ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804

Declaration holder	Eternit AG
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Eternit Equitone Pictura Façade Panels and Eternit Equitone Natura PRO Façade Panels

Eternit AG

Institut Bauen und Umwelt e.V.

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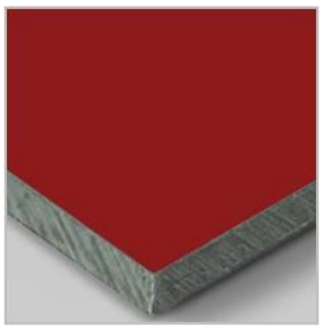

1. General information

Eternit AG

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
D-10178 Berlin

Declaration number
EPD-ETE-20130223-IAC1-EN

This Declaration is based on the Product Category Rules:
Fibre cement / Fibre concrete, 07-2012
(PCR tested and approved by the independent Expert Committee (SVA)

Issue date
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Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Chairman of the Expert Committee (SVA))

Eternit Equitone Pictura & Natura PRO Façade Panels

Holder of the Declaration
Eternit AG
Im Breitspiel 20
D-69126 Heidelberg

Declared product/unit
1 m² Pictura / Natura PRO

Area of applicability:
The environmental indicators for large-format fibre cement panels are depicted in the Environmental Product Declaration. This document refers to Pictura and Natura PRO façade panels manufactured by Eternit AG. Production data for 2010 was collated in the Eternit AG plant in Neubeckum. The products are practically identical; they merely differ in terms of the respective finish. As the Pictura finish is less aqueous despite having an otherwise identical composition, the Pictura façade panels are declared. The environmental impacts established here represent a worst-case scenario for Natura PRO façade panels.

The Life Cycle Assessment which is based on plausible, transparent and comprehensive basic data, represents in full the Eternit products referred to. The holder of the Declaration is liable for the information and evidence on which it is based; liability on the part of IBU in terms of manufacturer information, Life Cycle Assessment data and evidence is excluded.

Verification

The CEN EN 15804 standard serves as the core PCR
Verification of the EPD by an independent third party in accordance with ISO 14025
☐ internally ☒ externally

Patricia Wolf
Independent verifier appointed by the SVA

2. Product

2.1 Product description

The products in question are large-format smooth panels made of naturally-hardened fibre cement featuring a glazed or covering coating.
Eternit Equitone Natura PRO façade panels are dyed through and feature permanent graffiti protection. They are particularly scratch-resistant as well as being resistant to conventional spray paints and dyes. As the smooth surface features a transparent coating or colour glaze, the characteristic structure of the fibre cement shines through consistently.
Equitone Pictura fibre cement panels are produced by Eternit for colourful façade design featuring graffiti protection. These façade panels with smooth, matt and coloured covering coating avail of an extremely resistant, UV-hardened finish. Pictura is therefore particularly scratch-resistant as well as being resistant to conventional spray paints and dyes, whereby it involves fibre cement panels with fibres made of cellulose and plastic for water retention, improved tensile load distribution and increased breaking load and breakage deformation. The products are practically identical. They merely display differences in their respective finishes.

2.2 Application

Pictura and Natura PRO serve as panelling material for back-ventilated façades as well as decorative interior design. The façade panels are mounted on substructures made of wood or metal.

2.3 Technical data

Standard-related tests for CE marking are carried out via type testing to DIN EN 12467.

Technical construction data

Description	Value	Unit
Thermal conductivity	0.06	W/(mK)
Water vapour diffusion resistance factor to DIN 4108-4, EN ISO 12572	350 / 140	-

Swelling (air-dry to water-saturated)	1	mm/m
Gross density	1650 - 1800	kg/m^3
Compressive strength	50	N/mm^2
Bending tensile strength ⊥	24	N/mm²
Bending tensile strength ∥	17	N/mm^2
Elasticity module	15000	N/mm^2
Moisture content at 23 °C, 80% humidity	10	% by mass
Temperature elasticity reciprocal value	0.01	mm/mK
Chemical resistance	*	-
Age resistance	*	-
Long-term temperature resistance	< 80	°C

*similar to concrete C 35/45 (previously B 45)

Sound insulation: In the case of a cellular concrete wall where Rw,R = 44 dB, a back-ventilated façade with 80 mm fibre insulation and 8 mm fibre cement panelling can improve sound insulation from 9 to 11 dB (according to DIN 52210-6).

2.4 Placing on the market / Application rules

Regulation (EU) No. 305/2011 applies for placing on the market within the European Union. The products require a Declaration of Performance taking consideration of the harmonised DIN EN 12467: 2006-12, Fibre cement panels – Product specification and test methods; German version EN 12467:2004 + A1:2005 + A2:2006 and CE marking.

National guidelines apply for use, e.g. the general construction inspection approval no. Z-31.1-34 issued by the Deutsches Institut für Bautechnik (DIBt).

2.5 Delivery status

Packaging is in the form of standard pallets according to the price list with a weight of 1 to 2 tonnes per pallet, seldom weighing more than 2 tonnes. Small orders (< 1 tonne) are packed to customer specifications.

Maximum format in mm: 3100 x 1250; 2500 x 1250
Thickness in mm: 8; 12

Pictura finish: smooth, available in various colours
Natura PRO finish: smooth, available in various glazes

2.6 Base materials / Auxiliaries

Base materials in % mass, dry weight

Description	Value	Unit
Portland cement CEM I 32.5 R and 42.5 R to DIN EN 197-1 (as binding agent)	81.5	%
Trass (as filling material)	6.0	%
Pulp (as filtering fibres)	2.5	%
Polyvinyl alcohol fibres (as reinforcement fibres)	3.5	%
Colour	6.5	%

Mixing water is also required for the cement: approx. 0.24 m³/t fibre cement

No substances of REACH relevance according to the list of candidates dated 21.06.2013 are used in production.

Coatings

Order volume [g/m²]	Pictura	Natura PRO
Reverse side sealing		
wet	60-68	60-68
dry	24-27	24-27
Paint for priming the front		
wet	64-88	64-88
dry	29-40	29-40
Paint as pigmented interim coating on front side		
wet	104-132	104-132
dry	49-62	49-62
UV coating, 2-C UV clear varnish		
wet = dry	64-72	64-72

2.7 Production

Large-format panels made of fibre cement are manufactured in a largely automated winding process: the raw materials are treated with water to form a homogeneous mixture. Rotating screen cylinders are immersed in this fibre cement pulp which drain the mixture outwards. The screen surface is coated with a thin fibre cement film which is conveyed onto an infinite transport belt from where it reaches a format roller to which an increasingly thick layer of fibre cement is applied. Once the requisite material thickness has been achieved, the still moist and malleable fibre cement layer (fibre cement fleece) is unravelled and detached from the format roller. The fibre cement fleece is cut to length and any leftovers are returned to the production process with the result that no waste is incurred. The fleece is stacked and compressed under high pressure. The panels are then left to harden before being stacked on pallets and moved to a maturity store for additional setting. The setting time is approx. 4 weeks.
The reverse sides are given a transparent seal in a roller process. The visible sides are attributed a coating for which the high-quality pure acrylate paint is applied twice in a brushing/pouring process and hot-filmed to make the surface smooth.
A two-component transparent varnish is then applied to the façade panels by pouring before a micro-structured synthetic foil is rolled onto the varnish coating. The clear varnish is then immediately hardened by UV light radiant heaters. Once the transparent varnish has hardened, the foil is removed. The micro-structure embossed in the clear varnish coating ensures a silky-matt surface and prevents reflective effects.
Quality Management: TÜV certification to ISO 9001:2008 is available for the production facility.

2.8 Environment and health during manufacturing

During the entire manufacturing process, no other health protection measures are required extending beyond the legally specified industrial protection measures for commercial enterprises.

- Air: Any dust incurred is collected in filter systems and partially re-used. Emissions are significantly lower than the limit values specified by the Technical Guidelines on Air Quality Control.

- Water/Soil: Water incurred during production and plant cleaning is treated mechanically in water treatment plants on the site and re-used in the production process.
- Noise: The noise emissions into the environment by production equipment fall short of the permissible limit values.
- Recycling production waste: All hardened fibre cement waste from cuttings or reject material is transported to the Enningerloh cement plant for cement recovery (approx.10 km). The microstructure foil is shredded after use and sold as recycled material for PVC production.

Environmental Management: TÜV certification to ISO 14001:2004 is available for the production facility.

2.9 Product processing / Installation

Special low-dust equipment such as slow-running, carbide-tipped dicing saws or cutting burs and manually-operated tools such as guillotine shears, punch pliers etc. are available for processing. Drill holes can be made using standard HSS drills.
Additional products required for installing the products under review include: wooden or aluminium substructures including the requisite anchoring or connection components as well as mounting components (e.g. studs, screws, nails) and joint tapes made of EPDM or aluminium. An assessment of these additional products is not a component of this Declaration. When selecting any requisite constructive products, please ensure that they do not have a negative influence on the designated function of the building products referred to.
On request, the large-panel boards can also be supplied ready for installation simply requiring individual cuts in situ.
The professional liability associations' rules apply.
When processing the products under review, conventional industrial protection measures must be observed in accordance with information supplied by the manufacturer. Please note that dust incurred during processing can have an alkaline reaction (pH value: approx. 12). The general dust limit of ≤ 6 mg/m³ in accordance with TRGS 900 can be safely observed using processing equipment recommended by Eternit AG (please refer to the "Planning and Application, Façade Panels made of Fibre Cement" document issued by Eternit in 2013).
According to the present state of knowledge, hazards for water, air and soil can not arise when fibre cement is processed as designated.

2.10 Packaging

Products are supplied sealed in recyclable polyethylene foil (LDPE) on special pallets made of wood or wooden Euro-pallets. Special VdFZ pallets are deposit pallets used by members of the Fibre Cement Industrial Association.

2.11 Condition of use

Hydration of the cement and water mixture forms hardened cement paste (calcium silicate hydrate) with embedded fibres and fillers as well as micro air pores. Over the period of use, lime from the cement reacts with carbon dioxide from the air to form calcium carbonate (carbonation).
Fibre cement contains approx. 12% water (equilibrium moisture) and a volume of approx. 30% air (contained in the micropores).
The coating substances are bound as solid substances during use thanks to hot-coating. The water evaporates.
After the binding agent has set and when used as designated, fibre cement products can be used for practically any application.

2.12 Environment and health during use

Environmental protection: According to the present state of knowledge, hazards for water, air and soil can not arise when the products under review are processed as designated (see Requisite evidence).
Health protection: When the construction products are used as designated, no health hazards are known in connection with the base materials used and the performance thereof in the condition of use (see Requisite evidence). The low algicide aggregate contained in the basic coating is bound in the binding agent (pure acrylate) and can not be released in measurable volumes by leaching/washing out with the result that no health hazards can arise (see Eluate analysis). The weathering rate of the pure acrylate coating is very low even after years of use (not measurable) with the result that no health hazards can arise.
In interior applications, no emissions of volatile organic substances of dangerous to health are released into indoor air.

2.13 Reference Service Life

The Reference Service Life of fibre cement panels is comparable to that of buildings. In accordance with the guidelines on sustainable building issued by the BMVBS in 2000, the RSL is roughly 40 to 60 years. There are no verifiable influences on ageing when the products are applied in accordance with the generally accepted rules of technology.

2.14 Extraordinary effects

Fire

Building material class A2 as per DIN 4102, Part 1, i.e. "non-flammable"
Building material classification as per DIN EN 13501 A2,s1-d0, i.e. "non-flammable" in accordance with Building Regulation List, Part A
Development of smoke / Smoke density: At less than 30 m²/s², the smoke development caused by the products under review (coating) catching fire is very low.
Combustion gas: Results after testing to DIN 53436 indicate that the gaseous emissions when the panels under review are subject to fire are free of sulphur compounds and chlorine compounds. The concentration of released hydrogen cyanide (HCN) is within a normal framework.
Changing the system condition (burning dripping/falling material): When surrounding materials are on fire, the polyvinyl alcohol fibres bound in the concrete gradually lose their strength. This does not represent any explosive potential with the result that fibre cement does not pose a risk in the event of a fire. Burning dripping/Falling paint coating or fibre cement does not occur.

Fire protection

Description	Value
Building material class	A2
Burning drips	d0
Smoke gas development	s1

Water
No ingredients are washed out which could be hazardous to water (see also Eluate analysis in Requisite evidence). The pH value is alkaline (pH ≥ 12).

Mechanical destruction
Not of relevance

2.15 Re-use phase
De-construction: Depending on the mounting system, the façade panels can be removed without destruction by unscrewing or drilling out the rivet.
Re-use: In undamaged form, the dismantled products can be used again in accordance with their original designated purpose or used as protective panels for basement walls, for example.

Recycling: When separated by type, the uncoated and coated fibre cement products can be ground and re-used as aggregates in the manufacture of cement (material recycling). When separated by type, these fibre cement products are suitable for re-use as filling and bulking material in underground construction, especially in road construction or for noise barriers (material recycling).

2.16 Disposal
Where the recycling options referred to above are not practical, residue of the fibre cement products referred to and incurred on the construction site as well as residue from de-construction can be easily deposited without preliminary treatment in Class I landfills thanks to their largely mineral components. Waste key: 170101 (concrete) in line with the European Waste Catalogue

2.17 Further information
Further information and safety data sheets are available on the Web site: www.eternit.de.

3. LCA: Calculation rules

3.1 Declared unit
The Declaration as based on the production of 1 m² Pictura and Natura PRO façade panels. This Declaration concerns the Pictura product. The LCA results for Pictura façade panels are also representative for Natura PRO façade panels. The products are practically identical. They merely display differences in their respective finishes.
Pictura and Natura PRO façade panels are merely distinguished by the water content of the paint for priming the front and the water content of the pigmented central coating. As the Pictura finish is less aqueous despite having an otherwise identical composition, Pictura façade panels are declared. The environmental impacts established here represent a *worst-case scenario* for Natura Pro façade panels. Representativity is therefore guaranteed for both products.
The Declaration is based on an 8 mm thick façade panel with a basis weight of 16 kg/m² including coating and a residual moisture content of approx. 10%.

Declared unit

Description	Value	Unit
Declared unit	1	m²
Gross density	1800	kg/m^3
Conversion factor to 1 kg	1/16	-

3.2 System boundary
Type of EPD: cradle to plant gate
The following individual processes were included in the Product stage A1-A3 of manufacturing the fibre cement products:

- Processes associated with supplying auxiliaries and energy
- Transporting the resources, preliminary products (cement, fibres) and auxiliaries to Neubeckum
- Manufacturing process in the plant including energy expenses, manufacturing auxiliaries, disposing of any residual materials incurred
- Manufacturing the pro rata packaging

3.3 Estimates and assumptions
The wooden pallets used involve circulating pallets in the deposit system. They are not considered within the framework of the declared modules.
Coatings are applied in the manufacturing plant which makes them a component of the Product system Modules A1-A3. In the LCA model, it is assumed that the water contained in the coating evaporates after application to the fibre cement panels and the organic solvents contained are fully released as NMVOC.

3.4 Cut-off criteria
All operating data, i.e. all of the starting materials used, thermal energy, internal fuel consumption and electricity consumption, all direct production waste as well as all emission measurements available were taken into consideration in the analysis. Assumptions were made as regards the transport associated with all *input and output* data taken into consideration. Accordingly, material and energy flows with a share of less than 1 per cent were also considered. It can be assumed that the total of all neglected processes does not exceed 5% in the effective categories. Machinery, plants and infrastructure required in the manufacturing process are ignored.

3.5 Background data
The software system for comprehensive analysis (GaBi 6) developed by PE INTERNATIONAL AG was used for modelling the fibre cement production process. The consistent data sets contained in the GaBi data base are documented in the online GaBi documentation. The basic data in the GaBi data base was applied for energy, transport and consumables. The Life Cycle Assessment was drawn up for Germany as a reference area. This means that apart from the production processes under these marginal conditions, the pre-stages also of relevance for Germany such as provision of electricity or energy carriers were used. The power mix for Germany 2009 is applied.
Cement is used as a binding agent in the fibre cement products. The cement data is based on environmental

data on the German cement industry supplied by the German Cement Works Association (VDZ).

3.6 Data quality

All of the background data records of relevance for manufacturing were taken from the GaBi 6 software data base. Primary data was supplied by Eternit AG. The background data used was last revised less than 3 years ago. The production data involves up-to-date industrial data supplied by Eternit AG for 2010.

3.7 Period under review

The data on which this Life Cycle Assessment is based concerns data records for the manufacture by Eternit AG of Pictura / Natura PRO facade panels for 2010. The volumes of raw materials, energy, auxiliaries and consumables used must be considered as average annual values in the Neubeckum plant.

3.8 Allocation

Secondary fuels are used in cement manufacturing. As they not have a negative or no economic value, they are included in the system without any environmental burden. Transport by truck to the plant was taken into consideration. Contributions to the Global Warming Potential as a result of incineration were also taken into account in the model for renewable and non-renewable primary and secondary fuels. CO_2 neutrality ultimately prevails for renewable secondary fuels as the same volume is integrated as released.

3.9 Comparability

As a general rule, a comparison or evaluation of EPD data is only possible when all of the data to be compared has been drawn up in accordance with EN 15804 and the building context or product-specific characteristics are taken into consideration.

4. LCA: Scenarios and additional technical information

Reference Service Life

Description	Value	Unit
Reference Service Life	40 - 60	a

5. LCA: Results

The environmental impacts of 1 m² Pictura / Natura PRO façade panels manufactured by Eternit AG are outlined below. The modules marked "x" as per EN 15804 in the overview are addressed; the modules marked "MND" (Module not declared) do not form a component of the analysis.
The following tables depict the results of the indicators concerning impact estimates, use of resources as well as the waste and other output flows with reference to the declared unit.

SYSTEM BOUNDARIES (X = INCLUDED IN THE 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	Manufacture	Transport	Assembly	Use / Application	Maintenance	Repairs	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste treatment	Landfilling	Re-use, recovery or recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

LCA RESULTS – ENVIRONMENTAL IMPACT: 1m² Equitone Pictura / Natura PRO

Parameter	Unit	A1 - A3
Global Warming Potential	[kg CO_2 equiv.]	29.35
Ozone Depletion Potential	[kg CFC11 equiv.]	1.011E-8
Acidification Potential	[kg SO_2 equiv.]	5.628E-2
Eutrification Potential	[kg $(PO_4)^{3-}$ equiv.]	7.023E-3
Photochemical Ozone Creation Potential	[kg ethene equiv.]	2.842E-2
Abiotic Depletion Potential non-Fossil Resources	[kg Sb equiv.]	9.67E-4
Abiotic Depletion Potential Fossil Fuels	[MJ]	343.68

LCA RESULTS – USE OF RESOURCES: 1m² Equitone Pictura / Natura PRO

Parameter	Unit	A1 - A3
Renewable primary energy as energy carrier	[MJ]	26.5
Renewable primary energy as material utilisation	[MJ]	6.64
Total use of renewable primary energy sources	[MJ]	33.1
Non-renewable primary energy as energy carrier	[MJ]	363
Non-renewable primary energy as material utilisation	[MJ]	13.1
Total use of non-renewable primary energy sources	[MJ]	376.1
Use of secondary materials	[kg]	0
Renewable secondary fuels	[MJ]	3.81
Non-renewable secondary fuels	[MJ]	40.1
Net use of fresh water	[m³]	0.09

LCA RESULTS – OUTPUT FLOWS AND WASTE CATEGORIES: 1m² Equitone Pictura / Natura PRO

Parameter	Unit	A1 - A3
Hazardous waste for disposal	[kg]	0.09
Disposed of, non-hazardous waste	[kg]	5.8
Disposed of, radioactive waste	[kg]	0.01
Components for re-use	[kg]	-
Materials for recycling	[kg]	-
Materials for energy recovery	[kg]	-
Exported electrical energy	[MJ]	-
Exported thermal energy	[MJ]	-

The results of the impact estimates only represent relative statements. They do not make any claims concerning impact category limits, exceeding threshold values, safety limits or risks.

6. LCA: Interpretation

In the manufacture (Modules A1-A3) of 1 m² Pictura / Natura PRO, **non-renewable primary energy** account for 376 MJ/m². When considering the use of non-renewable primary energy during manufacture, the use of energy sources in the plant makes a contribution of 31%, whereby the provision of electricity (17%) and the requisite thermal energy from natural gas (14%) play a decisive role. Production of the preliminary products (Module A1) is also of significance, whereby PVA fibre production in particular makes a significant contribution accounting for 34%, cement manufacture accounts for 10% and paint production accounts for 12%. The coating determines 4% of non-renewable energy resources.

Renewable primary energy resources used during manufacturing of the Pictura / Natura PRO façade panels account for 33.1 MJ /m². An essential contribution towards the use of renewable primary energy during product manufacturing is represented by the production of cellulose which is attributable to the regenerative energy required for growing biomass in the upstream chains of cellulose production. Another percentage is accounted for by the regenerative share in the power mix (wind power).

Secondary raw materials are not used in manufacturing the products.

Secondary fuels are used in the upstream chains associated with cement manufacturing. During the burning process for cement clinker, the cement industry burns various secondary fuels.

Around 90 litres of **water** are required for manufacturing (Modules A1-A3) 1 m² Pictura / Natura PRO, including the upstream chains. Water is used directly in the manufacture of fibre cement, as process water and as mixing water for the cement. Most of the water required is attributable to the upstream chains associated with the provision of electricity.

An analysis of **waste volumes** is depicted separately for three main segments: disposed of non-hazardous waste for landfilling, hazardous waste for landfilling and disposed of radioactive waste. Non-hazardous waste represents the largest percentage during manufacturing. Inert waste is incurred by product manufacturing. Hazardous waste is primarily incurred during the upstream chains associated with manufacturing the preliminary products (paint). Radioactive waste is exclusively incurred in generating electricity in nuclear power plants.

When considering the results of the impact categories, it is obvious that the provision of raw materials (Module A1) has a decisive influence on the results in the impact categories. Product manufacturing (Module A3) by the use of energy resources in the plant is of further significance.

The **Global Warming Potential** during product manufacturing is primarily dominated by carbon dioxide emissions, essentially attributable to the upstream chains associated with cement production (38%) and the production of PVA fibres accounting for 20%. The upstream chains associated with the provision of electricity account for 15% of the Global Warming Potential; a further 12% is caused by direct emissions in the plant as a result of thermal conversion of natural gas. Production of the coating components accounts for 2% of the Global Warming Potential.

The **Ozone Depletion Potential** is primarily attributable to R11 and R114 emissions from the upstream chain associated with the provision of electricity.

The **Acidification Potential** during product manufacturing (Modules A1-A3) is dominated by sulphur dioxide emissions accounting for 55% and nitric oxides accounting for 39%. Contributions to the AP are divided by several factors: the upstream chains associated with cement production, paint manufacturing, the upstream chains associated with PVA fibre production, transport to the plant and the provision of electricity. Production of the coating components accounts for 4% of the Acidification Potential.

Consideration of the **Eutrification Potential** reveals a breakdown of main initiators similar to those causing the AP. 80% of the EP of the products under review is determined by nitric oxides. Production of the coating components accounts for 2% of the Eutrification Potential.

88% of the **Photochemical Ozone Creation Potential** during manufacture of the products under review is caused by NMVOC emissions. 70% of the contributions to the POCP originate in the upstream chains associated with paint production, 8% are the result of the PVA upstream chain and 12% are accounted for by the manufacturing process in the plant as a result of application of the coating, whereby NMVOC emissions arise.

When considering the **Abiotic Depletion Potential non-Fossil Resources**, production of the coating components dominates at almost 100%. This is primarily attributable to use of the non-renewable element antimony during the upstream chains associated with various coating preliminary products such as antimony oxide compounds.

Interpretations of the **Abiotic Depletion Potential Fossil Fuels** are similar to those concerning the use of non-renewable primary energy resources.

Data quality

All in all, the quality of data can be regarded as good for modelling the Pictura / Natura PRO façade panels. The corresponding consistent data sets were available in the GaBi Data base for most of the preliminary products and auxiliaries of relevance. Other preliminary products such as PVA fibres could be modelled using literary data. Detailed coating specifications were also made available by Eternit AG which enabled the preliminary products to be included in the LCA model. The data used was last revised less than 3 years ago.

The production data involves up-to-date primary data supplied by Eternit AG concerning the Neubeckum plant in 2010. The volumes of raw materials, energy, auxiliaries and consumables used are considered as average annual values in the plant.

In the LCA model, it is assumed that the water contained in the coating evaporates after application to the fibre cement panels and the organic solvents contained are fully released as NMVOC. This approach concerning NMVOC is reflected in the Photochemical Ozone Creation Potential. Other environmental indicators are not affected by this data gap. A worst-case approach was followed here. In reality however, the assumed values can be fallen short of thereby causing lower results in terms of the Photochemical Ozone Creation Potential. An interpretation of the results of the EPD is therefore restricted in terms of the Photochemical Ozone Creation Potential.

7. Requisite evidence

7.1 Radioactivity

In Germany, there are currently no statutory limit values specified for assessing the radioactivity of building materials. Assessments can be pursuant to the *Radiation Protection 112* document issued by the EU Commission.
According to BfS 2008, Annex 1, the index for cement is: I: 0.17 – 0.35
Accordingly, the index of 0.5 is maintained where ensuing external exposure < 0.3 mSv/a can be assumed and therefore no additional tests are required in accordance with RP112. As fibre cement products comprise < 100% cement, the index provides a maximum limit value for the products.
All mineral base materials contain low volumes of natural radioactive substances. Measurements indicate that natural radioactivity permits unrestricted usage of this construction material from a radiological perspective.

7.2 Leaching

Measuring agency / Protocol / Date: Hygiene-Institut des Ruhrgebietes, Gelsenkirchen; No. A-183135-09-To dated 2 November 2009
Result: The leaching analysis results pertaining to the Pictura and Natura PRO panels examined in accordance with DIN 38414-4 indicate that the allocation values specified in the Technical Guideline on Domestic Waste are maintained for Landfill Classes I and II. In terms of water hygiene, there are no reservations concerning structural usage of the products under review.

Parameter / Sample			"PICTURA" façade panels	Limit values as per Directive Landfill class I	Landfill class II
pH value			11.14	5.5-13	5.5-13
Conductivity		µS/cm	228	≤ 10000	≤ 50000
Org. carbon	C		1.2	≤ 50	≤ 80
Phenols		mg/l	< 0.010	≤ 0.2	≤ 50
Arsenic	As	mg/l	< 0.001	≤ 0.2	≤ 0.2
Lead	Pb	mg/l	< 0.005	≤ 0.2	≤ 1
Cadmium	Cd	mg/l	0.0007	≤ 0.05	≤ 0.1
Chrome	Cr^{6+}	mg/l	< 0.01	≤ 0.05	≤ 0.1
Copper	Cu	mg/l	< 0.005	≤ 1	≤ 5
Nickel	Ni	mg/l	< 0.005	≤ 0.2	≤ 1
Mercury	Hg	mg/l	< 0.0002	≤ 0.005	≤ 0.02
Zinc	Zn	mg/l	< 0.005	≤ 2	≤ 5
Fluoride	F	mg/l	0.06	≤ 5	≤ 15
Ammonium	N	mg/l	< 0.04	≤ 4	≤ 200
Cyanide, lfr.	CN	mg/l	< 0.01	≤ 0.1	≤ 0.5
AOX		mg/l	< 0.010	≤ 0.3	≤ 1.5
Evaporation residue		%	0.0066	≤ 3	≤ 6
Barium	Ba	mg/l	0.008	≤ 5	≤ 10
Chrome	Cr total	mg/l	< 0.005	≤ 0.3	≤ 1
Molybdenum	Mo	mg/l	< 0.05	≤ 0.3	≤ 1
Antimony	Sb	mg/l	< 0.001	≤ 0.03	≤ 0.07
Selenium	Se	mg/l	< 0.001	≤ 0.03	≤ 0.05
Chloride	Cl	mg/l	< 5	≤ 1500	≤ 1500
Sulphate	SO_4	mg/l	< 5	≤ 2000	≤ 2000

7.3 VOC emissions

Measuring agency: Eurofins Product Testing A/S, Smedeskovvej 38, DK-8464 Galten, Denmark, Report no. G02907BRev dated 9 September 2010; measurement results: Test process in accordance with the AgBB Scheme

- Carcinogens were not detected after 3 and 28 days.
- At 220 µg/m³, total VOC ("TVOC") after 3 days was below the limit value of 10 mg/m³.
- At 71 µg/m³, total VOC ("TVOC") after 28 days was below the limit value of 1 mg/m³.
- At < 5 µg/m³, total SVOC after 28 days was below the limit value of 0.1 mg/m³.
- For the individual VOC substances established with more than 5 µg/m³ after 28 days, a rating value R was achieved with 0.05 below the maximum limit of 1.
- At < 5 µg/m³, total individual VOC substances without NIK value after 28 days were below the limit value of 0.1 mg/m³.
- At < 3 µg/m³, formaldehyde concentration after 28 days was below the limit value of 120 µg/m³.

VOC emissions

Description	Value	Unit
AgBB overview of results (28 days)	-	µg/m³
TVOC (C6 - C16)	71	µg/m³
Total SVOC (C16 - C22)	< 5	µg/m³
R (dimensionless)	< 1	-
VOC without NIK	< 5	µg/m³
Carcinogens	n.n.	µg/m³

All measured values are below the limit values. The Pictura/Natura PRO product tested is suitable for use in interior applications in accordance with the "Approval guidelines for the health-related evaluation of indoor construction products" (DIBt publications 10/2008) in connection with the NIK values of the AgBB in the version dated May 2010.

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