ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804

Declaration holder	Eternit AG
Publisher	Institut Bauen und Umwelt (IBU)
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Roof and Façade Panels
ETERNIT AG

www.bau-umwelt.com

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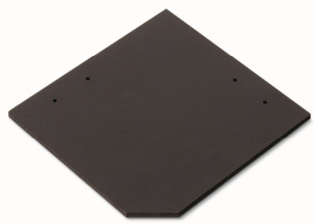

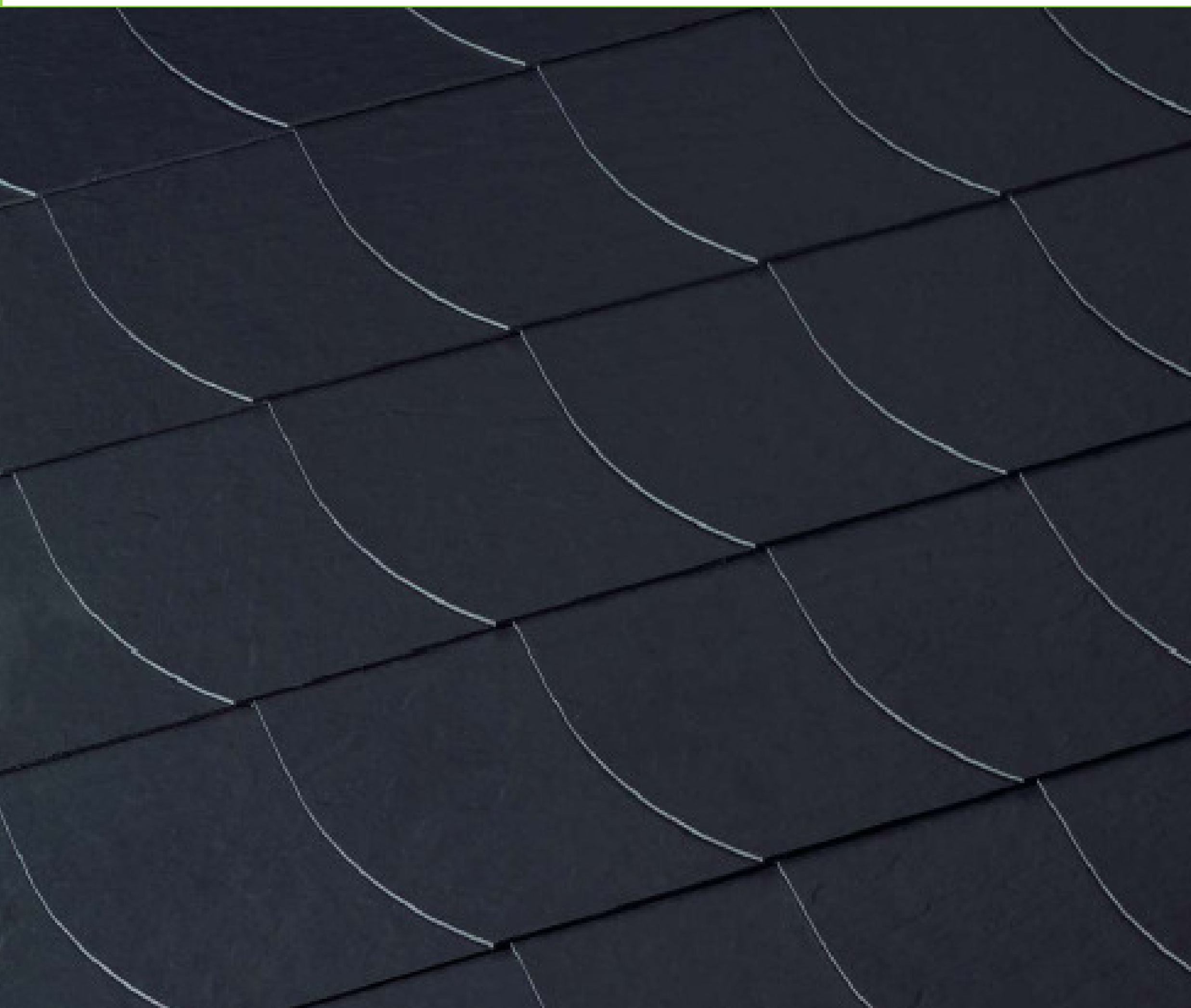

1 General information

ETERNIT AG	Roof and Façade 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-2013411-E	**Declared product/unit** 1 m² roof and façade panels
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 for roof and façade panels. This document refers to average roof and façade panels manufactured by Eternit AG in the Neubeckum plant. The production data used refers to production year 2010. 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 under review are roof and façade panels made of naturally-hardened fibre cement, with coloured coatings and with various surface structures.

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.

The Eternit products are manufactured in the same plant. Averages were formed on the basis of the production volume of both types of panel. The declared products do not display any differences in terms of the manufacturing process or the manufacturing technology applied. The slates can be used as roof or façade panels.

2.2 Application

Roof and façade panels for roofing and wall panelling

2.3 Technical data

Standard-related tests for CE marking via type testing in accordance with DIN EN 492.

Features	Value
Gross density	≥ 1,700 kg/m³ to 1,950 kg/m³
Strengths: Compressive strength	> 50 Nm/m

Quality features in terms of water impermeability and frost resistance in accordance with DIN EN 492

All other technical structural data is not of relevance for small-format panels.

2.4 Placing on the market / Application rules

DIN EN 492:2006-12, Fibre cement slates and fittings – Product specification and test methods

General technical approval No. Z-56.425-907 and the Deutsches Institut für Bautechnik (DIBt) for small-format Eternit roof and façade panels with smooth and structured surfaces

2.5 Delivery status

Format	Strength in mm	Surface	Colour
Slates	3.8 – 4.6	smooth	10 roof colours and 28 façade colours
Slates	4.0 – 4.8	structured	10 roof colours and 28 façade colours

Roof and façade panels are available in various formats (see price list on www.eternit.de for dimensions).

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

Roof and façade panels: (Base materials in % mass, dry mass)

81% Portland cement to DIN EN 197-1, (CEM I 32.5 R and 42.5 R) (as binding agent)

9% limestone powder, trass and amorphous silicon (as filling material)

4% dye

3% cellulose (as filter fibres)

3% polyvinyl alcohol fibres (as reinforcement fibres)

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

Coatings:

Backing sealing:

Application volume (incl. water):	11 - 17 g/m²
Dry mass:	2 – 3 g/m²

Base coat:

Application volume (incl. water):	61 - 67 g/m²
Dry mass:	24 – 27 g/m²

Top coat:

Application volume (incl. water):	61 - 67 g/m²
Dry mass:	30 – 33 g/m²

No substances of REACH relevance are used in production.

2.7 Manufacture

Roof and façade 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. During the manufacture of roof and façade panels or slates, compaction is not individual but rather in stacks, whereby the shingles are compressed under high pressure. There are smooth or structured sheets between the fibre-cement layers in the compaction stack. Depending on the sheet surface, the visible sides of the shingles are either smooth or feature a slate structure. 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 various roof panel formats are then punched out of the semi-finished products.

The surfaces are refined after the format punching. The reverse sides of the shingles are sealed in part. The visible sides of the slates are coated for which the high-quality pure acrylic paint is applied twice in the rolling/pouring process prior to hot filming.

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.

- 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/Ground: 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

The building products under review are supplied ready for installation with the result that only individual cuts to fit are required on the building site. 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.

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 homepage).

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 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 around 40 to 60 years for façade panels and 30 to 50 years for roof panels.

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 roof and façade panels can be removed non-destructively by unscrewing or removing the slate studs or façade nails.

Re-use: In undamaged form, the de-constructed products can be re-used in accordance with their original designated purpose.

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 roof and façade panels with an average basis weight of 9 kg/m² produced in the Eternit AG plant in Neubeckum. This would comply with a panel of 4.8 mm thickness and a density of 1875 kg/m³.

The roof and façade panels are manufactured in the plant in Neubeckum. They do not display any differences in terms of the manufacturing process or the manufacturing technology applied. Averages were formed on the basis of the production volume of both types of panel.

3.2 System boundary

Type of EPD: cradle to plant gate

The following processes were included in product stages A1-A3 of manufacturing both façade panels:

- processes for providing auxiliaries & 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 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 INERNATIONAL 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 roof and façade panels. 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 applied for this LCA is based on data recorded by Eternit AG for the manufacture of roof and façade panels in 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 data on both products was collated on the basis of the annual production volume of both panel types. No allocations were performed within the framework of the LCA as the production mix is declared.

The panels under review contain cement as a binding agent for the manufacture of which secondary fuels are used. As the secondary fuels used 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:

Roof panels 30 - 50 years

Façade panels: 40 - 60 years

5 LCA: Results

The environmental impacts of 1m² roof and façade 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	Manufacture	Transport	Construction-installation process	Use / Application	Maintenance	Repairs	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction	Transport	Waste treatment	Landfilling	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 roof and façade panels

		Product stage
Parameter	**Unit**	**A1-A3**
Global Warming Potential	[kg CO_2 equiv.]	12.47
Depletion Potential of the Stratospheric Ozone Layer	[kg CFC11 equiv.]	1.49E-07
Acidification Potential of soil and water	[kg SO_2 equiv.]	2.58E-02
Eutrification Potential	[kg PO_4^{3} equiv.]	3.06E-03
Formation Potential of Tropospheric Ozone Photochemical Oxidants	[kg ethene equiv.]	1.07E-02
Abiotic Depletion Potential non-Fossil Resources	[kg Sb equiv.]	9.62E-04
Abiotic Depletion Potential Fossil Fuels	[MJ]	132.58

LCA RESULTS - USE OF RESOURCES: 1m² roof and façade panels

		Product stage
Parameter	**Unit**	**A1-A3**
Renewable primary energy as energy carrier	[MJ]	18.9
Renewable primary energy as material utilisation	[MJ]	4.4
Total use of renewable primary energy sources	[MJ]	23.3
Non-renewable primary energy as energy carrier	[MJ]	147.2
Non-renewable primary energy as material utilisation	[MJ]	5.3
Total use of non-renewable primary energy sources	[MJ]	152.6
Use of secondary materials	[kg]	0.0
Renewable secondary fuels	[MJ]	1.98
Non-renewable secondary fuels	[MJ]	20.81
Net use of fresh water	[m³]	0.048

LCA RESULTS - OUTPUT FLOWS AND WASTE CATEGORIES: 1m² roof and façade panels

		Product stage
Parameter	**Unit**	**A1-A3**
Hazardous waste for disposal*	[kg]	-
Disposed of, non-hazardous waste	[kg]	32.1
Disposed of, radioactive waste	[kg]	0.0081
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 roof and façade panels, the use of non-renewable primary energy sources accounts for 153 MJ/m². The use of renewable primary energy sources accounts for 23.3 MJ/m².

The **use of non-renewable primary energy sources** during manufacture of the roof and façade panels is primarily determined by the upstream chains associated with PVA fibre production (37%). Furthermore, the upstream chains associated with cement manufacture account for 14%. The upstream chains associated with the provision of electricity and the requisite thermal energy at plant level account for a total of 18% of the PENRT.

The greatest share of **use of renewable primary energy sources** during manufacture of the roof and facade panels is accounted for by the manufacture of cellulose and silicon. Consideration of cellulose indicates that it 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 roof and façade panels.

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 the manufacture (Modules A1-A3) of 1m² roof and façade panels, around 52 litres of **water** are required, 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 incurred during the extraction of mineral raw materials (lime for cement production). Excavation waste is also incurred during the exploitation of energy carriers.

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

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

The **Global Warming Potential** of manufacturing the roof and façade panels under review is primarily dominated by carbon dioxide emissions. This is essentially accounted for by the upstream chains associated with cement production (46%) as well as the upstream chains associated with the production of PVA fibres (21%).

R114 emissions from the upstream chain associated with the production of silicon make the primary contribution towards the **Ozone Depletion Potential**.

The **Acidification Potential** during product manufacturing (Modules A1-A3) is 57% dominated by sulphur dioxide emissions and 38% by nitric oxides. Contributions to the AP are attributable to the upstream chains associated with cement production and PVA fibre production but the upstream chains associated with silicon and fibre production also make significant contributions. Other drivers include transport to the plant as well as the provision of electricity.

Consideration of the **Eutrification Potential** indicates a breakdown of primary initiators similar to those for the AP. 83% of the EP is determined by nitric oxides.

86% of the **Summer Smog Potential** is determined by NMVOC emissions. These are primarily attributable to the upstream chains associated with the manufacture of dyes. Dye is required as a direct recipe component. Additional contributions to the POCP are incurred during PVA fibre production. NMVOCs are also incurred as a result of the manufacturing process in the plant when applying the coating. Nitric oxides and sulphur dioxide emissions from cement production also contribute to the POCP.

In considering the **abiotic use of elementary resources**, the manufacture of coating components (Module A1) dominates at almost 100%. This is primarily attributable to the use of the non-renewable element antimony in the upstream chains of a preliminary coating products for coatings based on antimony oxide compounds.

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

The overall **data quality** can be regarded as good for modelling the roof and façade panels manufactured by Eternit AG. 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: Laboratorium Dr. Scheut-winkel GmbH, Berlin, Test Report No. 1-95/2321 dated 07.08.1995

Result: The results of the leaching analysis of panels examined in accordance with DIN 38414, Part 4 indicate that the allocation values specified in the "TA Municipal Waste" are adhered to for storage in a Class I landfill site. An exception is formed by the TOC value. The requirements of Class II landfill sites are complied with here.

Parameter	Measured value [mg/l]	Class I landfill limit value
Mercury	LOQ	< 0.005
Arsenic	LOQ	< 0.2
Lead	LOQ	< 0.2
Cadmium	LOQ	< 0.05
Zinc	LOQ	< 2
Nickel	LOQ	< 0.2
Copper	LOQ	< 1
Cyanide, easily released	LOQ	< 0.1
Phenol index	LOQ	< 0.2
TOC	22	< 20
AOX	LOQ	< 0.3
Fluoride	0.29	< 5
Chrome VI	LOQ	< 0.05
Ammonium nitrogen	0.56	< 4
pH value	12.2	5.5 - 13
Conductivity	6320 µS/cm	< 10000 µS/cm

LOQ = below the limit of quantification

7.3 VOC emissions

Roof and façade panels are only used in outdoor applications. Evidence of VOC emissions is not therefore of relevance.

8 References

Institut Bauen und Umwelt e.V., Königswinter (pub.)

General principles

General principles for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2011-06

PCR Part A

PCR Part A: Calculation rules for the LCA and requirements on the background report 2011-07

PCR Part B

PCR Part B: Requirements on the EPD for fibre cement / fibre concrete, 2011-06

www.bau-umwelt.de

DIN EN ISO 14025

DIN EN ISO 14025: 2011-10, Environmental labels and declarations – Type III environmental declarations – Principles and procedures (ISO 14025:2006); German and English versions EN ISO 14025:2011

DIN EN 15804

DIN EN 15804:2012-04, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products; German version EN 15804:2012

DIN EN ISO 9001

DIN EN ISO 9001:2008, Quality management systems – Requirements (ISO 9001:2008); trilingual version EN ISO 9001:2008

DIN EN ISO 14001

DIN EN ISO 14001:2004, Environmental management systems – Requirements with guidance for use

DIN EN 12467

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

DIN EN 492

DIN EN 492:2006-12, Fibre cement slates and fittings – Product specification and test methods; German version EN 492:2004 + A1:2005 + A2:2006

Z-31.1-34

General technical approval No. Z-31.1-34 of the Deutsches Institut für Bautechnik (DIBt) for Eternit façade boards, 2001

DIN 4102

DIN 4102:1994-03: Fire behaviour of building materials and building components; A1: synopsis and application of classified construction materials, components and special components

DIN EN 13501

DIN EN 13501-1:2010-01: Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2007 + A1:2009

DIN EN 197-1

DIN EN 197-1:2011-11: Cement – Part 1: Composition, specifications and conformity criteria for common cement; German version EN 197-1:2011

DIN 38414-4

DIN 38414-4:1984-10: German standard methods for the examination of water, waste water and sludge; sludge and sediments (group S)

DIN 53436

DIN 53436-1:1981-04: Producing thermal decomposition products from materials in an air stream and their toxicological testing; decomposition apparatus and determination of test temperature

BfS 2008

K. Gehrke, B. Hoffmann, U. Schkade, V. Schmidt, K. Wichterey: Natürliche Radioaktivität in Baumaterialien und die daraus resultierende Strahlenexposition (Natural radioactivity in construction materials and the ensuing radiation exposure) – Interim report, Federal Office for Radiation Protection, Berlin 2008

FEFCO 2009

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GaBi software

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