ENVIRONMENTAL PRODUCT DECLARATION

in accordance with */ISO 14025/* and */EN 15804+A1/*

Owner of the declaration	**Pavafrance SAS**
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-PAV-20190182-IBA1-DE
Issue date	24/02/2020
Valid to	23/02/2025

Dry process wood fibre insulation 110-200 kg/m^3

Pavafrance SAS

Life Panels.

Life Panels is the Australasian import & Distribution partner of Pavatex

www.Lifepanels.com

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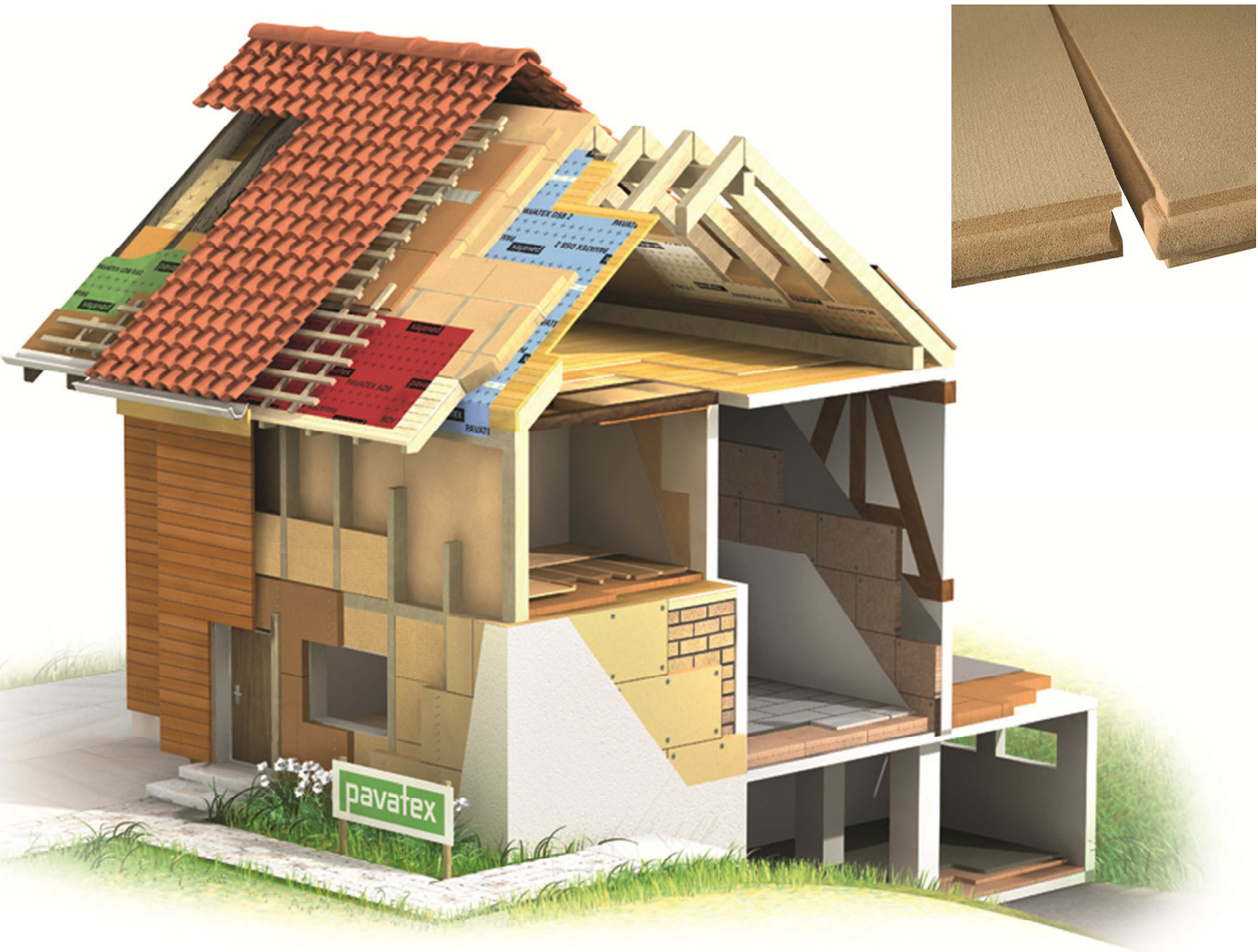

1. General Information

PAVATEX SAS

Dry process wood fibre insulation 110-200 kg/m^3

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Panoramastrasse 1
10178 Berlin
Germany

Owner of the declaration
Pavafrance SAS
Rue Jean Charles Pellerin
F-88190 Golbey

Declaration number
EPD-PAV-20190182-IBA1-DE

Declared product/declared unit
This declaration relates to 1 m^3 of wooden soft-fibre panel

This declaration is based on the following product category rules:
Derived timber products, 12/2018
(PCR tested and approved by the independent advisory board (SVR))

Scope:
This EPD relates to (dry process) wooden fibre panels which are produced in the PAVATEX works in Golbey (France). The calculation of the LCA relates to a product with a density of 200 kg/m$^{3.}$

The LCA results can be converted linearly for the following products:

Product group 110-180 kg/m^3

- PAVATHERM 110 kg/m^3
- PAVAWALL SMART 115 kg/m^3
- PAVAWALL 130 kg/m^3
- PAVAWALL GF 130 kg/m^3
- PAVAWALL-BLOC 130 kg/m^3
- ISOLAIR (100-200 mm) 145 kg/m^3
- ISOLAIR-ECO 150 kg/m^3
- ISOROOF 145 kg/m³
- PAVATHERM-COMBI 145 kg/m^3
- REVEAL PANEL 155 kg/m^3
- PAVADENTRO LIGHT 155 kg/m^3
- PAVATHERM-PROFIL 155 kg/m^3

Product group 180-200 kg/m^3

- PAVAWALL GF 190 kg/m^3
- PAVABOARD 190 kg/m^3
- ISOLAIR (30-80 mm) 200 kg/m^3
- ISOROOF 200 kg/m^3

Issue date
24/02/2020

Valid to
23/02/2025

The owner of the declaration is liable for the basic information and supporting evidence; any liability of the IBU in relation to manufacturer's information, LCA data and supporting evidence is excluded.

This EPD was compiled in accordance with the requirements of *EN 15804+A1*. This standard is described in simplified form as */EN 15804/* in the following.

Verification

European standard */EN 15804/* serves as the core PCR
Independent verification of the declaration and statements by an independent body in accordance with */ISO 14025:2010/*
☐ internal ☒ external

Dipl. Ing. Hans Peters
(President of Institut Bauen und Umwelt e.V.)

Dr. Alexander Röder
(President of Institut Bauen und Umwelt e.V.)

Patricia Wolf,
Independent verifier appointed by SVR

2. Product

2.1 Product description/Product definition

PAVATEX wooden fibre insulation products are breathable panel-shaped heat insulation materials for buildings in accordance with */EN 13171/.* The panes are produced in a so-called dry process. Wooden fibres gained from forest chips are glued with a resin adhesive and pressed into panels.

EU regulation no. /305/2011/ (CPR) applies for putting the product on the market in the EU/EFTA (with the exception of Switzerland). This product requires a declaration of performance including /DIN EN 13171:2012/, Thermal insulation products for buildings - Factory made wood fibre (WF) products - Specification and CE labelling. The respective national regulations apply to use.

2.2 Application

The products specified in the validity area are compression-proof wooden fibre insulation panels. **PAVAWALL, PAVAWALL-BLOC** as well as **PAVAWALL SMART and PAVAWALL GF 80-160** are plasterable insulation elements for composite heat insulation system for exterior walls made of masonry and wood constructions. **PAVATHERM, PAVATHERM-COMBI** and **PAVATHERM-FORTE** are wood fibre insulation panels which can be used in many ways for roofs, walls and floors. **ISOLAIR** Under-roof panels are weatherable for three months and "watertight" in accordance with European standard */EN 14964/* for under-roof panels. ISOLAIR under-roof panels are also insulation panels and may therefore be included in the calculation of heat transfer. **PAVABOARD and PAVATHERM PROFIL** are panels which can be used in a variety of ways as panels for flooring systems. The **reveal panel** is a plasterable panel for indoor and outdoor window reveal panels. **PAVAWALL GF 40-60** is an optimised, plasterable insulation element which is especially suitable for covering prefabricated wooden elements in sectional construction. **PAVADENTRO LIGHT** is a structural-physically unproblematic solution for listed facades worth conserving.

2.3 Technical data

Constructional data

The following information relates to the ISOLAIR product.

Name	Value	Unit
Bulk density in accordance with EN 13171	200	kg/m^3
Material humidity on delivery	7	%
Declared thermal conductivity in accordance with EN 13171	0,044	W/(mk)
Thermal conductivity rated value for Germany	0,046	W/(mk)
Specific thermal capacity	2,100	J/(kgK)
Water vapour diffusion resistance level in accordance with EN 13171	3	-
Fire behaviour in accordance with EN 13501-1	Class E	
Compressive stress at 10% compression in accordance with EN 13171	0.20	N/mm²
Formaldehyde emissions in accordance with EN 717-1	-	µg/m^3

Information on the other products for this EPD is available at www.soprema.com.

The product's performance data commensurate with the declaration of performance in relation to its main features in accordance with DIN EN 13171:2012, Thermal insulation products for buildings - Factory made wood fibre (WF) products - Specification.

2.4 Delivery status

ISOLAIR panels are supplied in the following dimensions:

Length x Width (cm)	Thicknesses (mm)
77 x 250	35/52/60

2.5 Base materials/ancillary materials

Composition of ISOLAIR

Name	Value	Unit
Softwood	95.2	% atro
Polyurea	4	% atro
Paraffin	0.7	% atro
Watery polymer concentrate	0.14	% atro

Certification for the origin of the timber from sustainable forestry in accordance with PEFC rules is currently being implemented.

1) Does the product/at least one part product contain substances which are on the candidate list (status: 07/01/2019) in doses of more than 0.1 mass %: yes/no."
2) Does the product/at least one part product contain further CMR Category 1A or 1B substances which are not on the candidate list in doses above 0.1 mass % in at least one part product: yes/no.
3) Have biocidal products been added to this building product or it has been treated with biocidal products (is it therefore a processed product in terms of EU Biocidal Product Directive no. 528/2012): yes/no

2.6 Manufacturing

The drying process for producing PAVATEX softwood panels is divided into the following steps:

1. Heating of the chips under steam pressure
2. Defibration process
3. Drying of the fibres in a flash tube drier
4. Spraying of the fibres with resin-based adhesive
5. Distributing the fibres to an even mat of fibres
6. The fibre mat passes through a continuous pre-press
7. The fibre mat passes through the calibration and hardening unit
8. Cutting to size and profiling depending on the product
9. Destacking and packaging

All residues which accrue during production (trimming and cutting waste) are recycled for energy recovery.

A quality management system in accordance with */ISO 9001/* is implemented to guarantee quality.

2.7 Environment and health during use

Health protection
Due to manufacturing conditions, no health protection measures beyond those prescribed by statutory and other regulations are necessary. The MAK values are not exceeded in any part of the plant.

Environmental protection
Air: The exhaust air produced by manufacturing is cleaned in accordance with statutory regulations. Emissions are below national requirements.
Water/Soil: No direct contamination for water or soil are produced.

The plant has an environmental management system in accordance with */ISO 14001* - SQS 14086/.

2.8 Product processing/installation

PAVATEX wood fibre boards can be worked with normal tools and machines such as insulation knives, electrical ripsaws and circular or belt saws. Circular saws with a large number of teeth and a high cutting speed are recommended up to 80 mm; a jigsaw is preferable above this.

Breathing protection should be worn when using hand tools without dust extraction.

Working on PAVATEX insulation materials cause no environmental contamination. No special environmental protection measures need to be taken.

2.9 Packaging

Insert sheets, cardboard, polyethylene (PE) foil, plastic or metal bands and wood are used to package PAVATEX insulation materials. All packaging can be sorted and recycled or otherwise incinerated to produce energy. External disposal can be arranged with the manufacturer in individual cases.

2.10 Condition of use

The ingredients of PAVATEX panels are the same as the composition of the base materials. At 200 kg/m^3, around 322 kg CO_2 have been stored over the lifecycle of ISOLAIR fibre boards.

2.11 Environment and health during use

Environmental protection: based on current knowledge, no hazards for water, air and soil can arise with appropriate use of the products described (see evidence).

Health protection: No hazards or impairments to health are to be expected if PAVATEX panels are used appropriately. Natural wood ingredients may be excreted in small quantities. No emissions of harmful substances which may be relevant to health have been detected (see Chapter 7).

2.12 Reference period of use

No reference period of use is declared due to the large variety of possible uses for PAVATEX softwood panels.

The durability of PAVATEX panels is defined via the application classes in accordance with */EN 13171/* and */EN 622-4/.* The average service life depends on the size of the building.

2.13 Extraordinary influences

Fire
Information in accordance with */EN 13501/:*

Fire protection

Name	Value
Building material class	E
Flaming droplets	no
Flue gas development	s2

Water
No ingredients are washed out which could be hazardous to water (see Chapter 7). Wood fibre panels are not resistant against the permanent effects of water. Damaged areas can be replaced locally.

Mechanical destruction
PAVATEX wood fibre insulation can be mechanically stressed (compression and tensile stress). In case of damage there is a soft break where the fibres are torn off unevenly.

2.14 End-of-life phase

PAVATEX wood fibre panels can easily be reused or used further for the same purpose in case of rebuilding or the termination of the use phase of a building in case of selective dismantling as long as they are untreated and not damaged.

Insofar as there was no contamination with third-party products, PAVATEX insulation materials can be easily utilised again.

2.15 Disposal

To conclude cascade use, PAVATEX wood fibre panels can be thermally recycled as renewable energy providers with the heating value of 16.22 MJ/kg (if u=20%) in old wood combustion plants or refuse/garbage incineration plants (MVA/KVA) to produce process energy and electricity.
European waste code: 03 0105.

2.16 Further information

More detailed information and processing recommendations are available in the technical brochures available at: www.soprema.com.

3. LCA: Calculation rules

3.1 Declared unit

1 m^3 of softwood fibre panel with a density of 200 kg/m^3 is declared.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	m^3
Conversion factor to 1 kg	0.005	-
Mass reference	200	kg/m^3

The LCA results can be converted linearly for the products listed in Chapter 1 via the density.

3.2 System boundary

EPD type: Cradle to gate with options

Modules A1–A3 of the production stage comprise the manufacture of products, in other words the production and processing of raw materials, energy production, the production of auxiliary and input materials, transport and the actual production of the softwood fibre panels and their packaging at PAVATEX. The forest processes are analysed according to *Werner et al. (2015)* as they are implemented in the following version of ecoinvent 2.2 (*KBOB 2016*).
Waste used as fuel, ancillary products and secondary fuels are classified and assessed accordingly in accordance with */EN 15804/.*
Due to their small quantity, the disposal processes for recycled materials or waste (not including wood) from production used to produce energy were assessed conservatively but the resulting credits ignored. Old wood which accrues is calculated as a loop within Modules A1-A3 in accordance with PCR (although no old wood is used for energy purposes); the energy generated is looped within Modules A1-A3.

The resource aspect of timber is calculated via its inherent material properties as a removal of CO^2 resources from the atmosphere and the lower heating value as the consumption of renewable energy providers.
Module A4 covers the distribution of the soft fibre panels in Germany.

In **Module A5,** manual installation is assumed for which waste of 2% is assumed in accordance with *EN 16783.* For the waste, production, transport to the building site and disposal is included in the C modules. In addition, transport and disposal of the packaging materials in a waste incinerator (KVA) is calculated; the cardboard is recycled. Credits from the energy recovered from the packaging and waste are declared in **Module D**.

For dismantling in **Module C1** it is assumed that dismantling is also manual as for installation without environmental impacts.

Module C2 contains transport of the dismantled panels to a sorting facility or waste material dealer. A transport distance of 20 km is calculated as a scenario assumption

Module C3 contains the manual sorting of the soft fibre panels as mechanical processing would lead to too high dust emissions. The product reaches the end of the waste characteristics here. No environmental loads are calculated for manual sorting.

The product is used completely as a secondary fuel. **Module C4** as waste disposal is therefore not relevant.

Transport to a biomass power plant, the actual incineration process and the credits from the substitution of fossil energy providers and electricity from the network are declared accordingly in **Module D**.

3.3 Estimations and assumptions

No further assumptions and estimates were made which are not included in this EDP.

3.4 Cut-off rules

All data from the operating data collection, i.e. All output materials used according to the formulation, the thermal energy used, internal fuel consumption and electricity consumption, all direct production waste and all available existing emission measurements are included in the LCA. Assumptions regarding transport costs were made for all in- and outputs which are included.

Costs for management, research and development, administration and marketing, as far as they are known, are not included.
The manufacture of an packaging for the additives used and for several material flows registered as waste were not included.

Material and energy flows with a share of less than 1% of the total material and total energy flows caused by the manufacture of softwood fibre panels were calculated with this approach.

In addition, no material or energy flows which were known to the project managers and which were expected to have a decisive environmental impact with regard to the declared indicators were left out of the LCA.

It can therefore be assumed that the total of the processes not included does not exceed 5% of the impact categories.

3.5 Background data

The data from an updated version of *ecoinvent 2.2 (KBOB 2016)*, which was last updated in 2016, was used as a database for the background data.

3.6 Data quality

The LCA is based on a comprehensive analysis of the material and energy flows caused by the manufacture of softwood fibre panels in the Golbey works of Pavafrance SAS. All data on production from the Golbey site (plus transport distances) was specifically collected in the works. The works data was checked independently for plausibility and linked to the data records of an internationally recognised database. The relevant data is current; it is assumed that the foreground data, which was collected more than 10 years ago, has no significant influence on the result.

The process data and the background data used are consistent. The data quality is therefore to be described as extremely good overall with the exception of the declaration of the net use of fresh water. As regards data, there is no limitation as to the use of data in an environmental product declaration in accordance with */EN 15804/* or */JBU PCR/ Part A.*

The LCA was modelled in accordance with /EN 15804/ and /JBU PCR/ Part A; no methodical standards were needed beyond this. From a methodical point of view, there is therefore no limitation on the use of the data in an EPD in accordance with */EN 15804/* or */JBU PCR/ Part A.*

3.7 Period under review

The data for the manufacture of the soft fibre boards depict the production conditions for the 2018 calendar year.

3.8 Allocation

The provision of the industrial timber used has already been inventarised in the processes already present in the updated version of *ecoinvent 2.2* (KBOB 2016). The timber chain processes are thus ecologically allocated *(Werner et al. 2015)* which results in a low degree of environmental impact for the raw materials for the sawmill waste compared to forest timber.

The data from the survey of the company is transferred to all products via the density. Additives are balanced according to the formulation. The various steam levels, which are drawn from a neighbouring company, are allocated via exergy.

The disposal of packaging in a waste incineration plant (including energy recovery) and also energy recovery from the soft fibre boards in a biomass power plant is balanced at end-of-life in Modules A5/D and in Modules C3/D.

3.9 Comparability

In principle, a comparison or the evaluation of EPD data is only possible if all data to be compared was compiled in accordance with */EN 15804/* and the building context or product-specific performance characteristics have been included.

Data from the updated version of *ecoinvent 2.2 (KBOB 2016)*, which is used for LCA data in the construction sector in Switzerland, was used exclusively.

4. LCA: Scenarios and further technical information

Transport to the building site (A4)
The delivery products including packaging are modelled on the German market by means of the data record entitled “Transport, lorry >16t fleet average/RER, where 267km are scheduled as the mean transport distance for deliveries within Germany.

Installation into the building (A5)
In Module A5, manual installation is assumed for which waste of 2 % is assumed in accordance with */EN 16783/.* For the waste, production, transport to the building site and disposal are included in the C modules.
Fixing materials are not included, as this can differ greatly depending on the installation situation.

In addition, transport and disposal of the packaging materials in a waste incinerator is calculated in Module A5; the cardboard is recycled. It is assumed that the sorted cardboard has reached the End of Waste status on the building site. Packaging waste from Module A5 is used to recovery in a waste incinerator. An average Swiss waste incinerator with representative heat recovery and electricity production is assumed to calculate the credits from thermal recycling (overall efficiency: 53 %, 8 % electricity, 92 % heat). In accordance with the requirements of the PCR, the processes entitled “Electricity, medium voltage, at grid/DE” and “Heat, natural gas, at boiler condensing modulating >100 kW/RER are credited.

End-of-life (C1 - C4)
For dismantling in Module C1 it is assumed that dismantling is also manual as for installation without environmental impacts.

The transport of the dismantled panels to a sorting plant or scrap dealer is balanced with the data record “Transport, lorry >16t, fleet average/RER”, whereby a transport distance of 20 km is calculated as a scenario assumption.
Module 3C contains the manual sorting of the soft fibre boards as mechanical processing would lead to too large dust emissions. The product reaches the end of the waste characteristics here (see Chapter 3.2). No environmental loads are calculated for manual sorting. The product is used completely as a secondary fuel. Module C4 as waste disposal is therefore not relevant.

Reuse, recovery and recycling potential (D)
It is assumed that the dismantled soft fibre boards are brought to a sorting and processing plant where they reach the end of waste properties in accordance with */EN 16485/.*
The following is calculated for the balance in Module D:

- The soft fibre boards are transported to a biomass power plant with a truck (default assumption 10 km, analogous to disposal in an MVA),
- Combustion of the soft fibre boards with energy retrieval,
- Credits according to the height and type of energy recovered.

In the absence of a data record on thermal recycling in a biomass power plant, data records for the disposal of individual components of the soft fibre boards in an MVA were used.
To calculate the credits, a biomass power plant was assumed as in other IBU declarations on wood products, in other words a total efficiency of 93%, whereby 9% is used as electricity and 91% as heat.

In 2018, no heat from recycled old wood was provided for Production in Module A1-A3. The soft fibre boards are thus recycled thermally without deductions for determining the net influences in Module D. In accordance with the requirements of the PCR, the processes entitled “Electricity, medium voltage, at grid/DE” and “Heat, natural gas, at boiler condensing modulating >100 kW/RER are credited.

In order to include the cut from the transfer, the above process was calculated for balancing the lifecycle 1.02.

5. LCA: Results

The results of the EPD for soft fibre panels 110-200 kg/m^3 in size, with a balanced density of 200 kg/m^3 are compiled in the following.

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

Production stage			Construction process stage		Use stage							End of life stage				Credits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Reuse, recovery or 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	X	X	X	X	X

RESULTS OF THE LCA – ENVIRONMENTAL IMPACT in accordance with EN 15804+A1: Soft fibre boards 200 kg/m³, pro m³

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2 eq.]	-2.53E+2	7.25E+0	1.04E+1	0.00E+0	5.19E-1	3.22E+2	0.00E+0	-2.6E+2
ODP	[kg CFC11 eq.]	1.76E-6	1.62E-7	4.79E-8	0.00E+0	1.16E-8	0.00E+0	0.00E+0	-2.79E-5
AP	[kg SO_2 eq.]	4.12E-1	4.17E-2	1.01E-2	0.00E+0	2.98E-3	0.00E+0	0.00E+0	-1.44E-1
EP	[kg $(PO_4)^{3-}$ eq.]	7.21E-2	8.88E-3	2.00E-3	0.00E+0	6.35E-4	0.00E+0	0.00E+0	-2.92E-2
POCP	[kg Ethene eq.]	1.63E-2	1.24E-3	3.82E-4	0.00E+0	8.88E-5	0.00E+0	0.00E+0	-1.79E-2
ADPE	[kg Sb eq.]	6.84E-5	1.82E-5	1.86E-6	0.00E+0	1.30E-6	0.00E+0	0.00E+0	-2.24E-5
ADPF	[MJ]	1.10E+3	1.09E+2	2.59E+1	0.00E+0	7.79E+0	0.00E+0	0.00E+0	-3.69E+3

Key	GWP = Global warming potential; ODP = Depletion potential for the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential for tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources (ADP – materials); ADPF = Abiotic depletion potential for fossil resources (ADP – fossil energy carriers)

RESULTS OF THE LCA – ENVIRONMENTAL IMPACT in accordance with EN 15804+A1: Soft fibre boards 200 kg/m³, pro m³

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	4.77E+2	1.79E+0	2.17E+2	0.00E+0	1.28E-1	0.00E+0	0.00E+0	-7.15E+1
PERM	[MJ]	3.51E+3	0.00E+0	-1.37E+2	0.00E+0	-3.38E+3	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	3.99E+3	1.79E+0	7.99E+1	0.00E+0	-3.38E+3	0.00E+0	0.00E+0	-7.15E+1
PENRE	[MJ]	1.87E+3	1.15E+2	3.42E+2	0.00E+0	8.26E+0	0.00E+0	0.00E+0	-3.98E+3
PENRM	[MJ]	2.95E+2	0.00E+0	-2.95E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	2.16E+3	1.15E+2	4.74E+1	0.00E+0	8.26E+0	0.00E+0	0.00E+0	-3.98E+3
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
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.51E+3
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.95E+2
FW	[m³]	IND	IND	IND	IND	IND	IND	IND	IND

Key	PERE = Renewable primary energy as energy carrier; PERM = Renewable primary energy as material utilisation; PERT = Total use of renewable primary energy resources; PENRE = Non-renewable primary energy as energy carrier; PENRM = Non-renewable primary energy as material utilisation; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary materials; 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 TO EN 15804-A1: Soft fibre boards 200 kg/m³, pro m³

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	7.43E-4	1.37E-4	2.08E-5	0.00E+0	9.82E-6	0.00E+0	0.00E+0	-3.03E-3
NHWD	[kg]	5.17E+0	8.93E-1	2.69E-1	0.00E+0	6.39E-2	0.00E+0	0.00E+0	2.64E+0
RWD	[kg]	2.24E-2	1.36E-4	4.53E-4	0.00E+0	9.75E-6	0.00E+0	0.00E+0	-6.22E-3
CRU	[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
MFR	[kg]	1.93E-1	0.00E+0	1.83E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MER	[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
EEE	[MJ]	0.00E+0	0.00E+0	5.60E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	6.43E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Key	HWD = Hazardous waste disposal; NHWD = Non-hazardous waste disposal; RWD = Radioactive waste disposal; CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

For reasons why the net use of fresh water resources cannot be meaningfully declared, see Chapter 6.

6. LCA: Interpretation

The results of the LCA for the product group 110-200 kg/m^3 with a balanced density of 200 kg/m^3 are interpreted as follows:

Global warming potential (GWP) is an indicator for the contribution to climate change and is calculated from the emissions of climate-relevant gases.
The emission of 75 kg of CO_2 from using a fossil energy carriers during manufacture is balanced by storage of 322 kg CO_2 in the soft fibre board across its service life. With energy use as a secondary fuel (not as waste!), the carbon stored as 322 kg CO_2 in the panel is exported from the productive system; use as energy as a secondary fuel permits the substitution of fossil energy carriers and leads to avoiding around 235kg CO_2in emissions from fossil sources.

Ozone depletion potential (ODP) is calculated from the emissions of gases which can destroy the stratospheric ozone ("hole in the ozone layer").
Around 60% of ODP is caused by the provision of natural gas for the production of the panels, whereby 30% is compensated by the "looping" of recovered energy from waste. Further contributions come from the use of natural gas for producing electricity, from electricity transformation and from the extraction of crude oil to produce diesel.
ODP is above all caused by halon 1211 (approx. 80%) and halon 1301 (approx. 10%) and a small proportion by CFC-114 (approx, 5%).
Contributions to ODP from production of the soft fibre board are compensated many times over by energy recovery from the board .
Acidification potential (AP) arises from the transformation of air pollutants into acids, which can sometimes impair the fruitfulness of the soil.
This AP is caused to approximately 45% by SO_2 emissions and approximately 50% through NOx emissions. These emissions are triggered by a large variety of incineration processes; on the one hand directly on-site (around 45%),
on the other by energy provision and in the transport costs in the pre-chains.
Around 35% of AP is compensated by the substitution of fossil energy carriers with the energetic recycling of the panel.

Eutrophication potential (EP) is calculated from the accumulation of nutrients in the soil and water which can lead to increased algae growth and displacement of the range of species.
65% of EP is caused by NOx emissions into the atmosphere and loads in waste water from production contribute around 15 % to EP; further contributions of around 15 % are caused by NH_3 emissions during production. The No_x emissions are caused by a variety of combustion processes; on the one hand directly on-site and on the other through energy provision and in the transport processes in the pre-chains.
Around 40 % of EP is compensated by the substitution of fossil energy carriers with the energetic recycling of the panel.
Photochemical ozone creation potential (POCP) is calculated from emissions into the atmosphere which can contribute to ozone formation in the summer.
POCP is mainly caused by the production of PMDI (polymer siphenylmethane diisocyanate) (around 40%). Contributions of approximately 10% originate from the provision of electricity and around 8% from drying as direct process emissions. Around 10% come from emissions from the chainsaw during timber harvesting. Further small contributions of around 5% to 10% are caused by the provision of packaging material and through delivery of the timber.
The largest contributions to POCP are caused by sulphur dioxide (approx. 50%), carbon monoxide (approx. 15%), methane (approx. 10%) and further alkanes.
Around 120% of the POCP caused by manufacture of the soft fibre panels is compensated by the substitution of fossil energy carriers with energetic use in the end-of-life phase.

The **abiotic depletion potential for fossil resources (ADP_fossil)** reflects the use of scarce fossil resources such as crude oil or natural gas.
Around 45% of ADP_fossil is caused by the manufacture of the PMDI adhesive. Contributions of 10% to 15% respectively originate from the provision of electricity, the use of natural gas and from transports.
The natural gas used is the most relevant resource for ADP_fossil, followed by crude oil and anthracite coal.
More than double the fossil resources used to manufacture the panel are saved through the substitution of fossil energy carriers by the energetic use of the soft fibre panel.

The **abiotic depletion potential for non-fossil resources (ADP_non-fossil)** is calculated from the use of scarce mineral resources such as ores and other mineral-based raw materials.
ADP_non-fossil of the balanced soft fibre panels is dominated by loads for the infrastructure of the transport loads, namely through the manufacture and maintenance of the trucks. Loads for the provision of the infrastructure which is needed to produce the raw materials and for power lines flow into ADP_non-fossil to a lesser extent.
ADP_non-fossil is caused by the use of various metallic resources including lead, copper, gold, zinc and chrome. These loads are partly compensated by energy recovery from the soft fibre panel.

The **use of renewable primary energy resources** is dominated by the use of timber which us used as fuel (around 5 %), but mainly as material utilisation , whereby the energy stored in the timber can be used to substitute fossil energy carriers through energy recovery. A comparably low amount of renewable primary energy is balanced as water for electricity production.

Around 45 % of the **use of non-renewable primary energy resources** is caused by the use of fossil energy carriers during manufacture (natural gas) but also during the manufacture of additives and through the diesel consumption for the transports. Around 55% is balanced as nuclear energy for electricity provision.

The indicator values for **waste** relate to the waste which accrues after possible waste treatment and which is disposed of on landfill. Inert waste from infrastructure processes represents the main proportion of this. Hazardous waste for landfill comes from various processes concerning energy provision of energy carriers and the production of additives;

radioactive waste comes from electricity production in nuclear power stations.

The **use of net fresh water** is caused by the provisions of electricity for the production of the soft fibre board (20 %) but particularly in the manufacture of the adhesive (60 %). This indicator is not declared in the EPD (IND: Indicator not declared) as only data which identifies the input of fresh water but not the output of fresh water, for example as cooling water, is available and which cannot be corrected because only accumulated data is available. The net use of fresh water is significantly over-estimated for this reason.

The **further indicators of the LCA** are individual values which result from balancing the waste streams into thermal waste treatment or from recycling.

7. Requisite evidence

7.1 Formaldehyde

No formaldehyde-containing adhesive is deployed in the manufacture of PAVATEX wood fibre insulation in the drying process. The following test applies to PAVATEX dry-process wood fibre insulation in the bulk density area of 110-200 kg/m^3.

Measurement point: Fraunhofer Institute for Research into Wood, Bienroder Weg 54 -E, 38108 Braunschweig, accredited test laboratory.

Test report: QA-2019-2420 dated 23rd May 2019

Results: Formaldehyde concentration after 267 hours in accordance with *EN 717-1* in the 0.225 m^3 chamber: 0.013 mg/m^3

7.2 MDI

PMDI is used as a bonding agent in the manufacture of PAVATEX dry-process wood fibre insulation. PMDI reacts with water during production to produce mainly polyurea.

7.3 Test for pre-treatment of raw materials

No old timber is used in the manufacture of PAVATEX wood fibre insulation.

7.4 VOC emissions

Measurement point: BREMER UMWELTINSTITUT, Gesellschaft für Schadstoffanalysen und Begutachtung mbH, Fahrenheitstrasse 1, 28359 Bremen, accredited test laboratory.

Test report: K 4103 FM-K dated 09/02/2017

AgBB Overview of results (28 days)

Name	Value	Unit
TVOC (C6 - C16)	n.d.	µg/m^3
Total SVOC (C16 - C22)	n.d.	µg/m^3
R (dimensionless)	3.972	-
VOC without NIK	n.d.	µg/m^3
Carcinogenic KMR-VOC	n.d.	µg/m^3

n.d = not detectable

7.5 Lindan/PCP

No pesticide-containing additives are deployed in the manufacture of PAVATEX dry-process wood fibre insulation. The following test applies to PAVATEX dry-process wood fibre insulation in the bulk density range of 110-200 kg/m^3.

Measurement point: BREMER UMWELTINSTITUT, Gesellschaft für Schadstoffanalysen und Begutachtung mbH, Fahrenheitstrasse 1, 28359 Bremen, accredited test laboratory.

Test report: H 8161 FM dated 20/12/2013

Results: Lindan and pentachlorphenol (PCP) below the detection threshold of 0.005 and 0.1 mg/kg.

8. References

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/EN 13171/
/DIN EN 13171:2012/, Thermal insulation products for buildings - Factory made wood fibre (WF) products - Specification.

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/DIN EN 717-1:2005-01/, Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method.

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/DIN EN 16783:2017-07/, Round and sawn timber - Environmental Product Declarations - Product category rules (PCR) for wood and wood-based products for use in construction.

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Publisher
Institut Bauen und Umwelt e.V.
Panoramastrasse1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastrasse1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the lifecycle assessment
Dr. Frank Werner - Environment & Development
Idaplatz 3
8003 Zürich
Switzerland

Tel + 41 (0)44 241 39 06
Fax + 41 (0)44 461 33 28
Mail frank@frankwerner.ch
Web **http://www.frankwerner.ch/**

Owner of the declaration
Pavafrance SAS
Rue Jean Charles Pellerin ZI II
88190 Golbey
France

Tel +33 (0)3 29 39 99 99
Fax no fax number
Mail info@pavatex.fr
Web **www.pavatex.de I www.soprema.com**