ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Pavatex SA**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-PAV-2013254-CBG1-EN
Issue date	04.02.2014
Valid to	03.02.2019

Woodfibre insulation materials produced in the wet process 135-200 kg/m^3

PAVATEX SA

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

1. General Information

PAVATEX SA	Woodfibre insulation materials produced in the wet process 135-200 kg/m³
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** **PAVATEX SA** Rte de la Pisciculture 37 CH-1701 Fribourg
Declaration number EPD-PAV-2013254-CBG1-EN	**Declared product / Declared unit** The declaration refers to 1 m³ woodfibre insulation
This Declaration is based on the Product Category Rules: Wood based panels, 07.2014 (PCR tested and approved by the independent expert committee) **Issue date** 04.02.2014 **Valid to** 03.02.2019	**Scope:** The EPD refers to woodfibre insulation boards (wet process), which are manufactured in the two works of PAVATEX SA in Fribourg and Cham. The calculation of the life cycle assessment refers to a product with a density of 140 kg/m³. The life cycle assessment results can be translated linearly to the products listed below. · PAVATHERM 140 kg/m³ · SWISSTHERM 150 kg/m³ · PAVATHERM-PROFIL 175 kg/m³ · PAVATHERM-COMBI 175 kg/m³ · PAVADENTRO 175 kg/m³ · DIFFUTHERM 190 kg/m³ · PAVAWALL 155 kg/m³ · PAVAPOR 135 kg/m³ · PAVATHERM-PLUS 180 kg/m³ · PAVATHERM-FORTE 175 kg/m³ 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.
	Verification The CEN Norm /EN 15804/ serves as the core PCR Independent verification of the declaration according to /ISO 14025/ ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Dr. Burkhart Lehmann (Managing Director IBU)	Patricia Wolf (Independent verifier appointed by SVR)

2. Product

2.1 Product description

PAVATEX woodfibre insulation materials are vapour permeable, thermal insulation materials in board form for buildings pursuant to EN 13171. The boards are manufactured using the so-called wet process. The wood's inherent cohesive forces (mainly lignin) are used for the bonding of the finished material. This takes place by decomposing the wood to fibres by means of a thermo-mechanical process and subsequently causing the form strand produced from this to bind using heat. In principle, no additional chemical binding agents are required when using such a process.

For the manufacture of thicker boards or boards made of raw boards in various densities, several raw boards are glued together with PVAc glue to form multilayer blocks.

2.2 Application

The products mentioned in the scope of validity are pressure-resistant woodfibre insulation boards. DIFFUTHERM as well as PAVAWALL are insulation elements that can be plastered over for thermal insulation composite systems for exterior walls made of masonry and timber constructions. PAVADENTRO is internal insulation that can be plastered over.

PAVATHERM, PAVATHERM-PROFIL, PAVATHERM-COMBI, PAVATHERM-FORTE and PAVAPOR are versatilely usable woodfibre insulating boards for roof, wall and floor.
PAVATHERM-PLUS are insulation elements with an integrated sarking board. They are suitable for use as roof insulation and for insulation measures on exterior walls in solid and timber constructions with curtain walls.

2.3 Technical Data

Building-related technical data
The following data refer to the product PAVATHERM. Data for the other products of this EPD can be viewed at www.pavatex.com.

Name	Value	Unit
Gross density pursuant to EN 13171	140	kg/m^3
Material dampness at delivery	7	%
Declared thermal conductivity pursuant to EN 13171	0.038	W/(mk)
Rated value of the thermal conductivity for Germany	0.040	W/(mk)
Specific thermal capacity	2100	J/(kgK)
Water vapour diffusion resistance factor pursuant to EN 13171	5	-
Fire behaviour pursuant to EN 13501-1	Class E	
Compressive stress at 10% pursuant to EN 13171	0.02	N/mm²

2.4 Placing on the market / Application rules

General Building Authority Approval Z-23.15-1429 issued by the Deutsche Institut für Bautechnik, Berlin.

Product and application standards:

- EN 13171:2012. Thermal insulation products for buildings - Factory-made wood fibre products (WF) - Specifications.
- DIN 4108-10:2008-06, Thermal protection and the saving of energy in buildings - Part 10: Application-related requirements for thermal insulation materials - factory-made thermal insulation materials
- EN 622-4:2009, Fibreboards - Specifications - Part 4: Requirements for permeable boards
- EN 14964:2006, Sarking boards for roof cladding - Definitions and characteristics
- Datasheet SIA 2001:2013, Thermally insulating building materials - declared values for the thermal conductivity and further data for building physics calculations
- ACERMI: Association pour la certification des matériaux isolants
- ÖNORM B 6000:2010, Factory-made insulation materials for thermal and/or sound insulation in building construction
- BBA: British Board of Agrément, technical approvals for construction

2.5 Delivery status

PAVATHERM boards are delivered in the following dimensions:

Length x width (cm)	Thicknesses (mm)
60 x 102	20-160
120 x 205	40/60

2.6 Base materials / Ancillary materials

Composition of the product group 135-200 kg/m³

Name	Value	Unit
Softwood	89.0-98.0	% atro
Paraffin	0.5-1.5	% atro
White glue PVAc	1.5-3.0	% atro
Aluminium sulphate max.	0.5-1.0	% atro
Starch max.	0.5-2.0	% atro
Flocculant max.	0.02-0.04	% atro

2.7 Manufacture

The wet process for the manufacture of the PAVATEX softboards is identical at both locations. It is divided into the following process steps:

- Further processing of the slabs and edgings to form wood chips
- Heating of the wood chips under steam pressure
- Defibration
- Suspension of the fibres in water to form a fibre mash
- Placing on the moulding machine
- Forming into fibre mats
- Mechanical pressing out of the water
- Lengthwise cutting to size of the fibre mat
- Drying at temperatures of between 160 and 220 °C
- Gluing of the raw boards, cutting to size and profiling, depending on make
- Stacking and packaging

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

The following systems are implemented for quality assurance

- CE-marking pursuant to EN 13171 - Notified Body MPA - Stuttgart, D
- FSC, Chain of Custody SQS-COC-021707
- EN ISO 9001:2008 - SQS 14086
- EN ISO 14001:2004 - SQS 14086

2.8 Environment and health during manufacturing

Health protection
Due to the manufacturing conditions, no health protection measures extending beyond the legal and other regulations are necessary. The TLV values (MAK in Switzerland) are bettered in each part of the plant.

Environmental protection
Air: The production-related exhaust air is cleaned in accordance with the legal regulations. Emissions lie below the limit specified in the Swiss Federal Clean Air Act.

Water/soil: There is no direct pollution of water and soil. Production-related wastewater is internally reconditioned and fed back to the production or to a wastewater treatment plant.

2.9 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 insulating materials. It is not necessary to take any special environmental protection precautions.

2.10 Packaging

Inserts, cardboard boxes, PE films, plastic or metal straps and wood are used for the packaging of the PAVATEX insulation materials. If sorted properly, all packaging can be recycled; otherwise it can be energetically utilised. External disposal can be agreed in individual cases with the manufacturer.

2.11 Condition of use

The ingredients of the PAVATEX boards correspond in their proportions to the raw material composition. Around 225 kg CO2 are stored over the lifetime of the PAVATHERM fibreboards (at 140 kg/m3).

2.12 Environment and health during use

Environmental protection: According to today's level of knowledge, water, air and soil cannot be endangered if the products described are used as intended (see proofs).

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 (see proofs).

2.13 Reference service life

Due to the many different usage possibilities of PAVATEX softboards, 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.

2.14 Extraordinary effects

Fire

Fire protection

Specifications pursuant to EN 13501-1

Name	Value
Building material class	E

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.

2.15 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 utilised without problems, for example, for the production of compost.

2.16 Disposal

As the conclusion of the cascade utilisation, PAVATEX woodfibre boards can be used as renewable energy carriers with the high calorific value of 17.9 to 18.5 MJ/kg (at u=20%) in wood waste burning plants or waste incineration/refuse incineration plants for the generation of process energy and electricity.
European waste code: 03 0105.
without problems, for example, for the production of compost.

2.17 Further information

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

3. LCA: Calculation rules

3.1 Declared Unit

1 m^3 softboard with a density of 140 kg/m^3 is declared.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	m^3
Conversion factor to 1 kg	0.00714	-
Mass reference	140	kg/m^3

A conservative approach was chosen for the definition of the average composition of the boards: the thinnest board thickness was assumed for ingredients that contribute to the strength (with pre-specified strength values); the thickest board was proportionately assumed for thickness-dependent ingredients. The life cycle assessment results can thus be linearly translated via the density to each product within a product group.

3.2 System boundary

Type of EPD: Cradle to factory gate - with options

The *modules A1 - A3* of the production stage encompasses the manufacture of the products, i.e. the raw material production and processing, the energy generation, the production of the auxiliary materials

and ingredients, transport and the actual manufacturing of the softboards and their packaging at PAVATEX SA. The forestry processes are thereby balanced according to Schweinle (2000) as they are implemented in ecoinvent 2.2 (Werner et al. 2007). Due to the small amounts involved, no "loops" are accounted for within the modules A1-A3 for recycled materials or energetically used wastes.
The resource aspect of wood is balanced via the inherent characteristics of the material as a resource withdrawal of CO_2 from the atmosphere and the lower calorific value as the consumption of renewable energy carriers.
Module A5 encompasses the transport and the disposal of the packaging materials in a refuse incineration plant, whereby the cardboard is recycled. The credits from the recovered energy are defined in module D.

The end-of-waste status for the demolished softboards is determined at the point at which they are ready for energy recovery as sorted waste wood. The transport to a biomass power station, the actual combustion process as well as the credits from the substitution of fossil energy carriers and electricity from the grid are declared accordingly in *module D*.

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 operating data acquisition, i.e. all raw materials used in accordance with the recipe, the thermal energy used, the internal fuel and electricity consumptions, all direct production wastes and all available emission measurements, are accounted for in the balance. Assumptions were made regarding transport expenditures for all inputs and outputs considered. Expenditures for management, research and development, administration and marketing - as far as these are known - are not taken into account. The manufacture of any packaging for the fillers employed or for some material flows treated as waste was neglected.
This approach also allows the balancing of those material and energy flows that make up less than 1 per cent of the total material or total energy flows arising in the production of softboards.
Beyond that, in the context of the life cycle assessment, no material or energy flows were neglected of which those responsible for the project would be aware and which would be expected to have a significant environmental effect with regard to the listed indicators. It can thus also be assumed that the sum of the neglected processes does not exceed 5 % of the impact categories.

3.5 Background data
The data records from ecoinvent v2.2, which was last updated in 2010, were exclusively used as the database for the background data.

3.6 Data quality
The life cycle assessment is based on an extensive analysis of the material and energy flows arising from the production of softboards at the two works of PAVATEX SA. All data for production at the two PAVATEX locations (plus transport distances) were specifically acquired in the works. The works data were checked independently for plausibility and linked to data records from an internationally recognised database. The process data and the background data employed are consistent. The data quality can therefore be described as very good. From the data point of view, therefore, there are no limitations to the use of the data in an environmental product declaration pursuant to SN EN 15804.
The life cycle assessment was modelled in accordance with the specifications of SN EN 15804 or IBU PCR Part A respectively; beyond that no methodical assertions had to be made. Hence, from the methodical point of view, there are no limitations to the use of the data in an environmental product declaration pursuant to SN EN 15804.

3.7 Period under review
The production conditions in the calendar year 2012 illustrate the data for the production of the softboards. The measured data of emission sources originate from the year 2011. At the Fribourg location the energy mix for the first half-year of 2013 is assumed due to a new boiler.
The products are declared as averaged values from the two locations of PAVATEX SA in Cham and Fribourg. The formation of the average is weighted according to the production volumes of the two locations.

3.8 Allocation
The provision of the industrial residual wood used is inventoried using processes already existing in ecoinvent. The processes in the wood chain are thus economically allocated (Werner et al. 2007) which, in comparison with forest wood, leads to a lesser environmental impact of the raw materials for the sawmill wastes used.
The data acquired during operation are apportioned to all products via the density; the fillers are balanced in accordance with the recipe.
During production or from the provision of energy at the two locations, no by-products result that would have to be allocated.
No secondary fuels or secondary materials are used on the input side.
The disposal of packaging in a refuse incineration plant (including energy recovery) as well as the energy recovery from the softboards in a biomass power plant at end of life is balanced in the modules A5/D or in module D.
Conservatively, due to the small amounts involved, no 'loops' were accounted for within this module for material for recycling or for energy from the thermal treatment of wastes from modules A1-A3.

3.9 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.

4. LCA: Scenarios and additional technical information

The following technical information forms the basis for the declared modules A5, C1-C4 and D:

Installation in the building (A5)
It is assumed that the softboards are installed as a component without further auxiliary materials.
An average Swiss refuse incineration plant with representative heat recovery and electricity production (overall efficiency: 53%, 8% electricity, 92% heat) is taken for the calculation of the credits from the thermal utilisation of the packaging materials. The processes 'Electricity, medium voltage, at grid/CH' or respectively 'Heat, natural gas, at industrial furnace low NOx >100 kw/RER' are credited.

End of life (C1-C4)
The softboard is energetic utilised, wherein the system limit is drawn where the softboard is available in a properly sorted form; the softboard thus exits the balance area in module C3 with an export of 225 kg CO2-equivalent as an inherent characteristic of the material.

Re-use, recovery and recycling potential (D), relevant scenario specifications
The transport of the softboards as a secondary fuel to a biomass power plant by truck is assumed (default assumption 10 km). For the calculation of the credits, a biomass power plant is assumed similar to that on which other IBU declarations for wood products are based, i.e. with an overall efficiency of 93%, wherein 9% is used as electricity and 91% as heat.
Neither recycled softboards as secondary fuels nor other waste woods are used for manufacturing. Hence, the softboards are energetically utilised without deductions for the determination of the net flows in module D.

5. LCA: Results

The results of the life cycle assessment for softboards from the product group 135-200 kg/m³ with a balanced density of 140 kg/m³ are summarised below.

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[1)]	Refurbishment[1)]	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	MND	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: Softboard 140 kg/m³, per m³

Parameter	Unit	A1-A3	A5	D
Global warming potential	[kg CO_2-Eq.]	-165.10	2.30	-164.40
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	6.95E-6	1.29E-8	-2.14E-5
Acidification potential of land and water	[kg SO_2-Eq.]	0.19	0.00	-0.16
Eutrophication potential	[kg $(PO_4)^{3-}$- Eq.]	0.03	0.00	-0.02
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	0.02	0.00	-0.01
Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	1.18E-4	2.44E-7	-3.70E-5
Abiotic depletion potential for fossil resources	[MJ]	1170.00	2.00	-3156.00

RESULTS OF THE LCA - RESOURCE USE: Softboard 140 kg/m³, per m³

Parameter	Unit	A1-A3	A5	D
Renewable primary energy as energy carrier	[MJ]	1082.00	0.03	-102.00
Renewable primary energy resources as material utilization	[MJ]	2383.00	0.00	0.00
Total use of renewable primary energy resources	[MJ]	3465.00	0.03	-102.00
Non renewable primary energy as energy carrier	[MJ]	1478.00	2.00	-3400.00
Non renewable primary energy as material utilization	[MJ]	134.00	0.00	0.00
Total use of non renewable primary energy resources	[MJ]	1612.00	2.00	-3400.00
Use of secondary material	[kg]	0.00	0.00	0.00
Use of renewable secondary fuels	[MJ]	0.00	0.00	0.00
Use of non renewable secondary fuels	[MJ]	0.00	0.00	0.00
Use of net fresh water	[m³]	1.49	0.01	-0.25

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: Softboard 140 kg/m³, per m³

Parameter	Unit	A1-A3	A5	D
Hazardous waste disposed	[kg]	1.20E-3	3.96E-6	-3.17E-3
Non hazardous waste disposed	[kg]	4.25	0.17	1.12
Radioactive waste disposed	[kg]	8.09E-3	1.97E-6	-7.38E-3
Components for re-use	[kg]	0.00	0.00	0.00
Materials for recycling	[kg]	0.05	0.00	0.00
Materials for energy recovery	[kg]	0.00	0.00	0.00
Exported electrical energy	[MJ]	0.00	9.53	0.00
Exported thermal energy	[MJ]	0.00	103.00	0.00

6. LCA: Interpretation

The results of the life cycle assessment for woodfibre boards from the product group 135-200 kg/m³ with the balanced density of 140 kg/m3 are interpreted as follows:

The Global Warming Potential (GWP) is an indicator for the contribution to the climatic change and is calculated from the emissions of climatically relevant gases.
The GWP is mainly determined by the CO_2 flows: the emission of 52 kg CO2 from the use of fossil energy carriers during the manufacture is opposed by the storage of 225 kg CO_2 in the softboard over its lifetime. During the energetic use the 225 kg CO_2 stored in the softboard are released, whereby approximately 60 kg CO_2 emissions from fossil sources can be avoided by the substitution of fossil energy carriers.

The Ozone Depletion Potential (ODP) is calculated from the emissions of gases that can deplete the stratospheric ozone ('ozone hole').
Around 50% of the ODP is caused by the provision of natural gas for the production of the woodfibre boards. Further contributions originate from the generation of electricity, in particular from uranium preparation, the transformation of electricity and the extraction of crude oil, e.g. for the production of diesel fuel.

The ODP is caused in particular by halon 1211 (about 65%) and halon 1301 (about 25%), and to a small extent by CFC-114 (about 10%).
The contributions to the ODP from the production of the softboard are compensated several times over by the recovery of energy from the board.

The Acidification Potential (AP) results from the transformation of air pollutants into acids, which amongst other things can impair soil fertility.
About 60% of the AP is caused by SO_2 emissions and about 40% by NOx emissions. These emissions are caused by a multitude of combustion processes, on the one hand directly at the location and on the other in the provision of energy and during the transport processes in the preliminary chains.
Approximately 90% of the AP is compensated by the substitution of fossil energy carriers during the energetic utilisation of the board.

The over fertilisation potential (Eutrophication potential, EP) is calculated from the enrichment of nutrients in soils and bodies of water, which can lead to intensified alga growth and shifts in the spectrum of species.
About 55% of the EP is caused by NOx emissions into the air, while the loads in the wastewater from production contribute approximately 45% to the EP.
The NOx emissions are caused by a multitude of combustion processes, on the one hand directly at the location and on the other in the provision of energy and during the transport processes in the preliminary chains.
About half of the EP is compensated by the substitution of fossil energy carriers during the energetic utilisation of the board.

The Photochemical Ozone Creation Potential (POCP) is calculated from emissions into the air that can contribute to the formation of ozone in summer.
A significant cause of the POCP is the production of PVAc (approximately 50%). Contributions of the order of magnitude of about 25% are caused at the works locations by the energetic use of wood and natural gas as well as direct emissions from the drying of the wood. The provision of electricity is responsible for a contribution of about 12%. Further low contributions of approximately 7% are caused by the provision of the packaging material, the manufacture of the sawmill wood residues and the transport of the wood to the works.
The largest contributions to the POCP are caused by sulphur dioxide (about 30%), carbon monoxide (about 20%), ethene (about 15%) and acetic acid (about 10%).
Approximately 85% of the POCPs caused by the production of the softboard are compensated by the substitution of fossil energy carriers by the energetic use at end of life.

The Abiotic Depletion Potential for fossil resources (ADP-fossil) reflects the use of scarce fossil resources such as crude oil or natural gas.
Approximately 45% of the ADP-fossil is caused by the use of natural gas in the manufacture of the softboards. The manufacture of PVAc contributes approximately 20% to this indicator. Lower amounts are caused by the provision of electricity (about 15%) and the transport of the wood to the works (about 5%).
The natural gas used is the most relevant resource for the ADP-fossil, followed by crude oil and lignite.
By the substitution of fossil energy carriers in the energetic use of the softboard, around 3 times as many fossil resources are saved as were used for the manufacture of the board.

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 raw materials.
The ADP-non-fossil of the balanced softboards is dominated by expenditures for the infrastructure that is required for the production of the fillers. Expenditures for the provision of the infrastructure of power lines and vehicles (trucks) are also incorporated to a small extent in the ADP-non-fossil.
The ADP-non-fossil is caused by the use of various metallic resources, including lead, copper, gold, zinc and chrome. These expenditures are partially compensated again through the recovery of energy from the softboard.

The use of renewable primary energy is dominated by the use of wood, which is used on the one hand as a fuel (approximately 30%), but mainly as a material, wherein the energy stored in the wood can be used for the substitution of fossil energy carriers in the recovery of energy. A comparatively small amount of renewable primary energy is balanced as water for the generation of electricity.

Around two thirds of the use of non-renewable primary energy is caused by the use of fossil energy carriers during production (natural gas) and also during the manufacture of the fillers, and by diesel consumption for transport. About one third is balanced as nuclear power for the provision of electricity.

The indicator values for Wastes refer to wastes that are dumped following a possible waste treatment. Inert wastes, i.e. those from infrastructure processes, constitute the major part. Dumped dangerous wastes come from various processes in the provision of energy carriers and the production of fillers; the radioactive wastes result from the generation of electricity in nuclear power plants.

The majority of the net use of fresh water is caused by the manufacture of the softboards using the wet process.

The further indicators of the life cycle inventory analysis are individual values that result from the balance of waste flows into thermal waste treatment or recycling.

7. Requisite evidence

7.1 Formaldehyde

No adhesives containing formaldehyde are used in the manufacture of PAVATEX woodfibre insulation materials in the wet process. The following test applies to PAVATEX woodfibre insulation materials in the wet process in the gross density range of 135-200 kg/m³.

Measuring body: eco-Institut GmbH, accredited test laboratory for product and emission testing and quality assurance, Cologne, Germany.
Test report: 38166-001 of 05/12/2012
Result: Formaldehyde concentration after 28 days pursuant to DIN EN 717-1:
• PAVATHERM 29 µg/m³ / 0.024 ppm

7.2 MDI

No adhesives containing isocyanate are used in the manufacture of PAVATEX woodfibre insulation materials in the wet process.

7.3 Check for the pretreatment of the materials used

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

7.4 VOC emissions

Measuring body: eco-Institut GmbH, accredited test laboratory for product and emission testing and quality assurance, Cologne, Germany.
Test report: 38166-001 of 05/12/2012

AgBB result overview (28 days)

Name	Value	Unit
TVOC (C6 - C16)	299	µg/m³
Sum SVOC (C16 - C22)	n.d	µg/m³
R (dimensionless)	0.55	-
VOC without NIK	3	µg/m³
Carcinogenic Substances KMR-VOC	n.d	µg/m³

n.d = not detectable

7.5 Lindan/PCP

No additives containing pesticides are used in the production of PAVATEX woodfibre insulation materials in the wet process. The following test applies to Pavatex woodfibre insulation materials in the wet process in the gross density range of 135-200 kg/m3.
Measuring body: eco-Institut GmbH, accredited test laboratory for product and emission testing and quality assurance, Cologne, Germany.
Test report: 38166-001 of 05/12/2012
Result: Lindan and pentachlorophenol (PCP) lie below the detection limit of 0.1 mg/kg

8. References

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Königswinter (pub.): Generation of Environmental Product Declarations (EPDs);

General principles
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013/04
www.bau-umwelt.de

PCR, Part A
Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. 2013/04
www.bau-umwelt.de

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

ISO 9001
ISO 9001:2008, Quality management systems – success through quality.

ISO 14001
ISO 14001:2009, Environmental management systems – requirements with instructions for application (ISO 14001:2004 + Cor. 1:2009).

EN 13171
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Publisher Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	 Tel Fax Mail Web	 +49 (0)30 3087748- 0 +49 (0)30 3087748- 29 info@bau-umwelt.com **www.bau-umwelt.com**
Programme holder Institut Bauen und Umwelt e.V. Panoramastr 1 10178 Berlin Germany	 Tel Fax Mail Web	 +49 (0)30 - 3087748- 0 +49 (0)30 – 3087748 - 29 info@bau-umwelt.com **www.bau-umwelt.com**
Author of the Life Cycle Assessment Frank Werner Idaplatz 3 8003 Zürich Switzerland	 Tel Fax Mail Web	 +41-44-241 39 06 keine frank@frankwerner.ch **www.frankwerner.ch**
Owner of the Declaration Pavatex SA Rte de la Pisciculture 37 1701 Fribourg Switzerland	 Tel Fax Mail Web	 +41(0)26 426 31 11 +41(0)26 426 32 00 info@pavatex.ch **www.pavatex.ch**