [dB] |
| [Hz] | **500** | 15,8 | 18,5 | 20,3 | 21,8 | 23,0 | 24,0 | 24,9 | 25,6 | 26,3 | 26,9 | 27,5 | [dB] |
| [Hz] | **630** | 18,8 | 21,5 | 23,4 | 24,8 | 26,0 | 27,0 | 27,9 | 28,6 | 29,3 | 29,9 | 30,5 | [dB] |
| [Hz] | **800** | 22,0 | 24,6 | 26,5 | 27,9 | 29,1 | 30,1 | 31,0 | 31,7 | 32,4 | 33,1 | 33,6 | [dB] |
| [Hz] | **1000** | 24,9 | 27,5 | 29,4 | 30,8 | 32,0 | 33,0 | 33,9 | 34,7 | 35,3 | 36,0 | 36,5 | [dB] |
| [Hz] | **1250** | 27,8 | 30,4 | 32,3 | 33,7 | 34,9 | 35,9 | 36,8 | 37,6 | 38,3 | 38,9 | 39,4 | [dB] |
| [Hz] | **1600** | 31,0 | 33,6 | 35,5 | 37,0 | 38,1 | 39,1 | 40,0 | 40,8 | 41,5 | 42,1 | 42,7 | [dB] |
| [Hz] | **2000** | 33,9 | 36,5 | 38,4 | 39,9 | 41,0 | 42,1 | 42,9 | 43,7 | 44,4 | 45,0 | 45,6 | [dB] |
| [Hz] | **2500** | 36,8 | 39,4 | 41,3 | 42,8 | 44,0 | 45,0 | 45,8 | 46,6 | 47,3 | 47,9 | 48,5 | [dB] |
| [Hz] | **3150** | 39,8 | 42,4 | 44,3 | 45,8 | 47,0 | 48,0 | 48,8 | 49,6 | 50,3 | 50,9 | 51,5 | [dB] |

*EN ISO 12354-2 Allegato C - formula C.4*

$$\Delta L_W = \left(13 \lg\left(m'\right)\right) - \left(14{,}2 \lg\left(s'\right)\right) + 20{,}8 \text{ dB}$$

*EN ISO 12354-2 Allegato C - formula C.1*

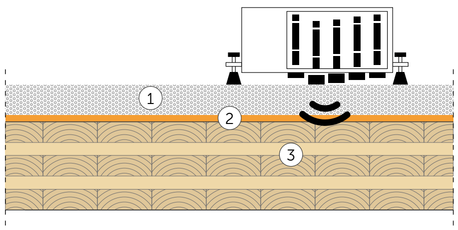
$$\Delta L = \left(30 \lg \frac{f}{f_0}\right) \text{dB}$$

*EN ISO 12354-2 Allegato C - formula C.2*

$$f_0 = 160 \sqrt{\frac{s'}{m'}}$$

# LABORATORY MEASUREMENT | CLT FLOOR 1

MEASUREMENT OF THE EVALUATION INDEX OF THE REDUCTION OF THE IMPACT SOUND PRESSURE LEVEL
REFERENCE STANDARD: ISO 10140-3 AND EN ISO 717-2




**FLOOR SLAB**

**Surface** = 13,71 $m^2$
**Surface mass** = 214,2 kg/$m^2$
**Receiving room volume** = 60,1 $m^3$

1. concrete screed (thickness: 50 mm); (2600 kg/$m^3$); (130 kg/$m^2$)
2. **SILENT FLOOR PE - SILFLOORPE5** (thickness: 5 mm); (30 kg/$m^3$); (0,15 kg/$m^2$)
3. CLT 5 layers (thickness: 200 mm); (420 kg/$m^3$); (84 kg/$m^2$)

## IMPACT SOUND INSULATION


| f [Hz] | $L_n$ [dB] |
|---|---|
| 50 | 59,9 |
| 63 | 58,0 |
| 80 | 57,8 |
| 100 | 67,7 |
| 125 | 66,6 |
| 160 | 70,3 |
| 200 | 72,7 |
| 250 | 71,1 |
| 315 | 70,4 |
| 400 | 68,6 |
| 500 | 66,1 |
| 630 | 64,7 |
| 800 | 63,4 |
| 1000 | 61,1 |
| 1250 | 60,6 |
| 1600 | 59,1 |
| 2000 | 59 |
| 2500 | 57,4 |
| 3150 | 55,8 |
| 4000 | 52,3 |
| 5000 | 48,0 |

$L_{n,w}$ $(C_I)$ = **67 (-3) dB**

$\Delta L_{n,w}$ = -19 dB[(1)]

IIC = **43**

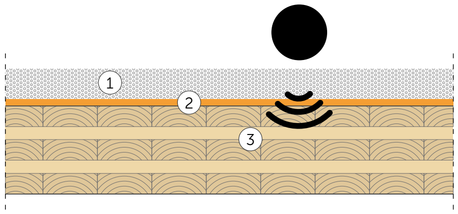
$\Delta$IIC = +19[(2)]

**Testing laboratory:** Building Physics Lab | Libera Università di Bolzano.
**Test protocol:** Pr. 2022-rothoLATE-L7.

**NOTES:**
[(1)] Decrease due to the addition of layers no. 1 and no. 2.
[(2)] Increase due to the addition of layers no. 1 and no. 2.

## LABORATORY MEASUREMENT | CLT FLOOR 1

MEASUREMENT OF THE EVALUATION INDEX OF THE REDUCTION OF THE IMPACT SOUND PRESSURE LEVEL
RUBBER BALL METHOD | REFERENCE STANDARD: ISO 16283-2

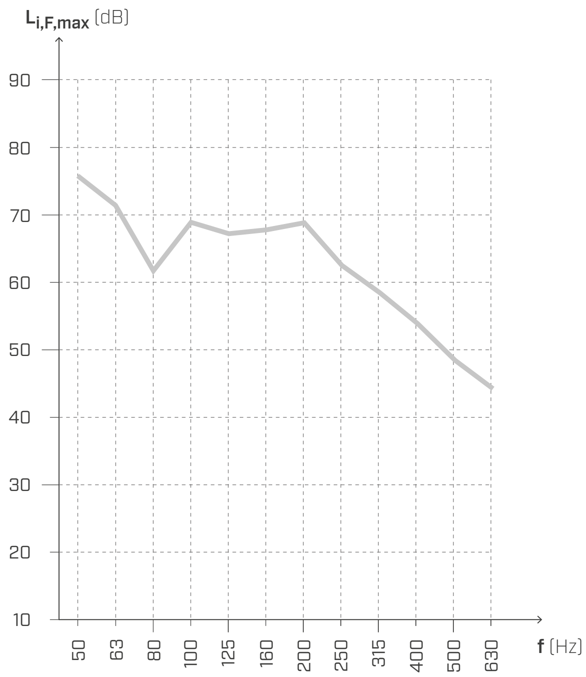



### FLOOR SLAB

**Surface** = 13,71 $m^2$
**Surface mass** = 214,2 $kg/m^2$
**Receiving room volume** = 60,1 $m^3$

(1) concrete screed (thickness: 50 mm); (2600 $kg/m^3$); (130 $kg/m^2$)
(2) **SILENT FLOOR PE - SILFLOORPE5** (thickness: 5 mm); (30 $kg/m^3$); (0,15 $kg/m^2$)
(3) CLT 5 layers (thickness: 200 mm); (420 $kg/m^3$); (84 $kg/m^2$)

## IMPACT SOUND INSULATION




| f [Hz] | $L_{i,F,max}$ [dB] |
|---|---|
| 50 | 75,8 |
| 63 | 71,4 |
| 80 | 61,7 |
| 100 | 68,9 |
| 125 | 67,2 |
| 160 | 67,8 |
| 200 | 68,9 |
| 250 | 62,5 |
| 315 | 58,5 |
| 400 | 53,9 |
| 500 | 48,5 |
| 630 | 44,3 |

$L_{i,F,max}$

**Testing laboratory:** Building Physics Lab | Libera Università di Bolzano.
**Test protocol:** Pr. 2022-rothoLATE-L7.

# SILFLOORPE10

## TECHNICAL DATA

| Properties | standard | value |
|---|---|---|
| Thickness | - | 10 mm |
| Surface mass m | - | 0,30 kg/m$^2$ |
| Apparent dynamic stiffness $s'_t$ | EN 29052-1 | 41 MN/m$^3$ |
| Dynamic stiffness s' | EN 29052-1 | 41 MN/m$^3$ |
| Theoretical estimate of impact sound pressure level attenuation $\Delta L_w$[1] | ISO 12354-2 | 25,2 dB |
| System resonance frequency $f_0$[2] | ISO 12354-2 | 91,6 Hz |
| Impact sound pressure level attenuation $\Delta L_w$[3] | ISO 10140-3 | - |
| Thermal resistance $R_t$ | - | 0,26 m$^2$K/W |
| Water vapour transmission Sd | - | 48,2 m |
| Water vapour resistance factor μ | EN 12086 | 5000 |
| Density ρ | - | 30 kg/m$^3$ |
| Resistance to airflow r | ISO 9053 | > 100.0 kPa·s·m$^{-2}$ |
| Thermal conductivity λ | - | 0,038 W/m·K |
| VOC emission classification | French decree no. 2011-321 | A+ |

(1) $\Delta L_w$= (13 lg(m'))-(14,2 lg(s'))+20,8 [dB] with m'= 125 kg/m$^2$.
(2) $f_0$= 160 √(s'/m') with m'= 125 kg/m$^2$.
(3) Measured in the laboratory on 200 mm CLT floor. See the manual for more information on configuration.

## EN ISO 12354-2 ANNEX C | ESTIMATE $\Delta L_W$ (formula C.4) E ΔL (formula C.1)

The following tables show how the attenuation in dB ($\Delta L_W$ e ΔL) of SILFLOORPE10 varies as the load m' (i.e., the surface mass of the layers with which SILFLOORPE10 is loaded) changes.

SILFLOORPE10

| | s't or s' | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | 41 | [MN/m$^3$] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | load m' | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 | [kg/m$^2$] |
| | $\Delta L_w$ | 20,0 | 22,3 | 23,9 | 25,2 | 26,2 | 27,1 | 27,8 | 28,5 | 29,1 | 29,6 | 30,1 | [dB] |
| | $f_0$ | 144,9 | 118,3 | 102,4 | 91,6 | 83,7 | 77,4 | 72,4 | 68,3 | 64,8 | 61,8 | 59,1 | [Hz] |
| | | | | | | | **ΔL** in frequency | | | | | | |
| [Hz] | **100** | -4,8 | -2,2 | -0,3 | 1,1 | 2,3 | 3,3 | 4,2 | 5,0 | 5,7 | 6,3 | 6,8 | [dB] |
| [Hz] | **125** | -1,9 | 0,7 | 2,6 | 4,0 | 5,2 | 6,2 | 7,1 | 7,9 | 8,6 | 9,2 | 9,7 | [dB] |
| [Hz] | **160** | 1,3 | 3,9 | 5,8 | 7,3 | 8,4 | 9,5 | 10,3 | 11,1 | 11,8 | 12,4 | 13,0 | [dB] |
| [Hz] | **200** | 4,2 | 6,8 | 8,7 | 10,2 | 11,4 | 12,4 | 13,2 | 14,0 | 14,7 | 15,3 | 15,9 | [dB] |
| [Hz] | **250** | 7,1 | 9,7 | 11,6 | 13,1 | 14,3 | 15,3 | 16,1 | 16,9 | 17,6 | 18,2 | 18,8 | [dB] |
| [Hz] | **315** | 10,1 | 12,8 | 14,6 | 16,1 | 17,3 | 18,3 | 19,1 | 19,9 | 20,6 | 21,2 | 21,8 | [dB] |
| [Hz] | **400** | 13,2 | 15,9 | 17,7 | 19,2 | 20,4 | 21,4 | 22,3 | 23,0 | 23,7 | 24,3 | 24,9 | [dB] |
| [Hz] | **500** | 16,1 | 18,8 | 20,7 | 22,1 | 23,3 | 24,3 | 25,2 | 25,9 | 26,6 | 27,2 | 27,8 | [dB] |
| [Hz] | **630** | 19,1 | 21,8 | 23,7 | 25,1 | 26,3 | 27,3 | 28,2 | 28,9 | 29,6 | 30,3 | 30,8 | [dB] |
| [Hz] | **800** | 22,3 | 24,9 | 26,8 | 28,2 | 29,4 | 30,4 | 31,3 | 32,1 | 32,7 | 33,4 | 33,9 | [dB] |
| [Hz] | **1000** | 25,2 | 27,8 | 29,7 | 31,1 | 32,3 | 33,3 | 34,2 | 35,0 | 35,7 | 36,3 | 36,8 | [dB] |
| [Hz] | **1250** | 28,1 | 30,7 | 32,6 | 34,0 | 35,2 | 36,2 | 37,1 | 37,9 | 38,6 | 39,2 | 39,7 | [dB] |
| [Hz] | **1600** | 31,3 | 33,9 | 35,8 | 37,3 | 38,4 | 39,5 | 40,3 | 41,1 | 41,8 | 42,4 | 43,0 | [dB] |
| [Hz] | **2000** | 34,2 | 36,8 | 38,7 | 40,2 | 41,4 | 42,4 | 43.2 | 44,0 | 44,7 | 45,3 | 45,9 | [dB] |
| [Hz] | **2500** | 37,1 | 39,7 | 41,6 | 43,1 | 44,3 | 45,3 | 46,1 | 46,9 | 47,6 | 48,2 | 48,8 | [dB] |
| [Hz] | **3150** | 40,1 | 42,8 | 44,6 | 46,1 | 47,3 | 48,3 | 49,1 | 49,9 | 50,6 | 51,2 | 51,8 | [dB] |

*EN ISO 12354-2 Allegato C - formula C.4*

$$\Delta L_W = \left(13 \lg\left(m'\right)\right) - \left(14{,}2 \lg\left(s'\right)\right) + 20{,}8 \text{ dB}$$

*EN ISO 12354-2 Allegato C - formula C.1*

$$\Delta L = \left(30 \lg \frac{f}{f_0}\right) \text{dB}$$

*EN ISO 12354-2 Allegato C - formula C.2*

$$f_0 = 160 \sqrt{\frac{s'}{m'}}$$