ENVIRONMENTAL PRODUCT DECLARATION
in accordance with ISO 14025 and EN 15804

Declaration holder	Eternit AG
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Eternit Equitone Natura Façade Panels,
Eternit Equitone Textura Façade Panels,
Eterplan Structural Panels

ETERNIT AG

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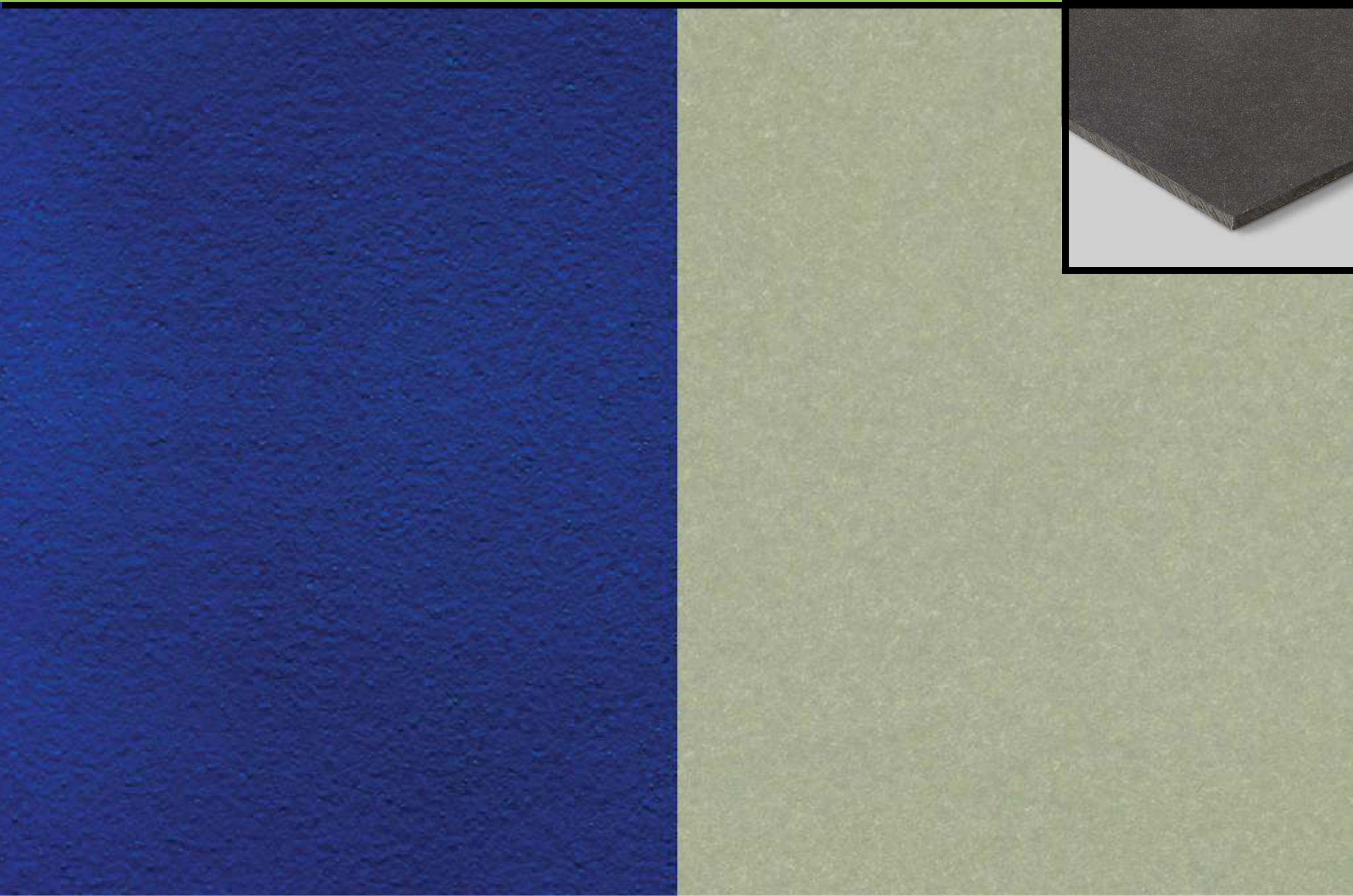

1 General information

ETERNIT AG	Equitone Natura / Textura Façade Panels & Eterplan Structural Panels
Programme holder IBU - Institut Bauen und Umwelt e.V. Rheinufer 108 D-53639 Königswinter	**Holder of the Declaration** Eternit AG Im Breitspiel 20 D-69126 Heidelberg
Declaration number EPD-ETE-2013111-E	**Declared product/unit** 1 m² Natura, 1m² Textura, 1m² Eterplan
This Declaration is based on the Product Category Rules: PCR Part B: Fibre cement / Fibre concrete, 07-2011 (PCR tested and approved by the independent Committee of Experts (SVA))	**Area of applicability:** Within the Environmental Product Declaration, the environmental parameters are indicated separately for three large-format fibre cement panels. This document refers to the manufacture of uncoated Eterplan smooth structural panels as well as the manufacture of Natura and Textura façade panels produced by Eternit AG. The production data referring to 2010 was collated in the Eternit AG plant in Neubeckum. Based on plausible, transparent and comprehensible basic data, the Life Cycle Assessment fully represents the Eternit products in question.
Issue date 14.01.2013	
Valid until 13.01.2018	**Verification** The CEN DIN EN 15804 standard serves as the core PCR. Verification of the EPD by an independent third party in accordance with ISO 14025 ☐ internal ☒ external
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the Expert Committee (SVA))	Patricia Wolf (Independent auditor appointed by the SVA)

2 Product

2.1 Product description

The products in question concern large-format, smooth panels made of naturally-hardened fibre cement, uncoated, with glazed or covering coating. Eterplan is an uncoated structural panel. Textura is a coated façade panel with a slightly grainy surface. Natura is a glaze-coated façade panel with a translucent surface structure. These products involve fibre cement panels with fibres comprising cellulose and plastic for water retention, improved tensile load distribution and increased breaking load and distortion.

2.2 Application

Eterplan is an uncoated structural panel for construction and civil engineering. They are used in drywall construction, as manhole covers, foundation beds, container construction, lost formwork etc. Eterplan is also the basic panel for Textura and Natura façade panels.

Textura and Natura serve as cladding materials for back-ventilated curtain façades as well as for decorative interior design applications. The façade panels serve towards assembly on substructures made of wood or metal.

2.3 Technical data

Please refer to the table for technical data.

Standard-related tests for CE marking via type testing in accordance with DIN EN 12467.

Sound insulation: In a 200 mm-thick porous concrete wall with $R_{w,R}$ = 44 dB, sound insulation can be improved from 9 to 11 dB (as per DIN 52210) using a back-ventilated curtain façade with 80 mm fibre insulation and cladding with 8 mm fibre cement.

Features	Value
Gross density	≥ 1,650 to 1,800 kg/m³
Strengths to DIN EN 12467 Compressive strength Modulus of elasticity Bending tensile strength ∥ ⊥	 50 N/mm² 15,000 N/mm² 17 N/mm² 24 N/mm²
Water vapour diffusion resistance figure μ as per DIN 4108-4	350 / 140
Equilibrium moisture at 23 °C, 80% rel. humidity	approx. 10 M.-%
Linear coefficient of expansion	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
Permanent temperature resistance	to 80° C
Thermal conductivity λ_R	approx. 0.60 W/(mK)

2.4 Placing on the market / Application rules

DIN EN 12467: 2006-12, Fibre-cement flat sheets – Product specification and test methods; German version EN 12467:2004 + A1:2005 + A2:2006

General technical approval No. Z-31.1-34 of the Deutsches Institut für Bautechnik (DIBt)

2.5 Delivery status

	Max. sizes in mm	Thickness-es in mm	Surface
Eterplan	3100 x 1500	6; 8; 10; 12; 15; 20	smooth
Textura*	3100 x 1500	8; 12	grainy
Natura*	3100 x 1250	8; 12	smooth
Textura (balcony slab)*	3100 x 1500	10	grainy

*) products available in various colours

Packaging is in the form of standard pallets in accordance with the price list with each pallet bearing a weight of 1 to 2 tonnes, seldom exceeding 2 tonnes.

Small orders (< 1 tonne) are packed to customer requirements.

2.6 Base materials / Auxiliaries

Fibre cement: (Base materials in % mass, dry mass)

81.5% Portland cement to DIN EN 197-1, (CEM I 32.5 R and 42.5 R) (as binding agent)

6% Trass (as filling material)

2.5% Cellulose (as filter fibres)

3.5% Polyvinyl alcohol fibres (reinforcement fibres)

6.5% Dye

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

Coatings:

Application volume [g/m²]	Textura	Natura
Backing sealing wet dry	 36 - 44 14 - 18	 38 - 42 15 - 17
Coating for the front wet dry wet dry	Primer 220 - 240 96 - 104 Textura TC 160 - 192 70 - 84	Primer 64 - 88 29 - 40 Isocolor TC 104 - 134 42 - 53

No substances of REACH relevance are used in production.

2.7 Production

Large-format panels made of fibre cement are manufactured largely in accordance with an automated winding process (Hatschek process): the raw materials are mixed with water to prepare a homogeneous mixture. Rotating screen cylinders are immersed in this fibre-cement pulp which drain internally. The screen surface is covered in a thin film of fibre cement which is transferred onto an infinite conveyor belt from where it is conveyed to a format roller which is gradually covered in an increasingly thicker layer of fibre cement. Once the requisite material thickness is achieved, the still moist and malleable fibre-cement layer (fibre-cement fleece) is separated and removed from the format roller. The fibre-cement fleece is cut to length and leftovers are returned to the production process preventing any waste from being incurred. The cut fleece is stacked and compressed at high pressure. The panels are then set aside for binding before stacking on pallets and stored temporarily in a special store for further setting. The setting time lasts approx. 4 weeks.

The façade panels are given a partial transparent seal on the back. The visible sides are coated for which the high-quality pure acrylic paint is applied twice in the rolling/pouring process or rolling/injection process prior to hot filming. Siliceous hollow spheres (micro glass balls) are also applied to Textura products to achieve the fine-grained surface and a conserving agent is added.

Quality Management:

The production facilities are TÜV-certified in accordance with ISO 9001:2008.

2.8 Environment and health during manufacturing

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

- Air: Any dust arising is collected in filter systems and partially recycled. Emissions are significantly lower than the limit values specified by the “TA Air”.
- Water/Soil: Water incurred during manufacturing and plant cleaning is treated mechanically in waste water treatment systems on the plant site and re-used in the production process.
- Noise: Noise emitted by the production equipment into the environment is below the permissible limit values.

Environment Management:

The production facilities are TÜV-certified in accordance with ISO 14001:2004.

2.9 Product processing / Installation

Special low-dust equipment such as slow-running, carbide-tipped splitting saws or cutting burs and hand-operated tools such as guillotine shears, punch pliers etc. are available for processing. Drill holes can be made using standard HSS drills. Additional products necessitated by design for installing the products referred to above include: wood or aluminium substructures including the requisite anchoring and joining equipment (studs, screws, nails) and joint tape made of EPDM or aluminium. An analysis 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-format panels can also be supplied ready for installation merely requiring individual cutting to size on site.

The set of rules laid out by the employers' liability insurance associations shall apply.

The typical health and safety measures in line with the manufacturer's instructions must be maintained when processing the products in question. Please note that processing dust can incur alkaline reactions (pH value: approx. 12). The general dust value as per TRGS 900 of ≤ 6 mg/m³ can be easily adhered to using the processing equipment recommended by Eternit AG (please refer to the brochure entitled "Planning and application, Façade panels made of fibre cement" issued by Eternit in 2011).

According to the current state of knowledge, hazards for water, air and soil can not arise when processed as designated.

2.10 Packaging

The products are supplied sealed in recyclable polyethylene film (LDPE) on special wooden pallets or wooden Euro pallets. VdFZ special pallets are returnable pallets used by member companies of the Verband der Faserzementindustrie (Fibre-Cement Industry Association).

2.11 Condition of use

When the cement and water mixture sets (hydration), cement stone (calcium silicate hydrate) is formed with embedded fibres and fillers as well as micro air voids.

Over the service life, free lime in the cement reacts with carbon dioxide in the air to form calcium carbonate (carbonation).

Fibre cement comprises approx. 12% water (equilibrium moisture) and a proportion by volume of approx. 30% air (contained in the micro-pores).

In the condition of use, the coating substances are bonded as solids via hot-coating. The water evaporates.

Fibre-cement products can be used as designated and for practically any application after the cement has set as a bonding agent.

2.12 Environment and health during use

Environmental protection: According to the current state of knowledge, hazards for water, air and soil can not arise when the products in question are applied as designated (please refer to the section on Requisite evidence).

Health protection: There are no known health risks attributable to the base materials used and their performance in use when the construction products are used as designated (please also refer to the section on Requisite evidence). The low algicide additive contained in the Textura coating is integrated in the binding agent (pure acrylic) and can not be released in any measurable quantities through leaching / washing out with the result that no health risks can be incurred (please refer to the Eluate analysis). Even after many years of use, the weathering rate of the pure acrylic coating is very low (can not be measured) with the result that no health risks can be incurred as a result.

2.13 Reference Service Life (RSL)

The reference service life of fibre-cement panels is comparable with the RSL of buildings. In accordance with the BMVBS Guidelines on Sustainable Building dating from 2000, this corresponds with 40 to 60 years. There are no verifiable influences on ageing when the recognised rules of technology are applied.

2.14 Extraordinary effects

Fire

Building materials class A2 as per DIN 4102, Part 1, i.e. "non-flammable"

Building materials classification to DIN EN 13501 A2,s1-d0, i.e. "non-flammable" in accordance with Part A of the Building Rules List

Development of smoke / Smoke density: Smoke development caused by burning the products in question (coating) is very low at less than 30 m²/s².

Combustion gases: The results in line with testing to DIN 53436 indicate that the gaseous emissions incurred when burning the panels in question are free of sulphur and chlorine compounds. The concentration of hydrogen cyanide HCN released is within the normal range.

Changing the system condition (burning dripping/falling material): When surrounding construction materials are burned, the polyvinyl alcohol fibres bound in the concrete gradually lose their strength: this performance does not lead to an explosion with the result that fibre cement does not represent a risk in the event of a fire. Burning dripping/falling coatings or fibre cement do not occur.

Water

No ingredients are washed out which could be hazardous to water (please also refer to the section on Requisite evidence: Eluate analysis). The pH value is alkaline (pH ≥ 12).

Mechanical destruction

Not of relevance

2.15 Re-use phase

Renaturation: Depending on the mounting system, the façade panels can be removed non-destructively by unscrewing or opening the studs.

Re-use: If undamaged, the dismantled products can be re-used in accordance with their original designated use or used as protective panels for basement walls, for example.

Re-use / Further use: When separated by type, the uncoated and coated fibre-cement products referred to can be re-ground and re-used as additives in the manufacture of fibre cement (material recycling). When sorted by type, the uncoated and coated fibre-cement products in question are also suitable for further use as filler and loose material in civil engineering, especially in road construction or for noise barriers (material recycling).

2.16 Disposal

Where the recycling options indicated above are not practical, fibre-cement product leftovers on the construction site as well as those incurred by demolition can be safely landfilled without pre-treatment in Class I landfills thanks to their largely mineral ingredients. Waste key: 170101 (Concrete) in line with the European Waste Catalogue.

2.17 Further information

Additional information and safety data sheets available online at www.eternit.de.

3 LCA: Calculation rules

3.1 Declared unit

This Declaration refers to the manufacture of 1m² Eterplan structural panels, 1m² Textura façade panels and 1m² Natura façade panels produced in the Eternit AG plant in Neubeckum.

The LCA models are depicted on the basis of a 10 mm-thick panel (corresponds with 18 kg/m²).

All other thickness-dependent results can therefore be generated as required by linear scaling of the basic panel to the requisite thickness and adding the coating for 1m². The coating is calculated as the difference between the declared products of 10 mm thickness.

3.2 System boundary

Type of EPD: cradle to gate

The following processes were included in product stages A1-A3 of manufacturing the fibre-cement products:

- processes for providing auxiliaries and energy
- transporting the preliminary products (cement, fibres) and auxiliaries to Neubeckum
- manufacturing process in the plant including energy expenses, manufacture of auxiliaries, disposal of residual materials incurred
- manufacturing the pro rata packaging

3.3 Estimates and assumptions

The wooden pallets used involve returnable circulation pallets. They are not considered within the framework of the declared modules.

Specific GaBi (software system for comprehensive analysis) processes are not available for all preliminary products and additives.

Manufacturing of the cellulose fibres is estimated using the RER: Kraftliner data record which is based on data from the European Association of Corrugated Cardboard Manufacturers (FEFCO 2009). Kraftliner production is identical to cellulose production; it merely includes an additional production step: paper manufacture. This process step was not calculated in this LCA model. The estimate for cellulose production therefore represents a conservative approach as it includes an additional process step.

Estimates were also made for some additives and coating components by applying chemically similar data records.

The coating is applied in the manufacturing plant and is therefore a component of the Modules A1-A3 product system. In the LCA model, it is assumed that the percentage of water in the coating evaporates after application to the fibre-cement panels and the organic solvents contained are released in full as NMVOC (worst-case approach).

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 expenses 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 neglected.

3.5 Background data

In order to model fibre-cement production, the GaBi 5 software system for comprehensive analysis developed by PE INTERNATIONAL AG was used. The consistent data items contained in the GaBi data base are outlined 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 is applied with 2008 as the year of reference.

Cement is used as a binding agent in the fibre-cement products. The cement data is based on environmental data supplied by the German cement industry's Verein deutscher Zementwerke e.V. (VDZ).

3.6 Data quality

Corresponding consistent data records were available for most of the relevant preliminary products and auxiliaries used. Other preliminary products such as PVA fibres, for example, could be modelled using literary data. Furthermore, detailed coating specifications were supplied by Eternit AG enabling the preliminary products to be included in the LCA model. The background data used was last revised less than 3 years ago. The production data involves up-to-date industrial data on Eternit AG from 2010.

3.7 Period under review

The data in this Life Cycle Assessment is based on data records for manufacturing Natura and Textura façade panels as well as Eterplan structural panels provided by Eternit AG and dating from 2010. The volumes of raw materials, energy, auxiliaries and consumables used are considered as average annual values in the Neubeckum plant.

3.8 Allocation

The products are produced in Neubeckum. Uncoated Eterplan structural panels represent independent products as well as base panels for Textura and Natura façade panels. The coating data distinguishing Textura and Natura façade panels was recorded separately.

Secondary fuels are used in manufacturing the cement. As they only have a negative or no economic value, they are included in the system without representing any negative impact on the environment. Transport to the plant by truck was taken into consideration. The contributions to the Global Warming Potential as a result of incineration were also considered in the model for renewable and non-renewable primary and secondary fuels. Ultimately, renewable secondary fuels give rise to neutral CO_2 values as they contain the same volume as they release.

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 other technical information

Reference service life: 40 to 60 years

5 LCA: Results

The environmental impacts of 1m² Natura façade panels, 1m² Textura façade panels and 1m² Eterplan structural panels manufactured by Eternit AG are outlined below. The modules to DIN EN 15804 marked "x" in the overview are addressed here while the modules marked "MND" (Module not declared) were not taken into consideration.

The following tables depict the results of estimated impact, the use of resources as well as the waste and output flows relating to the declared unit.

DESCRIPTION OF THE SYSTEM BOUNDARY (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	Manufacturing	Transport	Construction-installation process	Use / Application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste treatment	Disposal	Re-use, recovery and 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 Eterplan, 1 m² Natura, 1m² Textura

		Eterplan	Natura	Textura
Parameter	**Unit**	**A1-A3**	**A1-A3**	**A1-A3**
Global Warming Potential	[kg CO_2 equiv.]	33.48	33.83	34.32
Depletion Potential of the Stratospheric Ozone Layer	[kg CFC11 equiv.]	5.72E-08	5.81E-08	6.04E-08
Acidification Potential of soil and water	[kg SO_2 equiv.]	5.87E-02	5.99E-02	6.23E-02
Eutrification Potential	[kg PO_4^{3} equiv.]	7.48E-03	7.56E-03	7.68E-03
Formation Potential of Tropospheric Ozone Photochemical Oxidants	[kg ethene equiv.]	2.94E-02	3.25E-02	3.57E-02
Abiotic Depletion Potential non-Fossil Resources	[kg Sb equiv.]	1.85E-05	1.86E-05	1.39E-03
Abiotic Depletion Potential Fossil Fuels	[MJ]	385.49	393.77	401.42

LCA RESULTS – USE OF RESOURCES: 1m² Eterplan, 1 m² Natura, 1m² Textura

		Eterplan	Natura	Textura
Parameter	**Unit**	**A1-A3**	**A1-A3**	**A1-A3**
Renewable primary energy as energy carrier	[MJ]	26.0	26.3	27.0
Renewable primary energy as material utilisation	[MJ]	7.6	7.6	7.6
Total use of renewable primary energy sources	[MJ]	33.5	33.8	34.6
Non-renewable primary energy as energy carrier	[MJ]	407.0	415.8	424.2
Non-renewable primary energy as material utilisation	[MJ]	14.9	14.9	14.9
Total use of non-renewable primary energy sources	[MJ]	421.9	430.67	439.10
Use of secondary materials	[kg]	0.0	0.0	0.0
Renewable secondary fuels	[MJ]	4.34	4.34	4.34
Non-renewable secondary fuels	[MJ]	45.65	45.65	45.65
Net use of fresh water	[m³]	0.0956	0.0977	0.1035

LCA RESULTS – OUTPUT FLOWS AND WASTE CATEGORIES: 1m² Eterplan, 1 m² Natura, 1m² Textura

		Eterplan	Natura	Textura
Parameter	**Unit**	**A1-A3**	**A1-A3**	**A1-A3**
Hazardous waste for disposal*	[kg]	-		-
Disposed of, non-hazardous waste	[kg]	81.5	82.2	83.8
Disposed of, radioactive waste	[kg]	0.0147	0.0149	0.01518
Components for re-use	[kg]	-		-
Materials for recycling	[kg]	-		-
Materials for energy recovery	[kg]	-		-
Exported energy (electricity)	[MJ]	-		-
Exported energy (thermal energy)	[MJ]	-		-

*) In accordance with the transition solution approved by the SVA on 4.10.2012.

The estimated impact results only represent relative statements. They do make any statements regarding the final impact categories, exceeding threshold values, safety margins or risks.

6 LCA: Interpretation

In the manufacture (Modules A1-A3) of 1m² Eterplan, the use of **non-renewable primary energy sources** corresponds to 422 MJ/m²; 431 MJ/m² for Natura façade panels and 439 MJ/m² for Textura façade panels. The products are only distinguished by coating (Module A1) in terms of their use of primary energy.

When considering the use of non-renewable primary energy during product manufacturing, the manufacture of preliminary products (Module A1) is of significance, whereby PVA fibre manufacturing in particular accounting for 36-37%, cement manufacture with 10-11% and manufacture of paint accounting for 12-13% make a significant contribution. While Eterplan structural panels do not feature any coatings, Natura coatings account for 2% of the use of non-renewable primary energy and Textura coatings account for 4%.

The use of fuels in the plant accounts for around one-third of the use of non-renewable primary energy, whereby the provision of electricity (16-17%) and the thermal energy required from natural gas (15%) play a decisive role.

The **use of renewable primary energy sources** in the manufacture of Eterplan structural panels accounts for 33.5 MJ/m² while Natura façade panels account for 33.8 MJ/m² and Textura façade panels account for 34.6 MJ/m². An essential contribution towards the use of renewable primary energy during product manufacturing is made by cellulose production. This is attributable to the regenerative energy required for growing biomass in the upstream chains of cellulose production. Another percentage results from the regenerative share in the power mix (wind power).

Secondary raw materials are not used when manufacturing the products.

Secondary fuels are used in the upstream chains of cement manufacturing. The cement industry burns a wide variety of secondary fuels in the cement brick baking process.

During manufacture (Modules A1-A3) of 1m² Eterplan, Natura and Textura, around 100 litres of water are required for each, including the upstream chains. **Water** is used in fibre-cement manufacturing as process water and for mixing the cement.

An evaluation of the **waste volume** is depicted separately for the three main areas of disposed of non-hazardous waste (including mining waste, excavation waste, ore treatment residue, municipal solid waste including domestic and commercial waste), hazardous waste for landfilling and disposed of radioactive waste**.**

Non-hazardous waste depicts the largest percentage during manufacture. Excavation waste is primarily incurred during the extraction of mineral raw materials (lime for cement production) as well as in the extraction of fuels.

Radioactive waste is exclusively incurred in generating electricity in nuclear power plants.

Consideration of the results in the impact categories indicates that the supply of raw materials (Module A1) has a decisive influence.

The **Global Warming Potential** of manufacturing the products under review is primarily dominated by carbon dioxide emissions. This is essentially accounted for by the upstream chains associated with cement production (37-38%) as well as the production of PVA fibres accounting for 22%. The upstream chains associated with the provision of electricity determine 15% of the Global Warming Potential; another 12-13% is caused by direct emissions in the plant as a result of thermal realisation of natural gas. The manufacture of coating components for Natura makes a 1% contribution to the Global Warming Potential and 2.5% for Textura.

R11 and R114 emissions from the upstream chain associated with the provision of electricity make the primary contribution towards the **Ozone Depletion Potential**.

The **Acidification Potential** during product manufacturing (Modules A1-A3) is 54% dominated by sulphur dioxide emissions and 41% by nitric oxides. Contributions to the AP are accounted for by several drivers: 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. The manufacture of coating components for Natura makes a 2% contribution to the Acidification Potential and 6% for Textura.

Consideration of the **Eutrification Potential** indicates a breakdown of primary initiators similar to those for the AP. The EP is 85% determined by nitric oxides in the case of the products under review. The manufacture of coating components for Natura makes a 1% contribution to the Eutrification Potential and 3% for Textura.

The **Summer Smog Potential** is 87-89% determined by NMVOC emissions in the case of the products under review. In the case of uncoated Eterplan structural panels, around 85% is incurred during preliminary production of paint (recipe component) and 12% by the upstream chains associated with PVA fibre production. In the case of Natura facade panels, 76% originates from the upstream chains associated with fibre production, 11% from the PVA upstream chain and 10% from the manufacturing process in the plant following application of the coating, whereby NMVOC emissions are incurred. The latter percentage of coating application accounts for 19% for Textura façade panels. Another 68% is attributable to paint production and 10% to the PVA upstream chain.

In considering the **fossil abiotic use of resources**, the upstream chains associated with the provision of raw materials (Module A1) dominate at almost 100%. Almost 50% of contributions to Eterplan structural panels and Natura façade panels are attributable to the use of gypsum in cement manufacturing. Cement serves as a direct recipe component. The use of sodium chloride in the upstream chains associated with paint production and PVAL granulate production is also apparent. In the case of Textura façade panels, contributions are primarily attributable to the use of the non-renewable element antimony in the upstream chains of various preliminary products for coatings such as antimony oxide compounds.

Interpretations of the **fossil abiotic use of resources** comply with those concerning the use of non-renewable primary energy.

Data quality

The data quality can be regarded as good for modelling Eternit Eterplan structural panels as well as Natura and Textura façade panels. Corresponding consistent data records were available for most of the relevant preliminary products and auxiliaries used. Other preliminary products such as PVA fibres, for example, could be modelled using literary data. Life Cycle Assessment results of industrial data on PVA fibre manufacture could be higher or lower than the environmental profile used here for the fibres.

The production data involves up-to-date primary data supplied by Eternit AG for the Neubeckum plant in 2010.

In the LCA model, it is assumed that the percentage of water in the coating evaporates after application to the fibre-cement panels and the organic solvents contained are released in full as NMVOC. This approach as regards NMVOC is reflected in the summer smog potential. Other environmental indicators are not affected by this data gap. A worst-case scenario was pursued here. The reality can however fall short of the assumed value thereby causing lower results in terms of the Summer Smog Potential resulting in restrictions regarding the interpretation of EPD results.

7 Requisite evidence

7.1 Radioactivity

In Germany, there are currently no statutory limit values specified for assessing the radioactivity of building materials. Assessment can be in accordance with the EU Commission's "Radiation Protection 112" document.

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 an ensuing external exposure < 0.3 mSv/a can be assumed dispensing with the necessity for any further testing as per RP 112. As fibre-cement products comprise < 100% cement, the index referred to provides a maximum limit value for the products.

All mineral base materials contain low quantities of naturally radioactive substances. The measurements indicate that natural radioactivity from a radiological perspective permits unlimited use of this construction material.

7.2 Leaching

Measuring agency / Protocol / Date: Hygiene-Institut des Ruhrgebietes, Gelsenkirchen;
No. A 1027 S/00/Lo dated 15.03.2000

Result: The results of the leaching analysis of panels examined in accordance with DIN 38414, Part 4 indicate that the limit and guideline values specified in the Drinking Water Directive and the criteria specified in the TA Municipal Waste for storage in a Class I landfill site are adhered to. No reservations can be asserted against the structural use of the products referred to from a water-hygiene perspective.

Parameter		Sample name	ISOCOLOR Natura façade stone dated 24.02.2000 leaching 1+10	Limit values as per Drinking Water Act dated 12.12.1990	Limit values class I landfill TA Municipal waste, Annex B dated 14.05.1993
Colour			Colourless	Colourless	-
Odour			None	None	-
pH value			11.50	6.5 – 9.5	5.5 - 13.0
Electrical conductivity		µS/cm	556	2500	10000
Acid capacity	$K_{S8,2}$	mmol/l	2.6	-	-
Acid capacity	$K_{S4,3}$	mmol/l	3.1	-	-
AC (426 mm)		m^{-1}	0.9	-	-
Total dissolved solids	AR	mg/l	150	-	3000
Chloride	Cl^-	mg/l	< 10	250	-
Sulphate	SO_4^{2-}	mg/l	< 5	240	-
Phosphate, total	P	mg/l	< 0.2	6.7	-
Nitrate	NO_3^-	mg/l	< 2.0	50	-
Nitrite	NO_2^-	mg/l	0.100	0.1	-
Fluoride	F^-	mg/l	0.09	1.5	5
Cyanide, total	CN^-	mg/l	< 0.01	0.05	-
Cyanide, lfr	CN^-	mg/l	< 0.01	-	0.1
Sodium	Na	mg/l	2.2	150	-
Potassium	K		4.2	12	-
Calcium	Ca		49.7	400	-
Magnesium	Mg	mg/l	0.19	50	-
Ammonium	NH_4^+	mg/l	< 0.05	0.5	5
Iron	Fe	mg/l	< 0.05	0.2	-
Manganese	Mn	mg/l	< 0.01	0.05	-
Copper	Cu	mg/l	< 0.01	3	1
Zinc	Zn	mg/l	< 0.01	5	2
Nickel	Ni	mg/l	< 0.01	0.02	0.2
Chrome, total	Cr	mg/l	< 0.01	0.05	-
Chromate	Cr^{VI}	mg/l	< 0.01	-	0.05
Cadmium	Cd	mg/l	< 0.005	0.005	0.05
Mercury	Hg	mg/l	< 0.0002	0.001	0.005
Lead	Pb	mg/l	< 0.04	0.04	0.2
Arsenic	As	mg/l	< 0.001	0.01	0.2
Selenium	Se	mg/l	< 0.001	0.01	-
Thalium	Tl	mg/l	< 0.001	-	-
Antimony	Sb	mg/l	< 0.001	0.01	-
Tin	Sn	mg/l	< 0.005	-	-
Barium	Ba	mg/l	< 0.01	1	-
Beryllium	Be	mg/l	< 0.002	-	-
Boron	B	mg/l	< 0.05	1	-
Cobalt	Co	mg/l	< 0.01	-	-
Silver	Ag	mg/l	< 0.01	0.01	-
Vanadium	V	mg/l	< 0.05	-	-
Aluminium	Al	mg/l	0.56	0.2	-
$KMnO_4$ consumption		mg/l	3.5	5	-
Chem. oxygen demand (COD)	O_2	mg/l	< 15	-	-
Total Organic Carbon (TOC)	C	mg/l	3.8	-	20
Phenol index		mg/l	n. n.	0.005	0.2
Absorb. org. bound halogens (AO	Cl^-	mg/l	0.026	-	0.3
Σ PCB		mg/l	n. n.	-	-
Σ PCB as per the Drinking Water Ordinance		µg/l	n. n.	-	-
Benzopyrene		µg/l	n. n.	-	-
Σ CVOC		mg/l	n. n.	-	-
n .n. = unverifiable (below the detection limit)					

7.3 VOC emissions

Measuring agency: Eurofins Product Testing A/S, Smedeskovvej 38, DK-8464 Galten, Denmark, Report No. G02908BRev dated 09.09.2010; measurement results: test method in accordance with the Health Assessment of Construction Materials (AgBB)

[µg/m³]	Textura / Natura
TVOC $_{3d}$	53
Carcinogenics	No evidence after 3 and 28 days
TVOC $_{28d}$	24
TSVOC $_{28d}$	< 5
R (dimensionless)	< 1
VOC without NIK$_{28d}$	< 5

- There was no evidence of carcinogenics after 3 and 28 days.
- At 53 µg/m³, the total VOC ("TVOC") after 3 days was below the limit of 10 mg/m³.
- At 24 µg/m³, the total VOC ("TVOC") after 28 days was below the limit of 1 mg/m³.
- At < 5 µg/m³, the total SVOC after 28 days was below the limit of 0.1 mg/m³.
- At more than 5 µg/m³, the VOC individual substances established after 28 days resulted in a rating value R with < 0.02 below the maximum limit of 1.

- At < 5 µg/m³, the total VOC individual substances without an NIK value after 28 days was below the limit of 0.1 mg/m³
- At 8.4 µg/m³, the formaldehyde concentration after 28 days was below the limit of 120 µg/m³.

All of the measured values are below the respective limits.

The Textura/Natura product examined is suitable for use in interior areas in accordance with the "Certification principles for health assessment of construction products in interior areas" (DIBt notifications 10/2008) in combination with the NIK values of the AgBB in the version dated May 2010.

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