

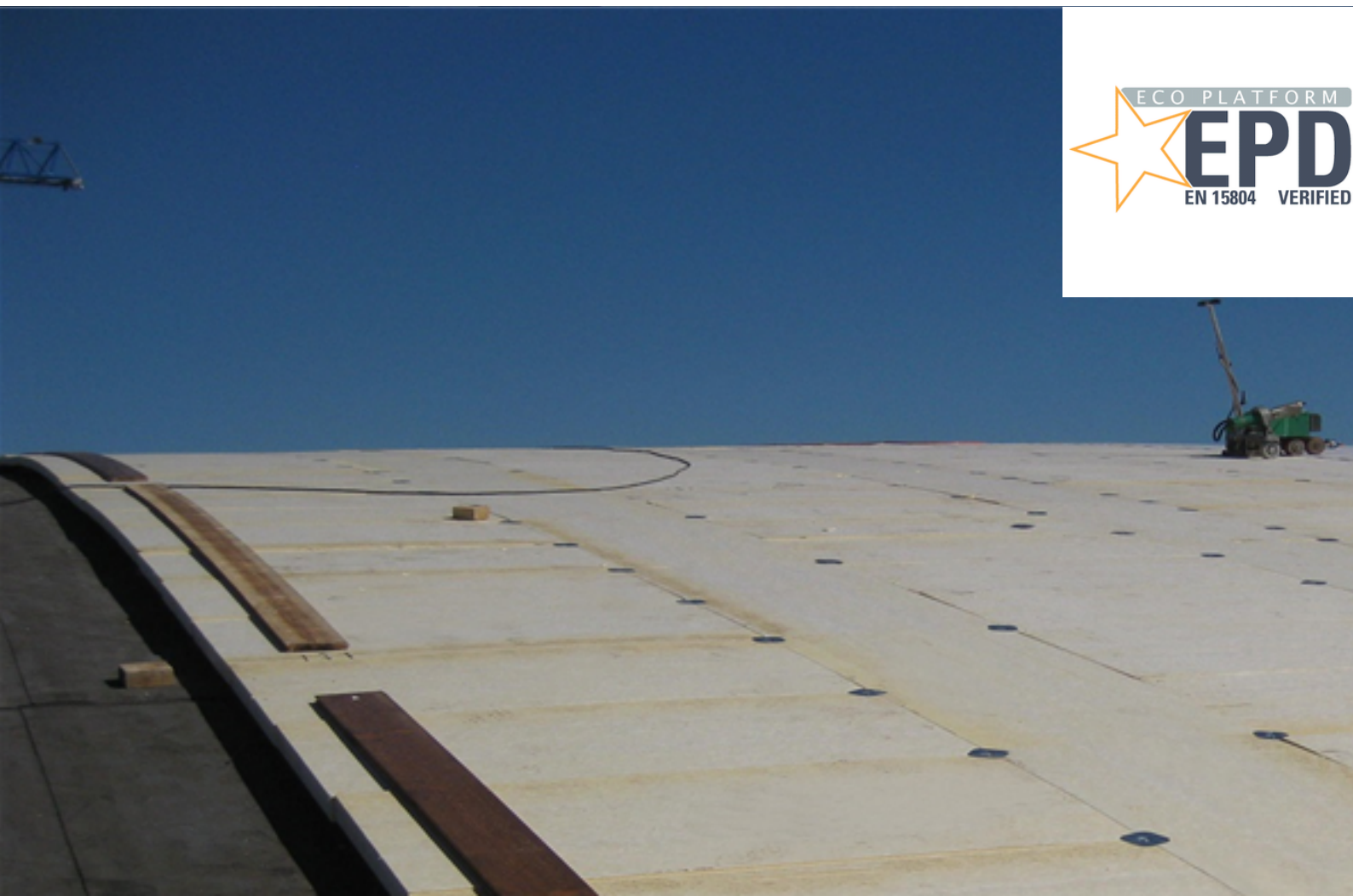
ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804




Owner of the Declaration	Stiferite
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-STF-20170047-CBA1-EN
ECO EPD Ref. No.	ECO-00000537
Issue date	01/06/2017
Valid to	31/05/2022

STIFERITE Class S average thick panel
Stiferite

www.ibu-epd.com / <https://epd-online.com>



General Information

<p>Stiferite</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-STF-20170047-CBA1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Insulating materials made of foam plastics, 12.2016 (PCR tested and approved by the SVR)</p> <hr/> <p>Issue date 01/06/2017</p> <hr/> <p>Valid to 31/05/2022</p> <hr/> <p></p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p></p> <hr/> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p>STIFERITE Class S insulation panel</p> <hr/> <p>Owner of the Declaration Stiferite Viale Navigazione Interna 54 35129 Padova PD Italy</p> <hr/> <p>Declared product / Declared unit STIFERITE CLASS S expanded rigid polyurethane foam, covered on both sides by saturated fibre glass facers, and produced by Stiferite. The EPD applies to 1 m² The EPD applies to 1 m² of an average thickness of 61 mm PUR sandwich board, i.e. 0.061 m³, with an average density between foam and facing of 35.6 kg/m³.</p> <hr/> <p>Scope: Stiferite produces STIFERITE Class S that is a high performance insulation board manufactured from closed cell expanded rigid polyurethane foam, covered on both sides by saturated fibre glass facers. The data have been provided by the only Stiferite factory that was located in Padova (Italy) for the year 2015. The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.</p> <hr/> <p>Verification</p> <table border="1"> <tr> <td colspan="2">The CEN Norm /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration according to /ISO 14025/</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p></p> <hr/> <p>Prof. Dr. Birgit Grahl (Independent verifier appointed by SVR)</p>	The CEN Norm /EN 15804/ serves as the core PCR		Independent verification of the declaration according to /ISO 14025/		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Product

Product description / Product definition

STIFERITE's thermo insulation panels are mainly used in the building/construction sector or industrial insulation.

The panels are made of thermo-setting closed cells polyurethane foam (PU) supplied with various types of flexible facers on both sides of the panel. The nature/type of facer contributes to the performance characteristics of the product and its application. Expanded rigid polyurethane foam is distinguished by its good thermo insulation performance, mechanical resistance, workability, lightness, and durability. The performance of STIFERITE's panels is determined based on the European norm /EN

13165:2012+A1:2015 Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products - Specification/.

This EPD refers to STIFERITE's Class S average thickness panel, made of an insulation component in polyurethane foam using blowing agent Pentane-based, covered on both sides by saturated fibre glass facers.

The saturated glass tissue facing ensures compatibility and adhesion of the panel to the most common materials used in building.

The panel is produced in standard dimensions of 600 x 1200 mm and straight finish edges.

Upon request and for minimum quantities, the panels may be produced in various dimensions, and the edges may be rabbeted along the sides. The surface of the panel may be evened off by sandpaper in order to allow installation to uneven surfaces. STIFERITE Class SK panel is produced by a certified company with systems: /ISO 9001/, /OHSAS 18001/, /ISO 14001/ in its entire line of products.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration /EN 13165:2012+A1:2015 Thermal insulation products for building- factory made rigid polyurethane foam (PU) products - Specification/ and the CE-marking. For the application and use the respective national provisions apply.

Application

The STIFERITE Class S panel is suitable for insulating: flat roofs, with glued bituminous or synthetic membranes: roofs for pedestrian and non-pedestrian traffic, paved roofs, vehicle traffic roofs and hanging garden roofs; pitched roofs: ventilated and non-ventilated with breathable waterproof sheet; walls: in cavity, ventilated façades; floors and lofts: residential and industrial.

Technical Data

The data provided by the Declaration of Performance apply. In this Life Cycle Assessment, a PU insulation board with the following properties has been regarded:

Constructional data

Name	Value	Unit
Gross density	35.6	kg/m ³
Declared Average Thermal conductivity λ_D acc. to /EN 13165/	0.027	W/mK
Compressive strength at 10% deformation acc. to /EN 826/	> 150	kPa
Tensile strength perpendicular to the face acc. to /EN 1607/	> 35	kPa
Water absorption by total immersion acc. to /EN 12087/	< 2	Vol.-%
Water absorption by partial immersion acc. to /EN 1609/	< 0.1	kg/m ²
Water vapour diffusion resistance factor μ acc. to /EN 12086/	56	
Euroclass reaction to fire acc. to /EN 11925/	E	

This provides a thermal resistance $R = 2.26 \text{ m}^2 \text{ k/W}$.

The LCI data used in this report refer to an average product having an average thickness (materials in the recipes of different thicknesses are weighted according to the relative production in square meters). The type of declaration is 1 c - declaration of an average product from a manufacturer's plant.

Base materials / Ancillary materials

Core material (about 93 % of the weight of the declared unit):

Closed-cell Polyiso (PIR) rigid foam made from MDI (50-65%), polyols (20-30 %), pentane (4-5%) and additives (4-7%).

Facing (about 7 % of the weight of the declared unit): saturated fibre glass consisting of glass fiber (70-80 %) and urea formaldehyde (20-30 %).

The PU board for insulation:

- does not contain substances which are included in the "Candidate List of Substances of Very High Concern for Authorisation" under the European chemicals Regulation /REACH/

Additional declaration according to quoted law: The product is compliant with all requirements indicated at chapter 2.4.2.9 of the /PANGPP 2017/:

- Any blowing agent with Ozone depletion potential >0 is not used in production
- Catalysts lead-based are not used in production
- Flame retardants used in production (belonging to the Organophosphorus class) are not banned by any national or European regulation
- According to the raw materials declarations of suppliers the minimum amount of recycled raw materials based on the product weight is 2.45 % (note: this information is not explicitly considered in the LCA and not included in the EPD tables that only refer to recycling content in the foreground system).

Reference service life

The durability of insulation panels is normally at least as long as the lifetime of the building in which it is used. The experimental data show that the reference life is longer than 50 years.

LCA: Calculation rules

Declared Unit

The declared unit is 1 m² with with an average thickness of 61 mm, e. g. 0.061 m³. Corresponding conversion factors are listed in the table below.

Declared unit

Name	Value	Unit
Declared unit	1	m ²
Gross density	35.6	kg/m ³
Volume	0.061	m ³
Declared average thermal conductivity λ_D	0.027	W/mK
Conversion factor to 1 kg	0.46	m ² /kg
Weight of declared unit	2.17	kg/m ²

This provides a thermal resistance $R = 2.26 \text{ m}^2 \text{ /W}$.

The LCI data used in this report refer to an average product having an average thickness (materials in the

recipes of different thicknesses are weighted according to the relative production in square meters). The type of declaration is 1 c - declaration of an average product from a manufacturer's plant.

System boundary

This life cycle assessment for the production of the polyurethane insulation board considers the life cycle from the supply of raw materials to the manufacturer's gate (cradle-to-gate with options). It also includes the transport to the construction site, the installation and the end-of-life stage of the used PU thermal insulation board. The life cycle is split into the following individual phases:

- A1 - Raw material formulation
- A2 - Raw material transport
- A3 - Production of the insulation board and packaging material
- A4 - Transport to the construction site
- A5 - Emissions and cutting losses during installation

and packaging disposal
 C2 - Transport to end-of-life
 C3/C4 - End-of-Life: waste management (thermal recovery, landfill)
 D - Benefits and loads beyond system boundary

the /GaBi 7: Software-System and Database for Life Cycle Engineering/ has been used.

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.
 . For life cycle modelling of the considered products,

LCA: Scenarios and additional technical information

Transport to the building site (A4)

The distances calculated are weighted average distances according to the overall sales distribution; such distribution is considered similar for all Stiferite products.

Name	Value	Unit
Truck with a capacity of 17.3 tons	271	km
Ferry with a capacity of 1200-10000 dwt payload capacity	144	km
Ship with a capacity of 27500 dwt payload capacity tons	11000	km
Plane with a capacity of 22 ton	0	km

Installation into the building (A5)

Name	Value	Unit
Material loss	0.0434	kg
VOC in the air Pentane	1.27E-06	kg

End of life (C1-C4)

The results for the end-of-life are declared for the 2 different scenarios:

Name	Value	Unit
Scenario No 1: Material Incineration	100	%
Scenario No 2: Landfill	100	%

C4: Disposal scenarios used is divided in the 2 sub-scenarios:

- 1) Incineration 100% (C4/1)
- 2) Landfilling 100% (C4/2)

D: Benefits and loads beyond system boundary is divided in the 2 sub-scenarios:

- 1) Incineration 100% (D1)
- 2) Landfilling 100% (D2)

LCA: Results

The tables below show the results of the LCA. Basic information on all declared modules provides chapter 4. There are two scenarios for the end-of-life (C3, C4 and D) analyzed: Scenario 1 considers 100% incineration, Scenario 2 considers 100% landfill disposal.

For (SM, RSF, NRSF, CRU) indicators only the foreground system is considered.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² CLASS S average thickness panel

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
GWP	[kg CO ₂ -Eq.]	6.37E+0	4.60E-2	2.03E-1	1.00E-2	0.00E+0	0.00E+0	4.55E+0	1.15E-1	-2.54E+0	-7.20E-2
ODP	[kg CFC11-Eq.]	9.59E-6	2.91E-13	1.92E-7	7.24E-14	0.00E+0	0.00E+0	5.74E-11	4.03E-11	-1.43E-9	-1.20E-11
AP	[kg SO ₂ -Eq.]	1.49E-2	4.16E-4	3.56E-4	2.50E-5	0.00E+0	0.00E+0	2.01E-3	3.91E-4	-5.94E-3	-1.13E-4
EP	[kg (PO ₄) ³⁻ -Eq.]	2.05E-3	5.42E-5	5.07E-5	5.81E-6	0.00E+0	0.00E+0	4.80E-4	4.79E-5	-5.50E-4	-1.25E-5
POCP	[kg ethene-Eq.]	3.94E-3	-4.94E-6	8.29E-5	-6.90E-6	0.00E+0	0.00E+0	1.37E-4	3.28E-5	-4.69E-4	-1.55E-5
ADPE	[kg Sb-Eq.]	2.47E-5	2.89E-9	5.04E-7	7.49E-10	0.00E+0	0.00E+0	7.20E-8	4.01E-8	-6.84E-7	-1.93E-8
ADPF	[MJ]	1.42E+2	6.16E-1	3.03E+0	1.38E-1	0.00E+0	0.00E+0	1.90E+0	1.13E+0	-3.10E+1	-1.68E+0

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - RESOURCE USE: 1 m² CLASS S average thickness panel

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
PERE	[MJ]	7.80E+0	IND	1.90E-1	IND	IND	IND	4.32E-1	IND	IND	IND
PERM	[MJ]	1.10E-2	IND	-1.10E-2	IND	IND	IND	0.00E+0	IND	IND	IND
PERT	[MJ]	7.81E+0	2.80E-2	1.79E-1	7.96E-3	0.00E+0	0.00E+0	4.32E-1	3.35E-1	-9.94E+0	-1.68E-1
PENRE	[MJ]	7.07E+1	IND	2.66E+0	IND	IND	IND	7.98E+1	IND	IND	IND
PENRM	[MJ]	7.97E+1	IND	-2.44E+0	IND	IND	IND	-7.73E+1	IND	IND	IND
PENRT	[MJ]	1.50E+2	6.19E-1	2.18E-1	1.39E-1	0.00E+0	0.00E+0	2.46E+0	1.52E+0	-4.43E+1	-1.82E+0
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m ³]	4.29E-2	6.90E-5	1.07E-3	1.97E-5	0.00E+0	0.00E+0	1.11E-2	5.32E-4	-1.54E-2	-2.76E-4

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 m² CLASS S average thickness panel

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
HWD	[kg]	1.19E-5	3.61E-8	2.40E-7	1.04E-8	0.00E+0	0.00E+0	3.21E-9	1.16E-8	-2.48E-8	-1.44E-9
NHWD	[kg]	1.22E-1	4.22E-5	6.63E-2	1.19E-5	0.00E+0	0.00E+0	8.99E-2	2.17E+0	-2.24E-2	-4.11E-4
RWD	[kg]	3.26E-3	1.20E-6	7.80E-5	2.97E-7	0.00E+0	0.00E+0	2.20E-4	1.56E-4	-5.32E-3	-5.83E-5
CRU	[kg]	2.55E-3	0.00E+0	5.10E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	2.16E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	2.42E-2	0.00E+0	0.00E+0	0.00E+0	2.17E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	1.17E-1	0.00E+0	0.00E+0	0.00E+0	1.54E+1	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	2.69E-1	0.00E+0	0.00E+0	0.00E+0	6.71E+0	0.00E+0	0.00E+0	0.00E+0

Caption: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

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EN 12087

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Thermal insulating products for building applications. Determination of long term water absorption by immersion.

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GaBi 7 2016

GaBi 7: Documentation of GaBi 7: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Leinfelden-Echterdingen, 1992-2016 <http://www.gabi-software.com>

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EN 15804

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