# ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

| | |
|---|---|
| Owner of the Declaration | Pavafrance SAS PAVATEX |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
| Declaration number | EPD-PAV-20250684-IBC1-EN |
| Issue date | 30.03.2026 |
| Valid to | 29.03.2031 |

## PAVATEX Dry process wood fibre insulation 110-200 kg/m³

## Pavafrance SAS PAVATEX

Institut Bauen und Umwelt e.V.

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# 1. General Information

## Pavafrance SAS PAVATEX

**Programme holder**

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

**Declaration number**

EPD-PAV-20250684-IBC1-EN

**This declaration is based on the product category rules:**

Wood-based panels, 01.08.2021
(PCR checked and approved by the SVR)

**Issue date**

30.03.2026

**Valid to**

29.03.2031

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

## PAVATEX Dry process wood fibre insulation 110-200 kg/m³

**Owner of the declaration**

Pavafrance SAS PAVATEX
Rue Jean Charles Pellerin ZI II
88190 Golbey
France

**Declared product / declared unit**

The declaration refers to 1 $m^3$ of softwood fibreboard.

**Scope:**

The EPD refers to woodfibre insulation boards (dry process), which are manufactured in the PAVATEX in Golbey (France). The calculation of the life cycle assessment refers to a product with a density of 200 kg/$m^3$. The life cycle assessment results can be translated linearly to the products listed below.

**Product group 110-180 kg/$m^3$**

- PAVATHERM 110 kg/$m^3$
- PAVAWALL SMART 115 kg/$m^3$
- PAVAWALL LIGHT 115 kg/$m^3$
- PAVAWALL 130 kg/$m^3$
- PAVAWALL GF 130 kg/$m^3$
- PAVAWALL-BLOC 130 kg/$m^3$
- ISOLAIR-ECO (60 - 200 mm) 145 kg/$m^3$
- LAIBUNGSPLATTE 155 kg/$m^3$
- PAVADENTRO LIGHT 155 kg/$m^3$
- PAVATHERM-PROFIL 155 kg/$m^3$
- PAVAWALL GF XL (40 - 60 mm) 165 kg/$m^3$
- PAVAWALL GF XL (80 - 160 mm) 130 kg/$m^3$
- ISOLAIR MULTI (40 - 89 mm) 165 kg/$m^3$
- ISOLAIR MULTI (100 - 200 mm) 150 kg/$m^3$
- ISOROOF R 130 kg/$m^3$
- PAVAROOF R Grunddämmplatte 130 kg/$m^3$
- PAVAROOF R Gefälleplatte 130 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/$m^3$
- ISOLAIR MULTI (30 - 35 mm) 200 kg/$m^3$

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.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

**Verification**

| |
|---|
| The standard EN 15804 serves as the core PCR |
| Independent verification of the declaration and data according to ISO 14025:2011 |
| ☐ internally ☒ externally |

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Matthias Klingler,
(Independent verifier)

## 2. Product

### 2.1 Product description/Product definition

PAVATEX wood fibre insulation materials are vapour-permeable, panel-shaped thermal insulation materials for buildings in accordance with *EN 13171*. The panels are manufactured using a dry process.
This involves coating wood fibres obtained from wood chips with a resin adhesive and pressing them into panels.

*Regulation (EU) No. 305/2011 (CPR)* applies to the marketing of the product in the European Union/European Free Trade Association (EU/EFTA with the exception of Switzerland).
The product requires a declaration of performance in accordance with *DIN EN 13171:2012, Thermal insulation products for buildings - Factory-made wood fibre products (WF) - Specification*, and CE marking. The respective national regulations apply to its use.

### 2.2 Application

PAVATEX has developed perfectly coordinated insulation systems for roofs, walls and floors. Wood fibre insulation materials are particularly heat-insulating and heat-retaining, ensuring comprehensive thermal protection for the entire house.
Possible applications include the roof area – for underlays and rafter insulation – as well as a wide range of uses in wall constructions. In interior construction, they are suitable for insulating installation levels, optimising the top floor ceiling and for subsequent room-side renovation measures on wall and floor surfaces.

### 2.3 Technical Data

**Technical data**

The following information refers to the ISOLAIR product.

| Name | Value | Unit |
|---|---|---|
| Gross density acc. to EN 13171 | 110 - 200 | kg/m$^3$ |
| Material dampness at delivery | 7 | % |
| Declared thermal conductivity acc. to EN 13171 | 0.044 | W/(mk ) |
| Rated thermal conductivity value in Germany acc. to DIN 4108-4 | 0.046 | W/(mk ) |
| Specific heat capacity acc. to EN 13171 | 2100 | J/(kgK) |
| Water vapour diffusion resistance factor acc. to EN 13171 | 3 | - |
| Fire behaviour acc. to EN 13501-1 | class E | |
| Compressive stress at 10% compression acc. to EN 13171 | 0.20 | N/mm² |
| Formaldehyde emissions acc. to EN 717-1 | - | µg/m$^3$ |

Information on the other products covered by this EPD can be found at www.soprema.com or www.pavatex.de.

The performance values of the product according to the declaration of performance in relation to its essential characteristics in accordance with *DIN EN 13171:2012, Thermal insulation products for buildings - Factory-made wood fibre products (WF) - Specification*.

### 2.4 Delivery status

The products covered by the EPD are produced in the following dimensions:

- Lenth: 188 cm
- Width: 61 cm
- Thickness: 30 - 60 mm

### 2.5 Base materials/Ancillary materials

**Composition of ISOLAIR**

| Name | Value | Unit |
|---|---|---|
| Softwood | 95,2 | % atro |
| Polyurea | 4 | % atro |
| Paraffin | 0,7 | % atro |
| Aqueous polymer concentrate | 0,14 | % atro |

Certification of the origin of wood from sustainable forestry in accordance with PEFC rules is currently being implemented.
0
1) The product/article/at least one component contains substances from the *ECHA candidate lis*t (as of 30 September 2025) above 0.1% by weight:

- no

2) The product/article/at least one component contains other CMR substances in category 1A or 1B that are not on the *ECHA candidate list* in concentrations above 0.1% by weight in at least one component:

- no

3) Biocidal products have been added to the construction product in question or it has been treated with biocidal products (it is therefore a treated article within the meaning of R*egulation (EU) No 528/2012 on biocidal products*):

- no

### 2.6 Manufacture

The dry process for the manufacture of the PAVATEX softboards is divided into the following process steps:

1. Heating of the wood chips under vapour pressure
2. Defibration
3. Drying the fibres in a flash tube dryer
4. Spraying the fibre with resin adhesive
5. Scattering the fibres to form an even fibre mat
6. Fibre mat passes through a continuous preliminary press
7. Fibre mat passes through the calibration and hardening unit
8. Cutting to size and profiling, depending on the make
9. Stacking and packaging

All residues (trimming and milling residues) accumulating during production are put without exception to energetic use.

A quality management system in accordance with *ISO 9001* has been implemented for quality assurance purposes.

### 2.7 Environment and health during manufacturing

**Health protection**

Due to the manufacturing conditions, no health protection measures beyond those required by law and other regulations are necessary. The MAK values are not exceeded at any point in the plant.

**Environmental protection**

Air: The exhaust air generated during production is cleaned in accordance with legal requirements. Emissions are below national requirements.
Water/soil: There is no direct impact on water or soil.

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

### 2.8 Product processing/Installation

PAVATEX fibreboards can be processed with conventional construction tools and machines such as insulation knives, electric saw, circular or band saws. Circular saws with a large number of teeth and high cutting speeds are recommended up to 80 mm; a reciprocating saw is preferable for greater thicknesses.

Respiratory protection should be worn when using manual tools without dust extraction.

No environmental pollution is caused by the processing/installation of the PAVATEX insulation materials. It is not necessary to take any special environmental protection precautions.

### 2.9 Packaging

Insert sheets, cardboard boxes, polyethylene (PE) film, plastic or metal strapping and wood are used to package PAVATEX wood fibre insulation boards. All packaging can be recycled if sorted correctly, otherwise it can be used for energy recovery.

External disposal can be arranged with the manufacturer on a case-by-case basis.

### 2.10 Condition of use

The ingredients of PAVATEX wood fibre insulation boards correspond in their proportions to those of the raw material composition. Over the lifetime of ISOLAIR wood fibre insulation boards (at 200 kg/m³), around 322 kg of $CO_2$ is stored.

### 2.11 Environment and health during use

**Environmental protectio**n: According to today's level of knowledge, water, air and soil cannot be endangered if the products described are used as intended.

**Health protection**: Health aspects: no damage or impairments to health are to be expected if the PAVATEX boards are used for their intended purpose. Of course, ingredients inherent to the wood can be given off. Health-relevant emissions of pollutants are not detectable.

### 2.12 Reference service life

Due to the many different usage possibilities of PAVATEX soft fibreboards, no reference service life is declared. Durability in the usage condition is defined for the PAVATEX boards via the application classes pursuant to *EN 13171* and *EN 622-4*. The average service life lies in the order of magnitude of the building.

### 2.13 Extraordinary effects

**Fire**

Data according to *EN 13501-1*:

**Fire protection**

| Name | Value |
|---|---|
| Building material class | E |
| Burning droplets | no |
| Smoke gas development | s2 |

**Water**

No ingredients that could pollute water are washed out (see proofs). Woodfibre boards are not resistant to the permanent influence of water. Damaged points can be locally exchanged.

**Mechanical destruction**

PAVATEX woodfibre insulation materials can be mechanically stressed (compressive and tensile stress). In case of damage, a soft break occurs at which the fibres are unevenly torn off.

### 2.14 Re-use phase

In the case of reconstruction or the end of the usage phase of a building in the case of selective demolition, and provided they are untreated and not damaged, PAVATEX woodfibre boards can easily be collected separately and reused or used further for the same application.

Provided that no contamination with foreign products or damage has taken place, the PAVATEX insulation materials can be put to material uses without problems.

### 2.15 Disposal

At the end of their cascade use, PAVATEX wood fibre boards can be used as a renewable energy source with a calorific value of around 18 MJ/kg for energy recovery in waste wood combustion plants or waste incineration plants (WIP) to generate process energy and electricity.

*European Waste Catalogue*: 03 01 05.

### 2.16 Further information

Detailed information and processing recommendations are available in the technical brochures at www.soprema.com or www.pavatex.de.

## 3. LCA: Calculation rules

### 3.1 Declared Unit

1 $m^3$ of soft fibreboard with a density of 200 kg/$m^3$ is declared.

**Definition of the declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1 | $m^3$ |
| Conversion factor to 1 kg ( in kg/m³ ) | 200 | - |
| Mass reference | 200 | $kg/m^3$ |
| Layer thickness | 0.06 | m |
| Grammage | 12 | $kg/m^2$ |
| Gross density | 200 | $kg/m^3$ |

The life cycle assessment results can be converted linearly via density to the products mentioned in Chapter 1.

### 3.2 System boundary

Type of EPD according to *EN 15804+A2*, section 5.2: "From cradle to factory gate with options, i.e. modules C1-C4 and module D (A1-A3, C, D and additional modules. The additional modules may be A4 and/or A5 and/or B1-B7)".

Modules A1–A3 of the production stage cover the manufacture of the products, i.e. raw material extraction and processing, energy generation, the manufacture of auxiliary and input materials, transport, and the actual manufacture of the wood fibre insulation boards and their packaging at Pavafrance SAS in Golbey.
The resource aspect of wood is balanced by the material's inherent properties as a resource for extracting $CO_2$ from the atmosphere and its lower calorific value as a renewable energy source. The biogenic $CO_2$ content when using waste wood is balanced in the same way. Various alternative fuels are used for energy production. According to *EN 15804+A2* and IBU PCR Part A (*IBU 2024*), waste leaves the product system once it has reached the end of its waste properties.
The resource aspect of wood is accounted for via the material-inherent properties as resource extraction of $CO_2$ from the atmosphere and the lower heating value as consumption of renewable energy sources.

**Module A4** covers the distribution of soft fibreboard in Germany.

**Module A5** assumes manual installation, with a 2% waste factor applied in accordance with *EN 16783*.
The production, transport to the construction site and disposal of offcuts are taken into account in the C modules. In addition, the transport and disposal of packaging materials in a waste incineration plant (WIP) are calculated, whereby the cardboard is recycled. The credits from the energy recovered from the packaging and offcuts are declared in Module D.
Fastening materials are not taken into account, as they can vary greatly depending on the installation situation and specific EPDs are usually available for fastening materials.
Machinery used for installation (e.g. crane, transport lift) is not taken into account.

For dismantling in *Module C*1, it is assumed that dismantling is carried out by machine. It can be assumed that the environmental impact of the machines used for installation (cranes, excavators, etc.) is negligible in relation to the environmental impacts of the life cycle.

**Module C2** includes the transport of the dismantled panels to a sorting plant or a waste dealer.

**Module C3** involves the manual sorting of soft fibreboard, as mechanical processing would lead to high dust emissions. At this point, the product reaches the end of its waste properties. No environmental impacts are calculated for manual sorting. The product is used entirely as secondary fuel.

**Module C4** as waste disposal is therefore not relevant.

Transport to a biomass power plant, the actual combustion process and the credits from the substitution of fossil fuels and electricity from the grid are declared accordingly in **Module D**. Furthermore, the energy recovered from the energetic recovery of waste is calculated.

### 3.3 Estimates and assumptions

No further assumptions or estimations have been made that are not listed in this EPD.

### 3.4 Cut-off criteria

All data from the production-related data collection, i.e. all raw materials used according to the recipe, the thermal energy used, internal fuel consumption and electricity consumption, all direct production waste and all available emission measurements were taken into account in the modeling. Assumptions were made regarding transport for all inputs and outputs taken into account.
Expenses for management, research and development, administration and marketing are not taken into account, as far as they are known.
The production of any packaging for the additives used or for some material flows recorded as waste was neglected.
This approach also included material and energy flows accounting for less than 1% of the total material and energy flows generated during the production of soft fibreboards. Furthermore, no material or energy flows known to the project managers and likely to have a significant environmental impact with regard to the reported indicators were neglected in the life cycle assessment.
It can therefore be assumed that the sum of the neglected processes does not exceed 5% of the impact categories.

### 3.5 Background data

Only data records from ecoinvent v3.11, last updated in 2024, were used as the database for background data.

### 3.6 Data quality

The life cycle assessment is based on a comprehensive analysis of the material and energy flows generated by the production of soft fibreboard at the Pavafrance SAS plant in Golbey.
All data relating to production at the Golbey site (plus transport distances) was collected specifically at the plant. The plant data was independently checked for plausibility and linked to data sets from an internationally recognised database. The relevant data sets are up to date.

The process data and background data used are consistent. Overall, the data quality can be described as very good. From a data perspective, there are no restrictions on the use of the data in an environmental product declaration in accordance with *EN 15804* or IBU PCR Part A (*IBU 2024*).

The life cycle assessment was modelled in accordance with the specifications of *EN 15804* and IBU PCR Part A (*IBU 2024*); no additional methodological settings were required. From a methodological point of view, there are therefore no restrictions on the use of the data in an environmental product declaration in accordance with *EN 15804* or IBU PCR Part A (*IBU 2024*).

### 3.7 Period under review

The data for the manufacture of soft fibreboards reflects the production conditions in the calendar year 2024.

### 3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

### 3.9 Allocation

The provision of industrial waste wood is inventoried using processes already available in *ecoinvent v3.11*. The processes in the wood chain are thus allocated economically (*Werner et al. 2015*), which means that the raw materials used have a low environmental impact compared to forest wood.

The data from the operational survey is allocated to all products based on density; the additives are accounted for according to the recipe. The allocation of the various steam levels obtained from a neighbouring plant is based on exergy.

The accounting of packaging disposal in an incineration plant (including energy recovery) and energy recovery from soft fibreboard in a biomass power plant at end-of-life is carried out in modules A5/D and C3/D, respectively.

### 3.10 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. Only data from *ecoinvent v3.11* with the 'cut-off by classification' system model was used.

## 4. LCA: Scenarios and additional technical information

**Characteristic product properties of biogenic carbon**

**Information on the biogenic carbon content at the factory gate**

| Name | Value | Unit |
|---|---|---|
| Biogenic carbon content in product | 88.7 | kg C |
| Biogenic carbon content in accompanying packaging | 4.72 | kg C |

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of $CO_2$.

**Transport to construction site (A4)**
The delivery of products, including packaging, to the German market is modelled using the dataset 'Transport, freight, lorry, 16-32 metric tonnes, diesel, EURO 6 {RER}', assuming a transport distance of 300 km for deliveries to Germany.

**Installation in the building (A5)**
Manual installation is assumed, with a 2% waste rate applied in accordance with *EN 16783*.
The production, transport to the construction site and disposal of the waste are calculated in the C modules. Fastening materials are not taken into account, as they can vary greatly depending on the installation situation.
Module A5 also covers the transport and energy recovery of the packaging materials wood and packaging film in a waste incineration plant. Benefits from the recovered exported energy are declared in Module D. The waste incineration plant is assumed to be an incineration plant with an efficiency of R1 > 0.6 (according to CEWEP Energy Report III (*Reimann 2013*)); the recovered energy is declared as exported energy; according to the same report, an efficiency of 29.34% for heat generation and 11.61% for electricity generation is assumed for quantification (always with reference to the lower calorific value of the waste).
Cardboard packaging is recycled; it is assumed that the sorted cardboard has reached end-of-waste status at the construction site and leaves the product system as 'material for recycling'. Cardboard recycling flows can be complex, which is why the modelling of loads and credits from cardboard recycling has been omitted.

**End of life (C1–C4)**
For dismantling in module C1, it is assumed that, as with installation, dismantling will also be carried out manually without any environmental impact.

The transport of the dismantled panels to a sorting plant or a waste dealer is accounted for using the datasetd 'Transport, freight, lorry, 16-32 metric tonnes, diesel, EURO 6 {RER}| ', with a transport distance of 50 km being calculated as a scenario assumption.

Module C3 involves the manual sorting of soft fibreboard, as mechanical processing would lead to high dust emissions. At this point, the product reaches the end of its waste properties. No environmental impact is calculated for manual sorting. The product is used entirely as secondary fuel.

Module C4, waste disposal, is therefore not relevant.

**Reuse, recovery and recycling potential (D)**
It is assumed that the dismantled soft fibreboards are taken to a sorting and processing plant where, in accordance with EN 16485, they reach the end of their waste properties as non-pressure-treated wood.
The following is therefore calculated for the balance sheet in Module D:

- transport of the soft fibreboards as secondary fuel to the biomass power plant by truck (default assumption 10 km, analogous to disposal in an incineration plant),
- incineration of the soft fibreboards with energy recovery,
- benefits according to the amount and type of energy recovered.

In the absence of data on thermal utilisation in a biomass power plant, data on the disposal of the individual components of the soft fibreboard in an incineration plant is used for the combustion process.
To calculate the benefits, a biomass power plant was assumed, as is the basis for other IBU declarations on wood products, i.e. a total efficiency of 68%, with 35% used as electricity and 65% as heat.
In 2024, no recycled waste wood was used for production in modules A1-A3; however, significant quantities of waste wood were used for external heat generation. This results in a negative net flow for the calculation of the benefits and burdens from the use of secondary fuels, which is why the burdens are higher than the benefits of heat recovery.
Similarly, the energy exported from Module A5 through the energy recovery of packaging is calculated as a benefit in Module D.
In order to take into account the waste from installation, 1.02 times the process per m3 of soft fibreboard is calculated for the life cycle assessment.

**GWP of the electricity mix used in Module A3**:
0.0797 kg $CO_2$ eq./kWh

## 5. LCA: Results

The results of the life cycle assessment for soft fibreboards weighing 110–200 kg/m³ with a balanced density of 200 kg/m³ are summarised below.
The characterisation factors EF3.1 are used for the impact assessment.

**DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)**

| 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 | X | X | X | X | X |

**RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: PAVATEX soft fibreboard 200 kg/m³, per m³**

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| GWP-total | kg $CO_2$ eq | -2.11E+02 | 1.19E+01 | 2.45E+01 | 0 | 1.87E+00 | 2.88E+02 | 0 | 2.73E+02 |
| GWP-fossil | kg $CO_2$ eq | 9.6E+01 | 1.19E+01 | 5.64E+00 | 0 | 1.87E+00 | 0 | 0 | 2.72E+02 |
| GWP-biogenic | kg $CO_2$ eq | -3.07E+02 | 2.54E-03 | 1.89E+01 | 0 | 3.99E-04 | 2.88E+02 | 0 | 1E+00 |
| GWP-luluc | kg $CO_2$ eq | 6.08E-02 | 4E-03 | 1.42E-03 | 0 | 6.28E-04 | 0 | 0 | 3.73E-01 |
| ODP | kg CFC11 eq | 3.48E-06 | 2.59E-07 | 9.58E-08 | 0 | 4.07E-08 | 0 | 0 | 5.1E-06 |
| AP | mol $H^+$ eq | 6.94E-01 | 2.55E-02 | 2.11E-02 | 0 | 4.01E-03 | 0 | 0 | 5.35E-01 |
| EP-freshwater | kg P eq | 1.27E-03 | 8.84E-05 | 3.21E-05 | 0 | 1.39E-05 | 0 | 0 | 3.32E-02 |
| EP-marine | kg N eq | 4.71E-01 | 6E-03 | 1.26E-02 | 0 | 9.42E-04 | 0 | 0 | 1.14E-01 |
| EP-terrestrial | mol N eq | 4.05E+00 | 6.63E-02 | 1.15E-01 | 0 | 1.04E-02 | 0 | 0 | 1.32E+00 |
| POCP | kg NMVOC eq | 1.27E+00 | 4.05E-02 | 3.8E-02 | 0 | 6.36E-03 | 0 | 0 | 4.56E-01 |
| ADPE | kg Sb eq | 4.52E-04 | 4.08E-05 | 1.1E-05 | 0 | 6.41E-06 | 0 | 0 | 3.81E-04 |
| ADPF | MJ | 2.82E+03 | 1.69E+02 | 7.3E+01 | 0 | 2.65E+01 | 0 | 0 | 4.31E+03 |
| WDP | $m^3$ world eq deprived | 1.58E+01 | 6.63E-01 | 3.73E-01 | 0 | 1.04E-01 | 0 | 0 | 8.85E+00 |

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; WDP = Water (user) deprivation potential)

**RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: PAVATEX soft fibreboard 200 kg/m³, per m³**

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ | -3.05E+03 | 2.75E+00 | 2.82E+01 | 0 | 4.31E-01 | 0 | 0 | 6.51E+02 |
| PERM | MJ | 3.57E+03 | 0 | -1.77E+01 | 0 | 0 | -3.55E+03 | 0 | 0 |
| PERT | MJ | 5.15E+02 | 2.75E+00 | 1.05E+01 | 0 | 4.31E-01 | -3.55E+03 | 0 | 6.51E+02 |
| PENRE | MJ | 2.52E+03 | 1.69E+02 | 9.38E+01 | 0 | 2.65E+01 | 0 | 0 | 4.31E+03 |
| PENRM | MJ | 2.97E+02 | 0 | -2.08E+01 | 0 | 0 | -2.76E+02 | 0 | 0 |
| PENRT | MJ | 2.82E+03 | 1.69E+02 | 7.3E+01 | 0 | 2.65E+01 | -2.76E+02 | 0 | 4.31E+03 |
| SM | kg | 0 | 0 | 6.32E-01 | 0 | 0 | 0 | 0 | 0 |
| RSF | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -3.72E+05 |
| NRSF | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -9.28E+02 |
| FW | $m^3$ | 5.48E-03 | 3.35E-05 | 1.14E-04 | 0 | 5.27E-06 | 0 | 0 | 6.9E-05 |

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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: PAVATEX soft fibreboard 200 kg/m³, per m³**

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| HWD | kg | 1.71E-02 | 1.15E-03 | 4.68E-04 | 0 | 1.81E-04 | 0 | 0 | 1.72E-02 |
| NHWD | kg | 9.31E+00 | 8.23E+00 | 6.02E-01 | 0 | 1.29E+00 | 0 | 0 | 1.02E+01 |
| RWD | kg | 3.2E-02 | 8.76E-05 | 6.47E-04 | 0 | 1.38E-05 | 0 | 0 | 2.49E-02 |
| CRU | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MFR | kg | 0 | 0 | 6.32E-01 | 0 | 0 | 0 | 0 | 0 |
| MER | kg | 0 | 0 | 3.97E+00 | 0 | 0 | 1.99E+02 | 0 | 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| EEE | MJ | 0 | 0 | 2.46E+01 | 0 | 0 | 0 | 0 | 0 |
| EET | MJ | 0 | 0 | 6.21E+01 | 0 | 0 | 0 | 0 | 0 |

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; EET = Exported thermal energy

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: PAVATEX soft fibreboard 200 kg/m³, per m³**

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| PM | Disease incidence | 5.62E-06 | 8.86E-07 | 2.67E-07 | 0 | 1.39E-07 | 0 | 0 | 2.83E-06 |
| IR | kBq U235 eq | 1.41E+01 | 7.38E-02 | 2.87E-01 | 0 | 1.16E-02 | 0 | 0 | 1.11E+01 |
| ETP-fw | CTUe | 1.05E+03 | 2.27E+01 | 2.38E+01 | 0 | 3.56E+00 | 0 | 0 | 5.79E+02 |
| HTP-c | CTUh | 5.11E-08 | 1.98E-09 | 1.43E-09 | 0 | 3.12E-10 | 0 | 0 | 2.81E-08 |
| HTP-nc | CTUh | 5.25E-07 | 1.06E-07 | 3.48E-08 | 0 | 1.67E-08 | 0 | 0 | 1.01E-06 |
| SQP | SQP | 2.55E+03 | 1.01E+02 | 5.5E+01 | 0 | 1.59E+01 | 0 | 0 | 4.64E+02 |

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

## 6. LCA: Interpretation

Figure 1 shows the contributions of the individual stages of the life cycle normalised to the sum of modules A1-C4 of the respective indicator:

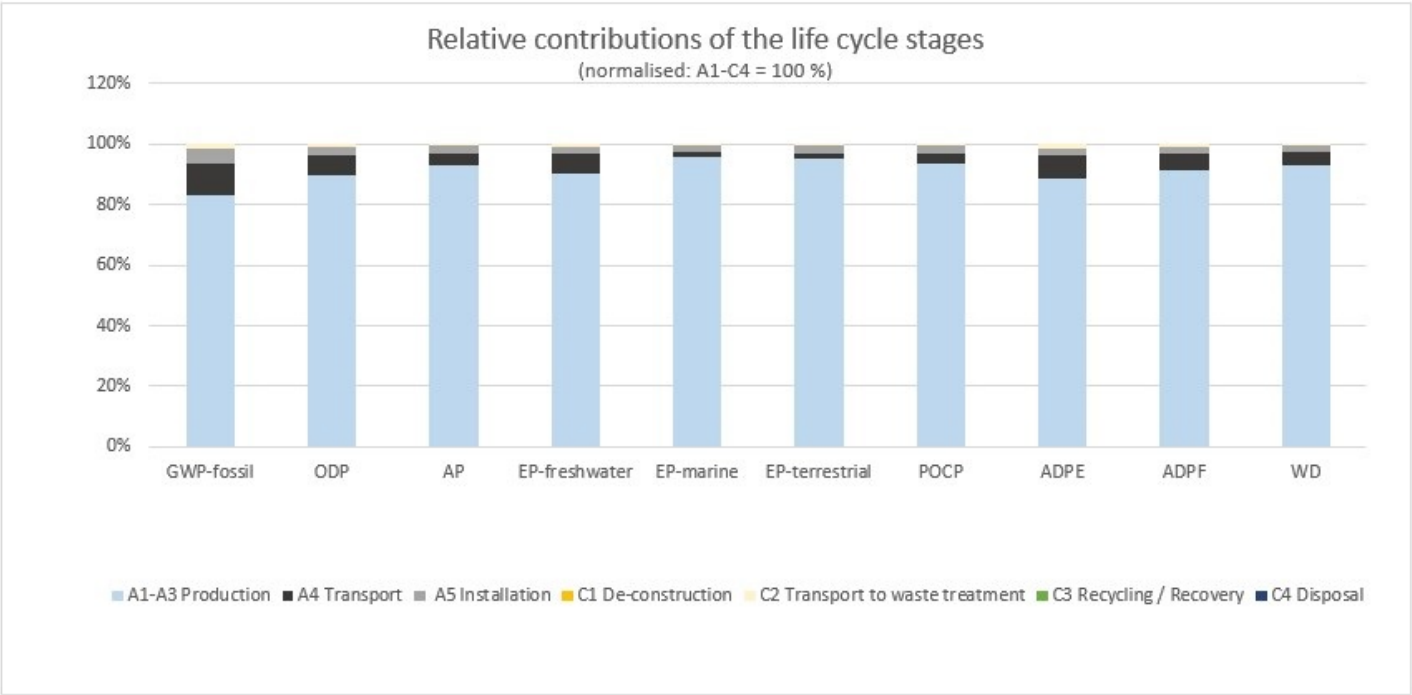


**Figure 1: Relative contributions of the individual stages of the life cycle: Modules A1-C4 = 100%**

This shows that the manufacture of soft fibreboard dominates the environmental impact over the life cycle. For individual indicators such as GWPfossil, delivery to the construction site also contributes around 10%. All other modules of the product life cycle are of minor importance in terms of their environmental impact.
However, relevant contributions also come from module D. Since the net flow calculation for the use of secondary fuels leads to negative values, module D shows the avoidance of wood waste incineration and the provision of heat and electricity from fossil sources or via the electricity grid.

Figure 2 shows the carbon footprint of the life cycle of soft fibreboard, 200 kg/m3.

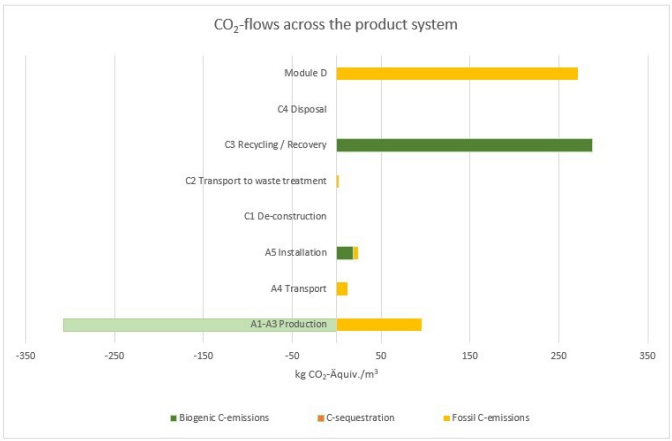


**Figure 2: carbon footprint of soft fibreboard, 200 kg/m³**

The emission of 96 kg $CO_2$ equivalent from the use of fossil fuels during production is offset by the storage of 322 kg $CO_2$ equivalent in the soft fibreboard over its lifetime. When used for energy as a secondary fuel (not as waste!), the C stored in the board is exported from the product system as 322 kg $CO_2$ equivalent; Since considerable amounts of waste wood are used as secondary fuel for heat generation in the manufacture of soft fibreboard, this results in a negative net flow of secondary fuels, which leads to additional fossil $CO_2$ emissions of around 270 kg $CO_2$ equivalent from the additional provision of heat from natural gas combustion or electricity from the grid.

The declared values cover the product with the highest density manufactured by Pavafrance SAS at its Golbey site as a 'worst-case' scenario. The environmental impacts of products with lower densities can be scaled linearly due to the very similar relative composition of all products.

## 7. Requisite evidence

### 7.1 Formaldehyde

No adhesives containing formaldehyde are used in the dry production process for PAVATEX wood fibre insulation materials. The following test applies to PAVATEX wood fibre insulation materials produced using the dry process with a bulk density of 110-200 kg/m³.

Testing laboratory: Fraunhofer Institute for Wood Research, Bienroder Weg 54 -E, 38108 Braunschweig, accredited testing laboratory.

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

Result: Formaldehyde concentration after 267 hours in accordance with EN 717-1 in the 0.225 m³ chamber: 0.013 mg/m³.

### 7.2 Testing for pre-treatment of input materials

No waste wood is used in the manufacture of PAVATEX wood fibre insulation materials. .

### 7.3 VOC emissions

Testing laboratory: BREMER UMWELTINSTITUT, Gesellschaft für Schadstoffanalysen und Begutachtung mbH, Fahrenheitstr. 1, 28359 Bremen, accredited testing laboratory.

Test report: K 4103 FM-K dated 9 February 2017

**AgBB results overview (28 days)**

| Name | Value | Unit |
|---|---|---|
| TVOC (C6 - C16) | n.d. | µg/m³ |
| Sum SVOC (C16 - C22) | n.d. | µg/m³ |
| R (dimensionless) | n.d. | - |
| VOC without NIK | n.d. | µg/m³ |
| Carcinogenic Substances KMR-VOC | n.d. | µg/m³ |

n.d = not detectable

### 7.4 Lindane/PCP

No pesticide-containing additives are used in the manufacture of PAVATEX wood fibre insulation materials using the dry process. The following test applies to Pavatex wood fibre insulation materials manufactured using the dry process with a raw density range of 110-200 kg/m³.

Testing laboratory: BREMER UMWELTINSTITUT, Gesellschaft für Schadstoffanalysen und Begutachtung mbH, Fahrenheitstr. 1, 28359 Bremen, accredited testing laboratory.

Test report: H 8161 FM dated 20 December 2013

Result: Lindane and pentachlorophenol (PCP) below the detection limit of 0.005 and 0.1 mg/kg respectively.

## 8. References

**Standards**

**DIN 4108-4**
DIN 4108-4:2020-11, Thermal insulation and energy economy in buildings — Part 4: Thermal and moisture protection design values.

**EN 622-4**
DIN EN 622-4:2019-08, Fibreboards — Requirements — Part 4: Requirements for porous boards.

**EN 717-1**
DIN EN 717-1:2005-01, Wood-based materials — Determination of formaldehyde emission — Part 1: Formaldehyde emission by the test chamber method.

**EN 13171**
DIN EN 13171:2015-04 — Thermal insulation products for buildings — Factory-made wood fibre products [WF] — Specification.

**EN 13501-1**
DIN EN 13501-1:2019-05, Classification of construction products and construction types according to their reaction to fire - Part 1: Classification using the results of tests on the reaction to fire of construction products.

**EN 14964**
DIN EN 14964:2007-01, Roofing underlays — Definitions and characteristics.

**EN 15804+A2**
DIN EN 15804+A2:2014-07, Sustainability of buildings — Environmental product declarations — Core rules for the product category construction products.

**EN 16485**
DIN EN 16485:2014-07, Round and sawn timber — Environmental product declarations — Product category rules for wood and wood-based materials in construction.

**EN 16783**
DIN EN 16783:2017-07, Thermal insulation products — Product category rules (PCR) for factory-made and in-situ thermal insulation products for the preparation of environmental product declarations.

**ISO 9001**
DIN EN ISO 9001:2008, Quality management systems — Success through quality.

**ISO 14001**
DIN EN ISO 14001:2009, Environmental management systems — Requirements with guidance for use (ISO 14001:2004 + Cor. 1:2009).

**ISO 14025**
ISO 14025:2006-07, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

**ISO 14044**
DIN EN ISO 14044:2006-11, Environmental management — Life cycle assessment — Requirements and guidance.

**Legal documents**

**COMMISSION REGULATION (EU) No 1179/2012**
COMMISSION REGULATION (EU) No 1179/2012 of 10 December 2012 establishing criteria determining when broken glass ceases to be waste under Directive 2008/98/EC of the European Parliament and of the Council. Official Journal of the European Union: 2012, L 337/31-33.

**COUNCIL REGULATION (EU) No 333/2011**
COUNCIL REGULATION (EU) No 333/2011 of 31 March 2011 establishing criteria determining when certain types of scrap metal cease to be waste under Directive 2008/98/EC of the European Parliament and of the Council.

**ECHA Candidate List**
The Candidate List of Substances of Very High Concern, available at https://echa.europa.eu/nl/-/four-newsubstances-added-to-the-candidate-list.

**Regulation on biocidal products**
REGULATION (EU) No 528/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 22 May 2012 concerning the making available on the market and use of biocidal products.

**Regulation (EU) No 305/2011 (CPR)**
REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

**European Waste Catalogue**
http://www.gesetze-im-internet.de/avv/anlage.html.

**Programme-specific documents**

**IBU (2021)**
IBU (2021): Product category rules for construction products Part B: Requirements for EPDs for wood-based materials. Status as of 1 August 2021, Institut Bauen & Umwelt, Berlin.

**IBU (2024)**
IBU (2024): Product category rules for construction products Part A: Calculation rules for the life cycle assessment and requirements for the project report according to EN 15804+A2:2019. Institut Bauen & Umwelt, Berlin, as of April 2024.

**Further references**

**AIB (2024)**
AIB (2024): Association of Issuing Bodies, European Residual Mixes, Results of the calculation of Residual Mixes for the calendar year 2023, Version 1.0, 2024-05-30, https://www.aib-net.org/facts/European-residual-mix/2023

**Ecoinvent v3.11**
Ecoinvent v3.11 (2024): life cycle inventories, ecoinvent v3.11, released 12/2024, ecoinvent centre Zurich.

**Frischknecht et al. (2007)**
Frischknecht, R., Jungbluth, N., Althaus, H.-J, Doka, G., Heck. T., Hellweg, S., Hischier, R., Nemecek, T., Rebitzer, G., Spielmann, M. und Wernet, G (2007): Overview and Methodology. ecoinvent report No. 1, Dübendorf: Swiss Cen-tre for Life Cycle Inventories.

**Grexel (2020)**
Grexel (2020): Issuance Based Residual Mix Calculation Methodology, Published 31.03.2020, Version 1.2, https://www.aib-net.org/sites/default/files/assets/facts/residual-mix/2022/RM%20EAM%20IB%20Calculation%20Methodology%20V1_2.pdf

**Reimann (2013)**
Reimann D.O. (2013): CEWEP Energy Report III (Status 2007 – 2010); Results of Specific Data for Energy, R1 Plant Efficiency Factor and NCV of 314 European Waste-to-Energy (WtE) Plants. Würzburg/Brussels: CEWEP.

**Weidema et al. (2013)**
Weidema, B., C. Bauer, R. Hischier, C. Mutel, T. Nemecek, J. Reinhard, C.O. Vadenbo, G. Wernet (2013): Overview and methodology, Data quality guideline for the ecoinvent database version 3. ecoinvent report no. 1 (v3), St. Gallen, Schweiz.

**Publisher**

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

**Programme holder**

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

**Author of the Life Cycle Assessment**

Dr. Frank Werner - Umwelt & Entwicklung
Kammelenbergstrasse 30
9011 St. Gallen
Switzerland

+ 41 (0)44 241 39 06
frank@frankwerner.ch
http://www.frankwerner.ch/

**Owner of the Declaration**

Pavafrance SAS PAVATEX
Rue Jean Charles Pellerin ZI II
88190 Golbey
France

+33 (0)3 29 39 99 99
info@pavatex.fr
www.pavatex.de I
www.soprema.com