ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025 and EN 15804

Declaration holder	Eternit AG
Publisher	Institut Bauen und Umwelt (IBU)
Programme holder	Institut Bauen und Umwelt (IBU)
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Cedral Fibre-Cement Façade Panels

ETERNIT AG

www.bau-umwelt.com

Institut Bauen und Umwelt e.V.

1 General information

ETERNIT AG	Cedral 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-2013211-E	**Declared product/unit** 1 m² Cedral
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:** The Environmental Product Declaration includes the environmental parameters for the Cedral façade panels produced by Eternit N.V. This document refers to the façade panels manufactured in the Kapelle-op-den-Bos plant (Belgium). 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 involve smooth or structured panels made from steam-hardened cellulose-reinforced fibre cement. The Cedral Structur and Cedral Glatt façade panels are declared. Both products are coated fibre-cement panels.

2.2 Application

Cedral façade panels are used as board-like façade cladding for back-ventilated façades.

2.3 Technical data

Features	Value
Gross density	1,300 kg/m³ +/- 10%
Strengths to DIN EN 12467 Compressive strength Modulus of elasticity Bending tensile strength ... tensile strength	 30 N/mm² 5,000 N/mm² ⊥ 15 N/mm²
Water vapour diffusion resistance figure μ as per DIN 4108-4	250
Equilibrium moisture at 23 °C, 80% rel. humidity	approx. 6 M.-%
Linear coefficient of expansion	a_t = 0.007 mm/(mK)
Moisture expansion (air-dry 30 % to water-saturated 95%)	1 mm/m
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 (to DIN 52612)	approx. 0.19 W/(mK)
Temperature elasticity reciprocal value	a_t = 0.005 mm/(mK)

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

2.4 Placing on the market / Application rules

DIN EN 12467, Fibre-cement flat sheets – Product specification and test methods

CE Declaration of Conformity in accordance with the specifications outlined in Annex ZA to DIN EN 12467:2006-04.

2.5 Delivery status

Cedral	Max. format in mm	Thickness in mm	Surface
Structure	3600 x 190	10	Slight cedar wood grain, coated
Smooth	3600 x 190	10	Slightly scarred surface, coated

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

Base materials in % mass (dry mass)

35-40% Portland cement to DIN EN 197-1, (CEM I 32.5 R and 42.5 R) (binding agent)

50-55% Quartz sand, mineral aggregates

5-10% Cellulose (as filter and reinforcement fibres)

3-7% Aluminium hydroxide

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

Coating

Primer:

Application volume (incl. water): 127 g/m²

Application volume (dry): 48 g/m²

Top coat:

Application volume (incl. water): 174 g/m²

Application volume (dry): 52 g/m²

No substances of REACH relevance are used in production.

2.7 Production

Façade panels made of fibre cement are manufactured largely in accordance with an automated winding 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 size. Leftovers are returned to the production process preventing any waste from being incurred. The panels are then set aside for binding before stacking on pallets and steam-hardened in an autoclave for approx. two hours. The setting time lasts approx. 3 days. The façade panels are then coated in acrylic paint. PE shrink film, wooden pallets and steel bands are used as packaging materials.

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/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

Cedral façade panels are supplied in a standard format and two surface structures. Special low-dust equipment such as slow-running, carbide-tipped splitting saws or cutting burs and hand-operated tools such as guillotine shears 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 substructures including the requisite anchoring and joining equipment (studs, screws, nails) and joint tape made of EPDM and edge profiles made of 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 on special wooden 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).

The fibre-cement products comprise approx. 6% water (equilibrium moisture) and a proportion by volume of approx. 30% air (contained in the micropores).

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).

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.

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 cellulose fibres bound in the cement 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 Evidence: Eluate analysis). The pH value is alkaline (pH ≥ 10).

Mechanical destruction

Not of relevance

2.15 Re-use phase

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

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 landfill sites 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

The Declaration refers to the manufacture of 1m² Cedral (10 mm, 13kg/m²) produced in the Eternit N.V.plant in Kapelle-op-den Bos.

3.2 System boundary

Type of EPD: cradle to plant gate

The following processes were included in A1-A3 product stages façade panel manufacture:

- processes for providing auxiliaries and energy
- Transporting the preliminary products (cement, fibres) and auxiliaries to Kapelle-op-den-Bos
- 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.

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.

An assumption was also made with regard to the composition of the coating. As only the application volumes and no exact chemical recipe is available for the base coat and top coat for Cedral façade panels, the composition is estimated on the basis of data available for other Eternit façade panels, whereby the coating with the highest contributions to the environmental impacts reviewed was applied (worst-case approach).

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 documented in the online GaBi documentation. The basic data in the GaBi data base was applied for energy, transport and consumables.

The products are produced in Belgium. This means that apart from the production processes under these marginal conditions, the pre-stages also of relevance for Belgium such as provision of electricity or energy carriers were used. The power mix for Belgium is applied with 2008 as the year of reference.

Cement is used as a binding agent in the fibre cement. 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. 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 N.V. for the manufacture of façade panels in 2010. The volumes of raw materials, energy, auxiliaries and consumables used are considered as average annual values in the Kapelle-op-den-Bos plant.

3.8 Allocation

Cedral façade panels are manufactured in the Kapelle-op-den-Bos plant. All plant data relates to the declared product. No allocations were made within the framework of the Life Cycle Assessment.

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: 40 to 60 years

5 LCA: Results

The environmental impacts of 1m² Cedral manufactured by Eternit N.V. 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: 1 m² Cedral

		Product stage
Parameter	**Unit**	**A1-A3**
Global Warming Potential	[kg CO_2 equiv.]	6.43
Depletion Potential of the Stratospheric Ozone Layer	[kg CFC11 equiv.]	2.86E-07
Acidification Potential of soil and water	[kg SO_2 equiv.]	1.64E-02
Eutrification Potential	[kg PO_4^{3} equiv.]	2.54E-03
Formation Potential of Tropospheric Ozone Photochemical Oxidants	[kg ethene equiv.]	5.71E-03
Abiotic Depletion Potential non-Fossil Resources	[kg Sb equiv.]	1.25E-03
Abiotic Depletion Potential Fossil Fuels	[MJ]	76.40

LCA RESULTS – USE OF RESOURCES: 1 m² Cedral

		Product stage
Parameter	**Unit**	**A1-A3**
Renewable primary energy as energy carrier	[MJ]	12.9
Renewable primary energy as material utilisation	[MJ]	15.2
Total use of renewable primary energy sources	[MJ]	28.1
Non-renewable primary energy as energy carrier	[MJ]	95.4
Non-renewable primary energy as material utilisation	[MJ]	0.0
Total use of non-renewable primary energy sources	[MJ]	95.4
Use of secondary materials	[kg]	0.0
Renewable secondary fuels	[MJ]	1.23
Non-renewable secondary fuels	[MJ]	12.94
Net use of fresh water	[m³]	0.0415

LCA RESULTS – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² Cedral

		Product stage
Parameter	**Unit**	**A1-A3**
Hazardous waste for disposal*	[kg]	-
Disposed of, non-hazardous waste	[kg]	19.3
Disposed of, radioactive waste	[kg]	0.0078
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 1 m² Cedral, the use of non-renewable primary energy sources accounts for 95.4 MJ/m². The use of renewable primary energy sources accounts for 28.1 MJ/m².

The **use of non-renewable primary energy sources** during Cedral manufacturing is largely determined by the use of energy carriers in the plant, whereby the provision of electricity (24%) and the thermal energy required from natural gas (23%) play a decisive role.

The manufacture of preliminary products (Module A1) is also of significance. Accounting for 20% and 14%, respectively, the manufacture of cellulose and cement make a significant contribution.

The largest share of **use of renewable primary energy sources** during Cedral manufacturing is accounted for by cellulose. 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 Cedral.

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 1 m² Cedral, around 41.5 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 primarily incurred during the extraction of mineral raw materials (lime for cement production, wollastonite) 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 both the provision of raw materials (Module A1) and product manufacturing (Module A3) have a decisive influence on the results.

The **Global Warming Potential** of Cedral manufacturing is primarily dominated by carbon dioxide emissions. This is essentially attributable to the upstream chains associated with cement manufacturing (56%) as well as the upstream chains associated with the provision of electricity (11%) but also direct emissions in the plant as a result of thermal implementation of natural gas (20%).

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 51% dominated by sulphur dioxide emissions and 40% by nitric oxides. Contributions to the AP are accounted for by several drivers: the upstream chains associated with cement production, mineral aggregate manufacturing, the upstream chains associated with cellulose production, transport to the plant, manufacture of the coating components and the provision of electricity.

Consideration of the **Eutrification Potential** indicates a breakdown of primary initiators similar to those for the AP. 68% of the EP is determined by nitric oxides.

80% of the **Summer Smog Potential** is determined by NMVOC emissions. These are 90% attributable to the manufacturing process in the plant following application of the coating during which process NMVOC emissions are incurred.

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 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.

The overall **data quality** can be regarded as good for modelling the Cedral façade panels. Corresponding consistent data records were available for almost all of the preliminary products and auxiliaries used.

The production data involves up-to-date primary data supplied by Eternit N.V. for the Kapelle-op-den-Bos 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.

An assumption was also made with regard to the coating. As no exact chemical recipe is available for the base coat and top coat for Cedral façade panels, the composition is estimated on the basis of data available for other Eternit façade panels, whereby the coating with the highest contributions to the environmental impacts reviewed was applied (worst-case approach).

With regard to the potential for abiotic depletion of resources - elements (ADP elements) for non-fossil resources which is practically 100% dominated by the manufacture of coating components in this assumption, there are therefore restrictions regarding the interpretation of results in the EPD. Effects in other impact categories are barely affected by this assumption.

7 Requisite evidence

7. 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-156349-07-To, 26.10.2007

Result: The results of the analysis of leaching by the panels examined in accordance with DIN 38414, Part 4 indicate that the eluate allocation values for Class I landfills in the Landfill Ordinance are adhered to with regard to any landfilling of non-recyclable residual construction panels.

In terms of use in construction, a comparison of the leaching data with the limit and guideline values outlined in the German Drinking Water Ordinance dated 21 May 2001 indicate that the limit values are exceeded concerning the pH value and concentration of water-soluble organic ingredients (see $KMnO_4$ use).

Parameter / Sample name			Sidings façade building block (grey) leaching 1+10	Limit values as per Drinking Water Act dated 21.05.2001	Map value as per Waste Disposal Act dated 13.12.2006 landfill class 1
Colour			Colourless	Colourless	-
Odour			None	None	-
pH value			11.5	6.5 – 9.5	5.5 - 13.0
Electrical conductivity		µS/cm	486	2500	10000
Acid capacity	$K_{S8,2}$	mmol/l	1.96	-	-
Acid capacity	$K_{S4,3}$	mmol/l	2.66	-	-
AC (426 mm)		m^{-1}	0.2	-	-
Total dissolved solids	AR	mg/l	167	-	3000
Chloride	Cl^-	mg/l	< 5	250	1500
Sulphate	SO_4^{2-}	mg/l	< 5	240	2000
Phosphate, total	P	mg/l	< 0.05	6.7	-
Nitrate	NO_3^-	mg/l	< 2.0	50	-
Nitrite	NO_2^-	mg/l	0.06	0.5	-
Fluoride	F^-	mg/l	0.06	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	14.7	200	-
Potassium	K		3.2	12	-
Calcium	Ca		36.6	400	-
Magnesium	Mg	mg/l	0.20	50	-
Ammonia nitrogen	NH_4^+-N	mg/l	0.09	0.5	4
Iron	Fe	mg/l	< 0.005	0.2	-
Manganese	Mn	mg/l	< 0.005	0.05	-
Copper	Cu	mg/l	< 0.005	2	1
Zinc	Zn	mg/l	< 0.005	5	2
Nickel	Ni	mg/l	< 0.005	0.02	0.2
Chrome, total	Cr	mg/l	< 0.005	0.05	0.3
Chromate	Cr^{VI}	mg/l	< 0.01	-	0.05
Cadmium	Cd	mg/l	< 0.0003	0.005	0.05
Mercury	Hg	mg/l	< 0.0002	0.001	0.005
Lead	Pb	mg/l	< 0.005	0.01	0.2
Arsenic	As	mg/l	< 0.001	0.01	0.2
Selenium	Se	mg/l	< 0.001	0.01	0.03
Thalium	Tl	mg/l	< 0.001	-	-
Antimony	Sb	mg/l	< 0.001	0.005	0.03
Tin	Sn	mg/l	< 0.005	-	-
Barium	Ba	mg/l	< 0.005	1	5
Beryllium	Be	mg/l	< 0.002	-	-
Boron	B	mg/l	0.08	1	-
Cobalt	Co	mg/l	< 0.005	-	-
Silver	Ag	mg/l	< 0.005	0.01	-
Vanadium	V	mg/l	0.008	-	-
Aluminium	Al	mg/l	0.8	0.2	-
$KMnO_4$ consumption		mg/l	60	5	-
Chem. oxygen demand (COD)	O_2	mg/l	49	-	-
Total Organic Carbon (TOC)	C	mg/l	15	-	50
Phenol index		mg/l	< 0.010	0.005	0.2
Adsorb. org.bound halogens (AO	Cl^-	mg/l	< 0.010	-	0.3
Σ PCB		mg/l	n. n.	-	-
Σ PCB as per the Drinking Water Ordinance		µg/l	< 0.1	0.1	-
Benzopyrene		µg/l	< 0.01	0.01	-
Σ CVOC		mg/l	n. n.	-	-

n.n. = unverifiable (below the detection limit)

7.3 VOC emissions

Cedral 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 designations and declarations – Type III Environmental Declarations – Basic principles and processes (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

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Institut Bauen und Umwelt e.V.	**Publisher** Institut Bauen und Umwelt e.V. Rheinufer 108 53639 Königswinter Germany	Tel. Fax E-mail Web	+49 (0)2223 296679-0 +49 (0)2223 296679-0 info@bau-umwelt.com **www.bau-umwelt.com**
Institut Bauen und Umwelt e.V.	**Programme holder** Institut Bauen und Umwelt e.V. Rheinufer 108 53639 Königswinter Germany	Tel. Fax E-mail Web	+49 (0)2223 296679-0 +49 (0)2223 296679-0 info@bau-umwelt.com **www.bau-umwelt.com**
Eternit	**Holder of the Declaration** Eternit AG Im Breitspiel 20 69126 Heidelberg Germany	Tel. Fax E-mail Web	+49 (0)1805 651651 +49 (0)1805 632630 info@eternit.de **www.eternit.de**
PE INTERNATIONAL	**Author of the Life Cycle Assessment** PE INTERNATIONAL AG Hauptstrasse 111 - 113 70771 Leinfelden-Echterdingen Germany	Tel. Fax E-mail Web	+49 (0)711 341817-0 Fax +49 (0)711 341817-25 info@pe-international.com **www.pe-international.com**