Environmental Product Declaration

according to ISO 14025

Facade panels and flat sheets Textura / Natura, Eterplan

Eternit AG

Declaration number
EPD-ETE-2008111-E

Institut Bauen und Umwelt e.V.
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Summary

Environmental Product Declaration

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Program holder

Eternit AG
Im Breitspiel 20
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Declaration holder

EPD-ETE-2008111-E

Declaration number

Facade panels (Textura / Natura) and flat sheets (Eterplan)

This declaration is an environmental production declaration according to ISO 14025 and describes the environmental performance of the building products mentioned. It is intended to promote the development of environmental and health compatible construction.

All relevant environmental data is disclosed in this validated declaration.

The declaration is based on the PCR document "Fibre Cement", reference year 2005.

Declared building products

This validated declaration authorises the holder to bear the official stamp of the "Institut Bauen und Umwelt". It only applies to the above-mentioned products for three years from date of issue. The declaration holder is liable for the information and evidence on which the declaration is based.

Validity

The **declaration** is complete and contains in detail:

- Product definition and physical data
- Information about raw materials and origin
- Specifications on manufacturing the product
- Notes on product processing
- Information on product in use, singular effects and end of life
- LCA results
- Evidence and verifications

Content of the declaration

September 3, 2007

Date of issue

Prof. Dr.-Ing. Horst J. Bossenmayer (Chairman of the Institut Bauen und Umwelt)

Signatures

This declaration, and the rules on which it is based, have been verified by the Independent Advisory Board (SVA) according to ISO 14025.

Verification of the declaration

Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the SVA)

Dr. Frank Werner (Verifier appointed by the SVA)

Signatures

Summary

Environmental Product Declaration

The named products are flat sheets made of naturally hardened fibre cement. The declaration includes Textura (formerly Pelicolor)/ Natura facade panels and the Eterplan flat sheet. Textura is a coated facade panel with a slightly grained surface. Natura is a facade panel with glazed coating and translucent surface structure. Eterplan is an uncoated fibre cement sheet.	**Product description**
Purposes of the declared large-size fibre cement boards are: Textura and Natura are used as cladding material for back-ventilated curtain walling and for decorative interior finishing. Eterplan is a building board for different applications, e.g. Portacabins, foundation bases, sewer covers, permanent formwork, substrate for composite elements, etc. Eterplan is also the baseboard for Textura and Natura facade panels.	**Range of application**
The **Life Cycle Assessment (LCA)** was carried out according to DIN ISO 14040 ff. corresponding to the requirements of the IBU guidelines for Type III declarations. Specific data of the examined products and data from the "GaBi 4" database were used. The life cycle assessment includes raw material recovery and energy generation, raw material transportation, the actual manufacturing phase as well as use phase of the fibre cement boards.	**Scope of the Life Cycle Assessment**

Results of the Life Cycle Assessment

Facade panels and flat sheets (raw materials & manufacture)

Parameter	Units per t	Eterplan	Textura / Natura
Primary energy, non-renewable	[MJ]	9784	14323
Primary energy, renewable	[MJ]	3887	3890
Global Warming Potential (GWP 100 years)	[kg CO_2 equiv.]	734	929
Ozone Depletion Potential (ODP)	[kg R11 equiv.]	$88.9 \cdot 10^{-6}$	$89.8 \cdot 10^{-6}$
Acidification Potential (AP)	[kg SO_2 equiv.]	2.63	4.73
Eutrophication Potential (EP)	[kg phosphate equiv.]	0,24	0,34
Photochem. Ozone Creation Potential (POCP)	[kg ethene equiv.]	0.32	0.52

Produced by: Eternit AG, Heidelberg
in collaboration with PE INTERNATIONAL, Leinfelden-Echterdingen

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Evidence and verifications

In addition, the results of the following verifications are also described in the Environmental Product Declaration:

- Fire gas (fire effluent) analysis:
  according to DIN 53436
- Eluate analysis:
  in accordance with Class 1 of the "TA Siedlungsabfall" for municipal waste

Scope of validity

This document applies to large-size fibre cement panels made in Germany.

0 Product definition

Product definition

The named products are flat sheets made of fibre cement. The declaration includes Textura / Natura facade panels and the Eterplan flat sheet.

Range of application

Natura, Textura: Facade panels for mounting on substructures made of wood or metal

Eterplan: Building boards for dry lining, sewer covers, foundation base, Portacabin building, permanent formwork, etc.

Product standard / approval

- DIN EN 12467, Fibre cement flat sheets - Product specification and test methods
- Approval number Z-31.1-34 issued in 2001 by DIBt for Eternit facade panels: (Allgemeine bauaufsichtliche Zulassung Nr. Z-31.1-34 des Deutschen Instituts für Bautechnik (DIBt) für Eternit Fassadentafeln, 2001)

Quality control

- CE Declaration of conformity according to the provisions of Annex ZA of DIN EN 12467
- External control of the products with general building approval issued by the "Materialprüfungsamt des Landes Brandenburg/Berlin" or the "Bundesanstalt für Materialprüfung und Forschung (BAM)".

State on delivery, properties

Table 1: Physical data

Property	Value
Apparent density	≥ 1,650 to 1,800 kg/m³
Strengths according to DIN EN 12467: Compressive strength Modulus of elasticity (Young's modulus) Flexural strength ∥ ⊥	 50 N/mm² 15,000 N/mm² 17 N/mm² 24 N/mm²
Water vapour diffusion resistance factor μ according to DIN 4108-4	350 / 140
Equilibrium moisture content at 23 °C, 80 % r.h.	approx. 10 M. %
Linear expansion coefficient	a_t = 0.01 mm/(mK)
Moisture expansion (air dry to water saturated)	1 mm/(mK)
Chemical resistance	Similar to concrete C 35/45
Ageing resistance	Similar to concrete C 35/45
Continuous temperature resistance	exists up to 80° C
Thermal conductivity λ_R	approx. 0.60 W/(m·K)

Table 2: Available sizes and product properties

	max. size in mm	Nominal thickness in mm	Surface	Colour
Eterplan	3100 x 1500	6; 8; 10; 12; 15; 20	smooth	uncoated
Textura	3100 x 1500	8; 12	granular finish	different colours
Natura	3100 x 1250	8; 12	smooth	
Textura (Balcony board)	3100 x 1500	10	granular finish	

Sound insulation

Back-ventilated curtain walling with 80 mm fibre insulating material and cladding made of 8 mm fibre cement can achieve an improvement of 9 to 11 dB (according to DIN 52210) in the airborne sound insulation of a 200 mm thick cellular concrete wall with $R_{w,R}$ = 44 dB.

Fire protection

Construction material class A2 according to DIN 4102, Part 1, i.e. "non-flammable“

Construction material classification according to DIN EN 13501 A2, s1-d0, i.e. according to Construction Product List Part A "non-flammable".

1 Raw materials

Raw materials, prime products

Fibre cement: (raw materials in % by weight, dry mass)

- Portland cement according to DIN EN 197-1, (CEM I 32.5 R and 42.5 R) (as binder) 84 %
- Trass (as filler) 9 %
- Cellulose (as filter fibres) 3 %
- Polyethylene fibrids (as filter fibres) 2 %
- Polyvinyl alcohol fibres (as reinforcing fibres) 2 %

and mixing water for the cement: 0.24 m³/t fibre cement.

Auxiliary substances / additives

Coatings:

	Textura	Natura
Rear sealant:		
Water	60.0 %	60.0 %
Setting up agent (bonding retarder)	0.3 %	0.3 %
PVDC butyl acrylate (binder)	35.7 %	35.7 %
Paraffin wax (binder)	4.0 %	4.0 %
Spread quantity in g/m²	60 – 80	60 – 80

Front coating:

	Textura		Natura
	Undercoat	Topcoat	
Water	41 %	52 %	56 %
Solvent (glycols)	4 %	4 %	4 %
Setting up agent (bonding retarder)	2 %	2 %	2 %
Inorganic pigments*	28 %	9 %	14 %
Pure acrylates (binder)	24 %	31 %	24 %
Polyethylene wax	1 %	1 %	-
Preservative	0.6 %	-	-
Spread quantity in g/m²	220-240	140-160	200-240

**In Structura coating including silicate hollow beads for forming surface structure (pearling)*

Material explanation

- **Portland cement:** Manufactured according to DIN EN 197-1, is produced from marly limestone, a mixture of limestone and clay. The raw material is crushed, dried, fired and ground to form cement. Precise manufacturing data is provided by cement manufacturers.
- **Trass:** Trass consists of volcanic tuff. It is used as a filler to optimise product properties (improvement in material bonding, deformation properties and reduction in tendency to effloresce).
- **Cellulose (sulphate pulp):** Cellulose (pulp) fibres, such as those used to make paper, are used as process fibres (fibre length 0.5 to 4 mm, fibre diameter 8 µm - 30 µm, i.e. extrathoracic (non-respirable)). During manufacture, the cellulose acts as a filter fibre which prevents cement particles from being washed out when surplus water is removed.
- **Polyethylene fibrids:** Synthetic, organic fibres with an average fibre diameter of 6 µm and a fibre length of approx. 200 - 500 µm (i.e. extrathoracic (non-respirable)) also act as filter fibres.
- **Polyvinyl alcohol fibres:** Synthetic organic fibres with a fibre length of 4 - 6 mm and a fibre diameter of 12 µm, (i.e. extrathoracic (non-respirable)). They reinforce the fibre cement and provide the necessary flexural strength.
- **Water:** Water from the factory site's own wells only is used for production. 0.6 m³ water is used for each tonne of fibre cement, of which 0.36 m³ is separated out again during the manufacturing process and following mechanical clarification treatment on site flows back into the production process.
- **Preservative:** A cleaning agent containing fungicide is used during the use phase of the panels.

Raw material extraction and origin

The majority of the named raw materials come from domestic deposits. All raw materials are bought in. Average transport distance from the raw material extraction/production site to the Eternit factory: 20 km.

Local and general availability of the raw materials

Fibre cement mainly consists of mineral raw materials for which, based on current knowledge, there is no resource scarcity.

2 Manufacturing the building product

Manufacturing the building product

Large-size flat sheets of fibre-cement are manufactured using a filament winding process which is automated to a large extent: The raw materials are mixed with water to form a homogeneous mixture. Rotating cylinder screens, which dewater to the inside, are submerged in this fibre cement slurry. The surface of the screen becomes covered with a thin fibre cement felt, which is transferred onto a continuous circulating conveyor belt. From there it is passed to a press roll, which is gradually covered with an increasingly thick layer of fibre cement. When the required material thickness is reached, the still wet and malleable fibre cement layer (fibre cement felt (non-woven)) is cut open and removed from the press roll. The fibre cement felt is cut to size and the off-cuts are returned to the production process so that no waste is produced. The cut felt is stacked and compressed under high pressure. The sheets are then laid down to set, and are later stacked on pallets and temporarily stored for further hardening. The setting time is approx. 4 weeks.

Some sheets are coated with a colourless sealant. The visible faces (both sides of Textura balcony boards) are coated, for which high-quality pure acrylate paint is applied twice with a brushing method/deluging and is covered with a hot film, whereby the surface of the paint is either smooth or has a slate-like texture. Silicate hollow beads (micro glass beads) are also applied to Textura products to achieve their fine-grained surface and a preservative is added.

Packaging

PE shrink films, wooden pallets and steel strip are used as packaging materials.

Health protection production

During the whole manufacturing process, no health and safety measures are required beyond the legally specified occupational safety measures for commercial enterprises.

Environmental protection production

- Air: Any dusts produced are intercepted in filter systems and partly reused. The emissions are significantly below the limit values of the "TA Luft" specifications for air.
- Water/soil: The water arising during production and plant cleaning is mechanically clarified in the wastewater treatment plant on the factory site and is used again during the production process.
- Noise: The noise emitted by the production plant to the surroundings is below the permissible limit values.
-

3 Product processing

Processing recommendations

Special, low-dust producing equipment is available for machining the product, such as slow-running carbide-tipped saws or cutters and manually operated tools such as lever shears, hole punches, etc. Holes can be made using normal HSS drill bits. Additional construction products required for the installation of the named products are: Wooden or aluminium substructures including the necessary anchors and connectors as well as fasteners (rivets, screws, nails) and jointing tapes made of EPDM or aluminium. Assessment of these additional products is not the subject of this document. When selecting the required additional construction products it is necessary to ensure that they do not have any negative effects on the described properties of the named building products' environmental compatibility.

On request, the large-size sheets are also delivered ready to lay, so that individual fitting cuts only must be made on the construction site.

Health & safety, environmental protection

The regulations of the "Berufsgenossenschaften" (professional & trade associations with liability for industrial safety and insurance) apply.

The usual health & safety measures according to the manufacturer's instructions must be complied with when using the named products. It must be noted that the dust arising during machining can cause an alkaline reaction (pH value: approx. 12). The general dust limit according to TRGS 900 of ≤ 6 mg/m³ can be safely complied with using the machining equipment recommended by Eternit AG (see, e.g. leaflet "Planning and use of facade panels made of fibre cement").

Based on knowledge currently available, risks to water, air and soil cannot occur if fibre cement is used properly and as intended.

Residual material

Sheet off-cuts and packaging arising on the construction site must be collected separately. The products must be disposed of in accordance with the regulations of the local waste disposal authorities and the notes given under Section 6. "End of life phase".

4 Building product in use

Constituents

Fibre cement:

Hydrated cement (calcium silicate hydrate) with embedded fibres and fillers as well as minute air pores are formed by the setting (hydration) of the cement-water mixture.

Over the useful life of the products, free lime from the cement mixes with carbon dioxide in air to form calcium carbonate (carbonation).

Fibre cement contains approx. 12 % water (equilibrium moisture content) and a percentage by volume of approx. 30 % air (contained in the micropores).

The coating materials are bonded as a solid substance during use of the products due to the hot filming process. The water is evaporated.

Environmental health effects

Environmental protection:

Based on current knowledge, risks to water, air and soil cannot occur if the described products are used as intended (see Section 8. Evidence).

Health protection:

Due to the raw materials used and their behaviour in use, no known health impairments are known of during normal use of the building products for their intended purpose (see also Section 8. Evidence). The small quantity of algaecide additive contained in the Textura coating is bonded in the binder (pure acrylate) and measurable quantities cannot be released by leaching/washing out, so that no risks to health can result from this (see also Section 8. Evidence: Eluate analysis). The weathering rate of the pure acrylate coating is also very low (immeasurable) even after many years of use so that no risks to health can result from this either.

Long-term durability

After the cement binder has set and if used properly as intended, fibre cement products have virtually unlimited usability.

5 Singular effects

Fire

- **Smoke production/smoke concentration:** The smoke production caused due to burning of the named products (coating) is very low at less than 30m²/s².
- **Fumes/fire gases:** See fire gas toxicity test results under Section 8. Evidence.

- **Change of state (burning drip down/drop-out):**
  The polyvinyl alcohol fibres bonded in the concrete gradually loose their strength during a fire in the surrounding building materials: This performance does not result in an explosion, therefore fibre cement does not cause any hazards in case of fire. Burning drip down/drop-out of the colour coating or the fibre cement does not occur.

Floods

No constituents which could endanger water are washed out (see also Section 8. Evidence: Eluate analysis). The pH value is alkaline (pH ≥ 12).

6 End of life phase

Disassembly

Depending on the fixing system, the facade panels and flat sheets can be removed non-destructively by unscrewing or by drilling out the rivets.

Re-use and continued use

If undamaged, the dismantled products can be used again for their original purpose or, e.g. they can continue to be used as protective panels for basement masonry.

Re-use and recycling

If homogeneously sorted into the separate material types, the named uncoated and coated fibre cement products can be reground and used as an additive in the manufacture of fibre cement (material recycling).

If homogeneously sorted into the separate material types, the named uncoated and coated fibre cement products can also be re-used as fill material in civil engineering, especially in road construction or for noise bunds (material recycling).

Disposal

Fibre cement: If the recycling options named above are impracticable, due to their mainly mineral constituents, residual quantities of the named fibre cement products arising on site and those arising as a result of demolition can be safely deposited on class I landfill sites without any pretreatment. Waste code: 170101 (concrete) according to the European waste catalogue.

Packaging: If homogeneously collected into separate types of material, the recyclable polyethylene films are disposed of by INTERSEROH: If less than 20 m³ PE film arise, they can be returned to the builders' merchant or building supplies retailer or wholesaler free of charge, who will then arrange for disposal through INTERSEROH. If more than 20 m³ film arises, INTERSEROH will organise free of charge collection. The reusable pallets can be returned to the builders' merchant or building supplies retailer or wholesaler who will accept them and pay the refund (deposit charge system) and then return them to Eternit.

7 Life cycle assessment

7.1 Production of fibre cement flat sheets

Declared unit

The declared unit is the production of one tonne of average fibre cement flat sheet.

The apparent density of fibre cement flat sheets is 1650 kg/m³.

A scenario for the use phase is calculated with 100 m² used area.

System limits

The chosen system limits include production of the products including raw material extraction through to the finished, packaged product at the factory gate (cradle to gate).

The GaBi database /GaBi 2006/ was used for energy generation and transportation. The scope of consideration includes, in detail:

- Production of all materials used (prime products)
- Transportation and packaging of the raw materials and prime products
- Expenditure during manufacture (energy, waste, emissions), as well as prime products and energy provision from resources
- Packaging

All examined products are solely produced in the Neubeckum factory.

A scenario for cleaning of the sheets considered for the use phase of the examined products. End of life scenarios have not be considered in this declaration.

Cut-off criterion

On the input side, all material flows into the system and which account for more than 1 % of its total mass or contribute to more than 1 % of the primary energy consumption are taken into account. On the output side, all material flows which exit the system and whose environmental effects are greater than 1 % of the total impact of a considered impact category are recorded. The unmodelled processes have been ignored due to their small quantities and low primary energy consumption relevance.

Transport

Transport of the raw materials and auxiliary substances have been taken into account.

Period under consideration

The data for the production of the examined products refers to 2005. The life cycle assessments were prepared for the reference area Germany. As a result, apart from the production processes under these general conditions, the upstream stages relevant for Germany such as electricity and energy source provision have also been used.

Background data

The software system GaBi 4 was used to model the life cycle for the production of Textura / Natura fibre cement panels and Eterplan. All background data records relevant for the panel production were supplied by Ecobilan or were taken from the GaBi 4 software database. Most of the data (processes) was supplied by Ecobilan as aggregated process data.

The production of one tonne of Textura / Natura and Eterplan was, where available, calculated with specific data from Eternit, alternatively, average data records were used.

Assumptions

The results of this life cycle assessment are based on the following assumptions.

The transport movements of all raw materials and auxiliary materials are summarised in one transport process. The specific fuel consumption for individual materials is not known.

Cleaning of the fibre cement product during the use phase is assumed. The cleaning takes place every 10 years; details of the consumption of cleaning agents relate to 100 m² fibre cement product.

Data quality

All data used is less than 5 years old.

The data for the examined fibre cement product was acquired directly in the factory. Most of the data for the pre-chains comes from industrial sources, which were surveyed under consistent time and methodological boundary conditions. The process data and the background data used are consistent. Value is placed in a high degree of completeness of the recording of environment-related life cycle inventory data, both on the input side and on the output side. The data used (processes) was acquired by Ecobilan. Most of the data (processes) was supplied as aggregated process data and so more detailed analysis of these processes was not possible.

The data supplied (processes) was checked with respect to its plausibility; the data quality can therefore be classified as being good.

Allocation

Allocation is the term used to describe assignment of the input and output flows of a life cycle assessment module to the product system examined /ISO 14040/.

Relevant allocations (i.e. the assignment of environmental impacts of a process to several products) did not have to be made in this life cycle assessment for the foreground data of the examined products. Where relevant, e.g. electricity mix allocations were used for the background data. A German electricity mix is used in this study.

Notes on the use phase

The life of building products depends on the respective design, construction, the use situation, the users themselves, maintenance and servicing.

The use phase calculations for the Textura and Natura facade panels in this declaration are based on cleaning of the facade panels every 10 years using a fungicide. Consumption of the fungicide refers to 100 m² fibre cement product.

No cleaning is included for the uncoated Eterplan sheet.

7.2 Description of the balances and analyses

Life cycle inventory

In the following chapters, the life cycle inventory analysis is described with respect to primary energy consumption and wastes.

Primary energy

Table 3 shows the primary energy consumption (renewable and non-renewable), broken down into production, raw material supply, coating, transport and packaging of one tonne of Textura / Natura.

Raw material supply accounts for 46 % of the non-renewable primary energy requirement while coating accounts for 32% of the consumption (Textura F baryt and Textura TC baryt). Cement (20 %), polyvinyl alcohol fibres Textura (20 %) and cellulose (5 %) account for the highest energy consumptions among the raw materials.

Around 21 % of the total energy requirement is covered by renewable energy. Around 29 % of the total 3890 MJ/t renewable primary energy requirement is for the manufacture of the raw materials (cellulose) and around 67 % is for the manufacture of the packaging (wooden pallets). This is the proportion of solar energy stored in the wood during growth of the trees.

Table 3: Energy input for production of the fibre cement product Textura / Natura

Eternit fibre cement product Textura / Natura						
Parameter	Units per t	Raw materials	Coating	Production	Transport	Packaging
Primary energy (non-renewable)	[MJ]	6619	4539	1695	56	1414
Primary energy (renewable)	[MJ]	1215	3	48	0	2624

Closer examination of the energy required to produce one tonne of Eternit Textura / Natura shows that mineral oil (34 %) and renewable resources (21 %) are used as significant primary energy sources, followed by natural gas (18 %), coal (11 %), uranium (10 %) and lignite coal with 6 %.

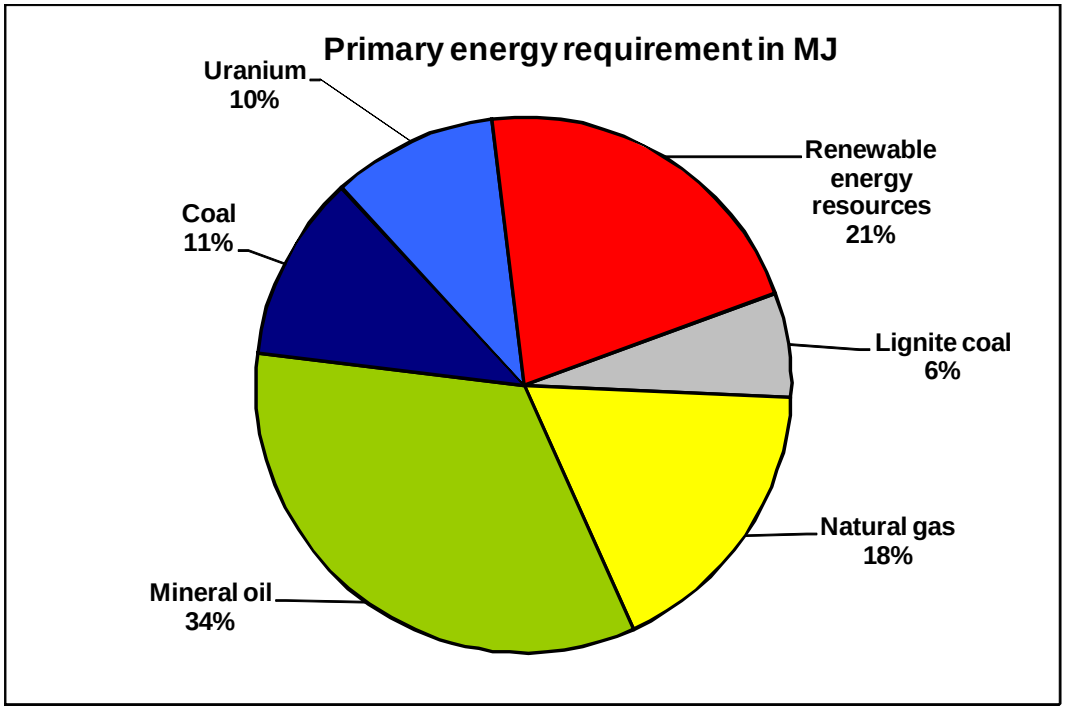

Figure 1: Energy consumption spread for the production of 1 t Textura / Natura

Table 4 shows the primary energy consumption (renewable and non-renewable), broken down into production, raw material supply, transport and packaging of one tonne of Eterplan. As the only difference is the coating, all other values are identical and analogous to the assessment of Textura / Natura.

Table 4: Energy input for production of the fibre cement product Eterplan

Eternit fibre cement product Eterplan					
Parameter	Units per t	Raw materials	Production	Transport	Packaging
Primary energy (non-renewable)	[MJ]	6619	1695	56	1414
Primary energy (renewable)	[MJ]	1215	48	0	2624

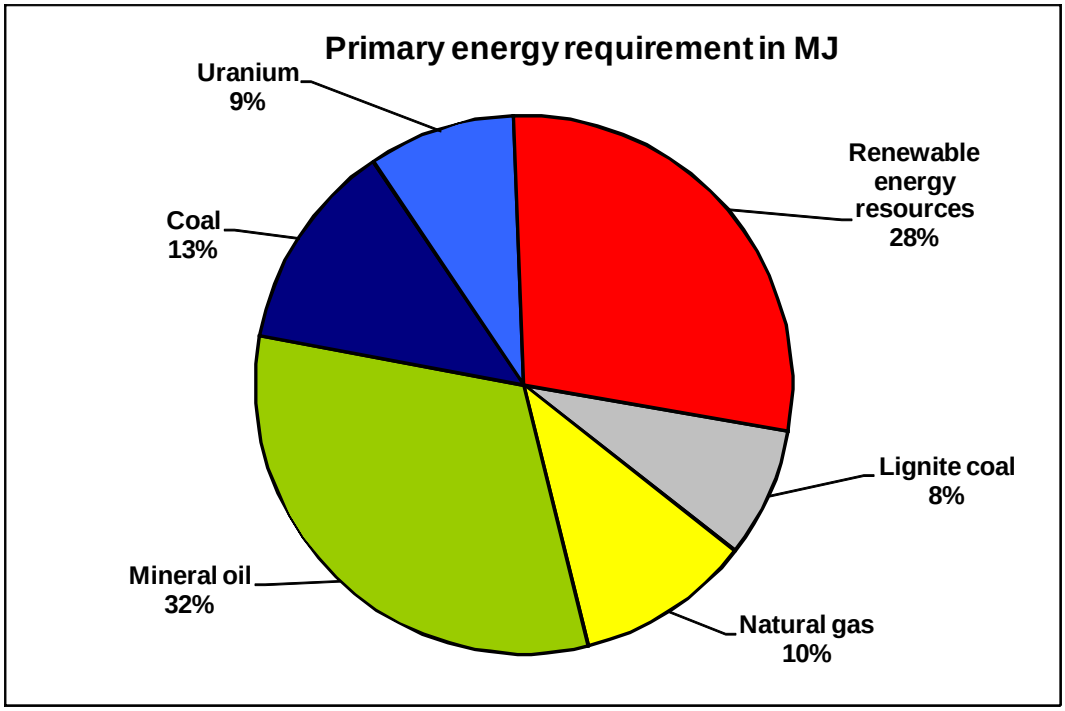

Figure 2: Energy consumption spread for the production of 1 t Eterplan

Wastes

The assessment of the waste produced in manufacturing 1 t Textura / Natura and Eterplan is shown separately for the three fractions: overburden/stockpile dump (including ore processing residues), municipal wastes (including household rubbish and commercial wastes) and hazardous waste (incl. radioactive wastes from the nuclear power station share of the electricity consumption) (Table 5 / Table 6).

Table 5: Wastes during the production of the fibre cement product Textura / Natura

Eternit fibre cement product Textura, Natura	
Parameter	Production [kg / t]
Overburden/stockpile dump	1768
Household-type commercial waste	1.96
Hazardous waste (incl. radioactive wastes)	3.28

Table 6: Wastes during the production of the fibre cement product Eterplan

Eternit fibre cement product Eterplan	
Parameter	Production [kg / t]
Overburden/stockpile dump	1748
Household-type commercial waste	1.32
Hazardous waste (incl. radioactive wastes)	2.68

Overburden accounts for the largest quantity of the **stockpile dump** materials, fol-

lowed by treatment residues and ore extraction residues. Overburden is mainly produced during the upstream process for the production of electricity (coal mining). Treatment residues arise during the production of cement and ore extraction residues are produced as a result of the extraction and processing of ore concentrates.

The most important influencing variable within the **municipal waste** segment is the unspecific waste. All other fractions play a secondary role.

Hazardous wastes are essentially waste materials which arise during the production of cement, roof tile dispersion and wooden pallet production for the packaging.

Radioactive wastes are solely due to the electricity consumption (nuclear power).

Impact assessment

The following figure shows the contributions of the production, raw material supply, coating, transport and packaging of one tonne of Eternit Textura / Natura and Eterplan to the impact categories: global warming potential (GWP), ozone depletion potential (ODP), acidification potential (AP), eutrophication potential (EP) and photochemical ozone creation potential (POCP).

Raw material supply accounts for between 43 % and 90 % of the examined environmental impact categories. The coating processes play a negligible role in the ozone depletion potential category. In all other categories the contribution is larger than 20 %. The production (including electricity and thermal energy) of one tonne of Textura / Natura has an effect of 4-12 % within the categories considered. The transport processes follow with small percentage shares. The contribution of the packaging processes is relevant for the ozone depletion potential category (26 %; production of the PE film). In the environmental impact category photochemical ozone creation potential, the packaging processes contribute 14 %, whereas the packaging processes provide a credit of around 23 % with respect to the GWP category.

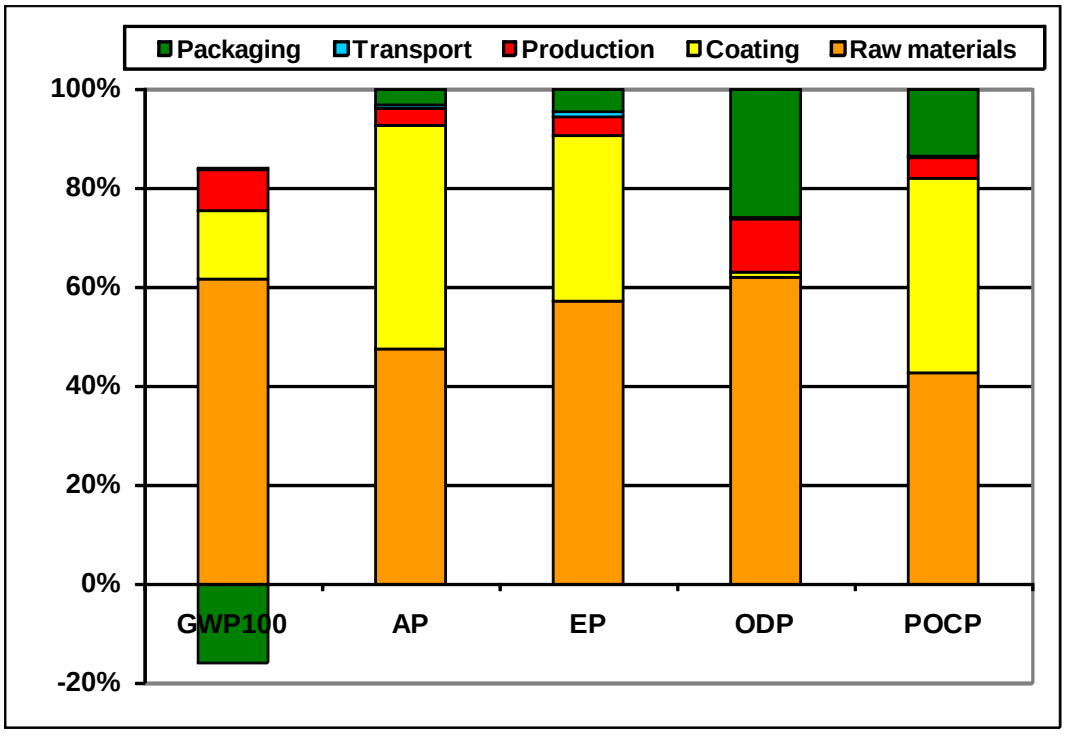

Figure 3: **Relative contributions of individual categories to the environmental impacts of the production of fibre cement products Textura / Natura**

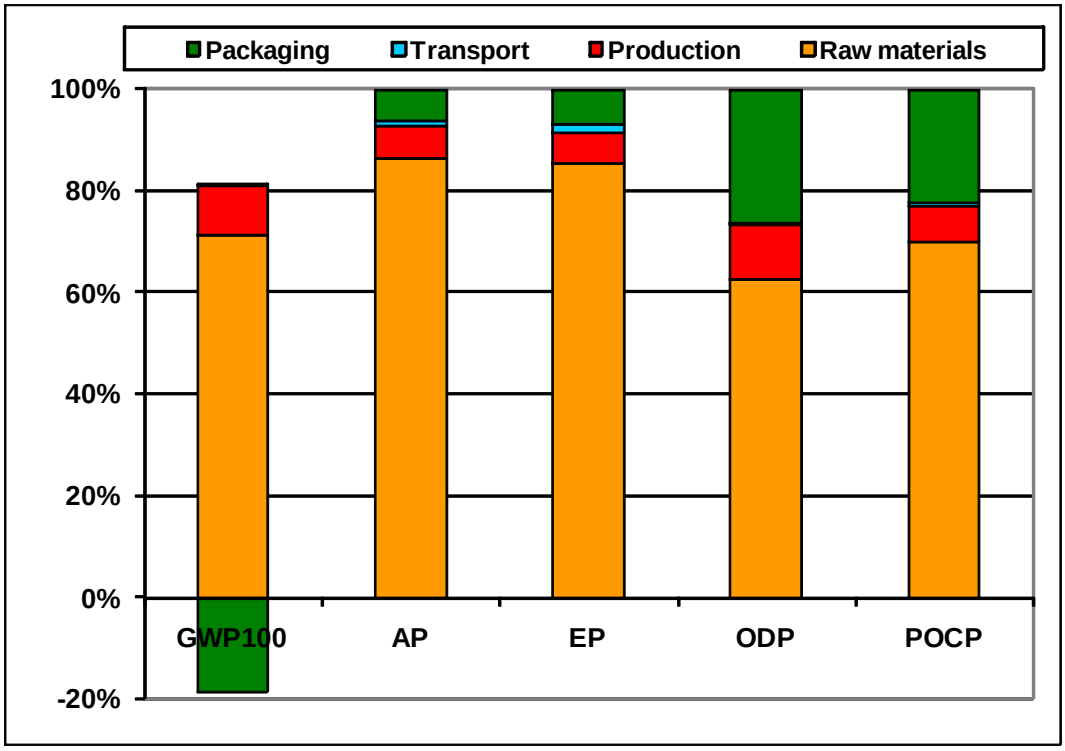

Figure 4: Relative contributions of individual categories to the environmental impacts of the fibre cement product Eterplan

The absolute contributions of the Eternit Textura / Natura fibre cement panel to the individual environmental impacts broken down into production, raw materials, coating, transport and packaging are shown in Table 7.

Table 7: Absolute contributions of the fibre cement product Textura / Natura per tonne

	Unit	Raw materials	Coating	Production	Transport	Packaging
Global Warming Potential (GWP 100 years)	kg CO_2 equiv.	847	195	103	4	-220
Ozone Depletion Potential (ODP)	kg R11 equiv.	$56.0 \cdot 10^{-6}$	$0.86 \cdot 10^{-6}$	$9.9 \cdot 10^{-6}$	$6.6 \cdot 10^{-9}$	$23.0 \cdot 10^{-6}$
Acidification Potential (AP)	kg SO_2 equiv.	2.2	2.1	0.2	$26.0*10^{-3}$	0.2
Eutrophication potential (EP)	kg phosphate equiv.	0.2	0.1	$14.0 \cdot 10^{-3}$	$4.5 \cdot 10^{-3}$	$17.0 \cdot 10^{-3}$
Photochem. Ozone Creation Potential (POCP)	kg ethene equiv.	0.2	0.2	$21.8 \cdot 10^{-3}$	$2.2 \cdot 10^{-3}$	$71.0 \cdot 10^{-3}$

Assessment of the **global warming potential** shows that almost 46 % of the 1343 kg CO_2 equivalents (gross) per tonne of Textura / Natura is due to the production of the cement material, 17 % is due to the production of cellulose and 9 % is due to the production of the polyvinyl alcohol fibres. The net total of kg CO_2 equiva-

lents is 938. The credits calculated for this result from the cellulose, wood and kraft liner processes. The coating materials Textura F baryt and Textura TC baryt each account for around 7 % of the gross total. Electrical energy and thermal energy each account for around 4 %.

Around 11 % of the **ozone depletion potential** is due to the production of electricity. The raw material supply of cement accounts for almost 16 %, die and polyvinyl alcohol fibres and cellulose each account for around 21 %. Production of the packaging materials contributes around 24 % (production of PE film).

Raw material supply (around 47 %) and coating (45%) are decisive for the **acidification potential**. The main contributors to these values are the production of cement (24 %), cellulose (15 %) and polyvinyl alcohol fibres (9 %). For the coating, production of the rear sealant (7 %) and production of Textura TC baryt and Textura F baryt each with 19 %, are the relevant contributors.

57 % of the **eutrophication potential** is accounted for by raw material supply and 33 % is determined by the coating of the Textura / Natura product. Of the raw materials, the production of cement (39 %) and cellulose and polyvinyl alcohol fibres (each with 8 %) and the Textura F baryt and Textura TC baryt coating (each 13 %) are the main contributors to the eutrophication potential.

Assessment of the **photochemical ozone creation potential (POCP)** shows that here too, raw material production and coating have a significant effect on this impact category. Raw material production accounts for 43 % and coating accounts for around 39 %. Above all, of the raw materials used, cement (17 %), polyvinyl alcohol fibres (13 %) and cellulose (12 %) are particularly noticeable. Production of the rear sealant contributes 6 % and production of Textura F baryt and Textura TC baryt each contribute 17 % to the photochemical ozone creation potential. The packaging processes contribute to around 14 %; whereas the processes for the production and the transport processes are negligible.

Table 8: Absolute contributions of the fibre cement product Eterplan per tonne

	Unit	Raw materials	Production	Transport	Packaging
Global Warming Potential (GWP 100 years)	kg CO_2 equiv.	847	103	4	-220
Ozone Depletion Potential (ODP)	kg R11 equiv.	$56.0 \cdot 10^{-6}$	$9.9 \cdot 10^{-6}$	$6.6 \cdot 10^{-9}$	$23.0 \cdot 10^{-6}$
Acidification Potential (AP)	kg SO_2 equiv.	2.2	0.2	$26.0*10^{-3}$	0.2
Eutrophication potential (EP)	kg phosphate equiv.	0.2	$14.0 \cdot 10^{-3}$	$4.5 \cdot 10^{-3}$	$17.0 \cdot 10^{-3}$
Photochem. Ozone Creation Potential (POCP)	kg ethene equiv.	0.2	$21.0 \cdot 10^{-3}$	$2.2 \cdot 10^{-3}$	$71.0 \cdot 10^{-3}$

Assessment of the product Eterplan can be considered to be analogous to that of the Textura / Natura product. The only difference is the effect of coating, which does not apply to Eterplan.

Use phase

The assessment is based on cleaning of the fibre cement products every 10 years. 13.3 kg cleaning agents are used for 100 m². Table 9 shows the results of the examined environmental impact categories per 100 m² for one year.

Table 9: Impact category results of use (cleaning) of 100 m² Textura / Natura

	Unit	Cleaning per 100 m² per year
Primary energy, non-renewable	MJ	0.891
Primary energy, renewable	MJ	0.014
Global Warming Potential (GWP 100 years)	kg CO_2 equiv.	$54.1 \cdot 10^{-3}$
Ozone Depletion Potential (ODP)	kg R11 equiv.	$10.8 \cdot 10^{-9}$
Acidification Potential (AP)	kg SO_2 equiv.	$0.17 \cdot 10^{-3}$
Eutrophication Potential (EP)	kg phosphate equiv.	$17.6 \cdot 10^{-6}$
Photochem. Ozone Creation Potential (POCP)	kg ethene equiv.	$17.3 \cdot 10^{-6}$

8 Evidence

Eluate analysis

Test laboratory/report/date: Hygiene-Institut des Ruhrgebietes, Gelsenkirchen; No. A 1027 S/00/Lo dated 15.03.2000

Result: The eluation (leaching) analysis results for the panels tested in accordance with DIN 38414, Part 4, show compliance with both the limit or guideline values defined in the (German) Drinking Water Regulations and the classification values defined for landfill class 1 in the "TA-Siedlungsabfall" municipal waste standard. There are no misgivings against the use of the named products in construction with regard to water hygiene aspects.

Toxicity of the fire gases

Measurement according to DIN 53436

Test laboratory/date: Prof. Dr. Lechner, Institut für Chemie, University of Osnabrück; 19.11.1997

Result: The results of the test according to DIN 53436 show that the gaseous emissions in case of fire in the examined panels are free of sulphur compounds and chlorine compounds. The concentration of the released hydrocyanic acid HCN is within the normal range.

Building material classification according to DIN EN 13501-1 for all three products is A2-s1,d0. "s1" stands for the lowest smoke density SMOGRA <= 30m²/s²

9 PCR document and verification

This declaration is based on the PCR document "Fibre Cement".

Review of the PCR document by the Independent Advisory Board (SVA). Chair of the SVA: Prof. Dr.-Ing. Hans-Wolf Reinhardt (University of Stuttgart, IWB)
Independent verification of the declaration according to ISO 14025: ☐ internal ☒ external
Validation of the declaration: Dr. Frank Werner

10 References

/ISO 14020/ ISO 14020: Environmental labels and declarations – General principles, 2000

/ISO 14025/ ISO DIS 14025: Environmental labels and declarations — Type III environmental declarations — Principles and procedures, 2005

/ISO 14040/ ISO DIS 14040: Environmental management - Life cycle assessment - Principles and framework, 2005

/ISO 14044/ ISO DIS 14044: Environmental management - Life cycle assessment - Requirements and guidelines, 2005

/GaBi 2006/ Software und Datenbank zur Ganzheitlichen Bilanzierung, IKP Universität Stuttgart und PE Europe GmbH, 1992-2004

/Institut Bauen und Umwelt/ Leitfaden für die Formulierung der produktgruppen-spezifischen Anforderungen der IBU-Deklarationen (Typ III) für Bauprodukte, www.bau-umwelt.com

/DIN 12467/ DIN EN 12467 : Fibre cement flat sheets - Product specification and test methods, 2006

/Z-31.1-34/ Allgemeine bauaufsichtliche Zulassung Nr. Z-31.1-34 des Deutschen Instituts für Bautechnik (DIBt) für Eternit Fassadentafeln, 2001

/DIN 52210/ DIN 52210 : Bauakustische Prüfungen; Luft- und Trittschalldämmung; Bestimmung der Schachtpegeldifferenz, 1998

/DIN 4102/ DIN 4102 : Brandverhalten von Baustoffen und Bauteilen; A1: Zusammenstellung und Anwendung klassifizierter Baustoffe, Bauteile und Sonderbauteile, 2004

/DIN 13501/ DIN 13501 : Klassifizierung von Bauprodukten und Bauarten zu ihrem Brandverhalten - Teil 1: Klassifizierung mit den Ergebnissen aus den Prüfungen zum Brandverhalten von Bauprodukten

/DIN 197-1/ DIN EN 197-1 Cement - Part 1: Composition, specifications and conformity criteria for common cements, 2004

/DIN 38414/ DIN 38414 : Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung; Schlamm und Sedimente (Gruppe S)

/DIN 53436/ DIN 53436 : Erzeugung thermischer Zersetzungsprodukte von Werkstoffen unter Luftzufuhr und ihre toxikologische Prüfung; Zersetzungsgerät und Bestimmung der Versuchstemperatur, 2003

For further references, see PCR document

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In the case of a doubt is the original EPD “EPD-ETE-2008111-D” applicable