Environmental Product Declaration

according to ISO 14025

Duripanel Textura
Duripanel Baseboard

Eternit AG

Declaration number
EPD-ETE-2008311-E

Institut Bauen und Umwelt e.V.
www.bau-umwelt.com

Institut Bauen
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Summary

Environmental Product Declaration

Program holder

Institut Bauen und Umwelt e.V.
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Declaration holder

Eternit AG
Im Breitspiel 20
D – 69126 Heidelberg

Declaration number

EPD-ETE-2008311-E

Declared building products

Duripanel Textura / Duripanel Baseboard/Building Board

This declaration is an environmental production declaration according to ISO 14025 and describes the environmental performance of the building products mentioned. It is intended to promote the development of environmental and health compatible construction. All relevant environmental data is disclosed in this validated declaration. The declaration is based on the PCR document "Wood-Cement", reference year 2006.

Validity

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

Content of the declaration

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

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

Date of issue

December 8, 2008

Signatures

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

Verification of the declaration

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

Signatures

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

Dr. Frank Werner (Verifier appointed by the SVA)

Summary

Environmental Product Declaration

The named products are the cement-bonded particle boards Duripanel B1 (uncoated) and Duripanel Textura (acrylate coated).	**Product description**
The purposes of the declared wood cement boards are: Cladding material for back-ventilated curtain walling and for decorative interior finishing. Building board for different applications, e.g. timber-frame buildings, Portacabins, furniture making, permanent formwork, substrates for composite elements, etc.	**Range of application**
The **Life Cycle Assessment (LCA)** was carried out according to DIN ISO 14040 ff. corresponding to the requirements of the IBU guidelines for Type III declarations. Specific data of the examined products and data from the "GaBi 4" database were used. The life cycle assessment includes raw material recovery and energy generation, manufacture of the product and all transport of the raw materials. The long version also describes a use scenario.	**Scope of the Life Cycle Assessment**

Duripanel wood cement boards (Raw materials and production)

Results of the Life Cycle Assessment

Impact category	Units per t	Duripanel B1 (uncoated)	Duripanel Textura (coated)
Primary energy, non-renewable	MJ	6869	14229
Primary energy, renewable	MJ	4190	4195
Global Warming Potential (GWP 100 years)	kg CO_2 equiv.	434	750
Ozone Depletion Potential (ODP)	kg R11 equiv.	$38 \cdot 10^{-6}$	$39 \cdot 10^{-6}$
Acidification Potential (AP)	kg SO_2 equiv.	1.43	4.89
Eutrophication Potential (EP)	kg phosphate equiv.	0.16	0.39
Photochem. Ozone Creation Potential (POCP)	kg ethene equiv.	0.31	0.46

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

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

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

Evidence and verifications

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

Product group	Cement-bonded particle boards	Prepared by
Declaration holder:	Eternit AG	25-11-2008
Declaration number:	EPD-ETE-2008311-E	

Scope of validity

This document applies to wood cement products made in Germany.

0 Product definition

Product definition

The named products are the cement-bonded particle boards Duripanel B1 (uncoated) and Duripanel Textura (coated). The coated boards have a sealed rear and coated front (see Chapter 1 Raw materials).

Range of application

Duripanels are facade panels for mounting on wooden substructures. Duripanel baseboards are building boards for use in timber-frame buildings, dry lining and general interior finishing.

Product standard / approval

- DIN EN 633, DIN EN 634, DIN EN 13 986

Quality control

- CE Declaration of conformity according to the provisions of Annex ZA of DIN EN 13 986: 2002
- External control of the products with general building approval issued by the "Materialprüfungsamt des Landes Brandenburg/Berlin" or the "Bundesanstalt für Materialprüfung und Forschung (BAM)".

State on delivery, properties

Table 1: Physical data

Property	Value
Apparent density	≥ 1,650 to 1,800 kg/m³
Strengths: Compressive strength Modulus of elasticity (Young's modulus) Flexural strength ∥ ⊥	 50 N/mm² 15,000 N/mm² 17 N/mm² 24 N/mm²
Water vapour diffusion resistance factor μ according to DIN 4108-4	350 / 140
Equilibrium moisture content at 23 °C, 80 % r.h.	approx. 10 M. %
Linear expansion coefficient	a_t = 0.01 mm/mK
Moisture expansion (air dry to water saturated)	1 mm/mK
Chemical resistance	Similar to concrete C 35/45
Ageing resistance	Similar to concrete C 35/45
Continuous temperature resistance	exists up to 80° C
Thermal conductivity λ_R according to DIN 52612	approx. 0.60 W/(m·K)

Table 2: Available sizes and product properties

	max. size in mm	Nominal thickness in mm	Surface	Colour
Duripanel B1	3100 x 1250	6; 8; 10; 12; 14; 16; 18; 20; 22; 24; 28; 32; 36; 40	smooth	uncoated
Textura	3100 x 1500	12; 16; 18	granular finish	different colours

Sound insulation

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

Fire protection

Duripanel B1 / Duripanel Textura

Construction material class B1 according to DIN 4102, Part 1, i.e. "flame resistant"

Construction material classification according to DIN EN 13501 B, s1-d0, i.e. according to Construction Product List Part A "flame resistant".

1 Raw materials

Raw materials, prime products

Wood cement (raw materials in % by weight)

Raw materials	Duripanel B1 / Textura
Portland cement according to DIN EN 197-1, (CEM I 32.5 R and 42.5 R) (as binder)	69 %
Absolutely dry wood	23 %
Ground production residues	8 %
	100 %

The water content of the end product is around 9 % and is not included in the recipe. Production residues are ground and added back to the basic raw material mixture.

The proportion of fixed carbon dioxide as a renewable material resource in the wood is 431 kg based on one tonne of Duripanel.

Auxiliary substances / additives

Coatings:

	Duripanel Textura	Duripanel B1
Rear sealant:		none
Water	60.0 %	
Setting up agent (bonding retarder)	0.3 %	
PVDC butyl acrylate (binder)	35.7 %	
Paraffin wax (binder)	4.0 %	
Spread quantity	60 - 80 g/m²	

Front coating:

	Duripanel Textura		Duripanel B1
	Undercoat	Topcoat	none
Water	40.4 %	53 %	
Solvent (glycols)	4 %	4 %	
Setting up agent (bonding retarder)	2 %	2 %	
Inorganic pigments*	28 %	9 %	
Pure acrylates (binder)	24 %	31 %	
Polyethylene wax	1 %	1 %	
Preservative	0.6 %	-	
Spread quantity in g/m²	220-240	140-160	

Material explanation

- **Portland cement:** Manufactured according to DIN EN 197-1, is produced from marly limestone, a mixture of limestone and clay. The raw material is crushed, dried, fired and ground to form cement. Precise manufacturing data is to be provided by cement manufacturers.
- **Wood:** Selected, healthy, mechanically peeled sprucewood, graded industrial wood quality ("Sortiertes-Industrie-Normalholz" - SIN) aged 30 to 40 years, which is free of rot, mould and fungal attack, is used. It may contain up to 3% bark and knot residues. The timber, purchased through local forestry within a radius of 150 km is not treated with fungicide.
- **Ground production waste:** Dust and edge off-cuts arise during sawing and squaring up of the wood cement panels, which are first passed through filters and return systems to a grinder and from there are returned to the raw material mixing stage.

Raw material extraction and origin

The majority of the named raw materials come from domestic deposits. All raw materials are bought in. Average transport distance from the raw material extraction/production site to the Eternit factory: 150 km.

Local and general availability of the raw materials

Wood is a renewable raw material. All other materials mainly consists of mineral raw materials for which, based on current knowledge, there is no resource scarcity.

2 Manufacturing the building product

Manufacturing the building product

The production of large-size sheets of wood cement takes places in a largely automated, semi-dry spreading process, in which no surplus water arises. The spreading mix of wood chips, cement, returned material from squaring up wastes, auxiliary materials and water are added to a mechanical mixer. The material is uniformly spread by means of mechanical air separation over substrate boards. Surplus material at the edges is returned directly to the spreading machine. The spread material is compressed, stored in a conditioning cabinet to set (heat exchanger, steam produced using natural gas), the hardened sheets are restacked, squared up (cut) and temporarily stored for 28 days. The boards are then dried in a forced-draught stove to delivery moisture content.

Duripanel Textura is also coated.

Some sheets are coated with a colourless sealant. The visible sides are coated, for the high-quality pure acrylate paints using brushing/spraying method, applied twice and covered with a hot film. Silicate hollow beads (micro glass beads) are applied to the Textura coating to achieve the fine-grained surface and a preservative is added.

Packaging

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

Health protection production

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

Environmental protection production

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

3 Product processing

Processing recommendations

Machining: Sawing, drilling, possibly cutting (milling). When selecting the required additional construction products it is necessary to ensure that they do not have any negative effects on the described properties of the named building products' environmental compatibility.

Health & safety Environmental protection

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

The usual health & safety measures according to manufacturer's instructions must be complied with when using the named products. It must be noted that the dust arising during machining can cause an alkaline reaction (pH value: approx. 12). The general dust limit according to TRGS 900 of ≤ 6 mg/m³ can be safely complied with using the machining equipment recommended by Eternit AG (see, e.g. /Eternit 2005/).

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

Residual material

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

4 Building product in use

Constituents

Wood cement:

Hydrated cement (calcium silicate hydrate) with embedded wood chips, ground production wastes and auxiliary materials in the proportions given in Section 1 "Raw materials" is produced by setting (hydration) the cement-water mix. Over the useful life of the products, free lime from the cement mixes with carbon dioxide in air to form calcium carbonate (carbonation). Wood cement contains approx. 7 % water (equilibrium moisture content).

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

Environmental health effects

Environmental protection:

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

Health protection:

The constituents of the building product are bound during use. Dust emissions are not possible. In the event of contact (skin, eye or mouth contact) it must be noted that hydrated cement produces a slightly alkaline reaction when combined with moisture. Use of the constituents is not limited by existing statutory regulations. The small quantity of algaecide additive contained in the coating is bonded in the binder (pure acrylate) and measurable quantities cannot be released by leaching/washing out, so that no risks to health can result from this (see also Section 8. Evidence: Eluate analysis). The weathering rate of the pure acrylate coating is also very low (immeasurable) even after many years of use so that no risks to health can result from this either.

Long-term durability

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

5 Singular effects

Fire

Duripanel B1 and Duripanel Textura conform to construction material class B-s1, d0 according to DIN EN 13501, Part 1, i.e. according to Construction Product List Part A are "flame resistant".

- **Smoke production/smoke concentration:** Smoke production caused due to burning of the named products (coating) is very low.
- **Fumes/fire gases:** See fire gas toxicity test results in Section 8. Evidence.
- **Change of state (burning drip down/drop-out):** Burning drip down/drop-out of the colour coating or the wood cement does not occur.

Floods

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

6 End of life phase

Re-use and continued use

If undamaged, the dismantled products can be used again for their original purpose or can continue to be used, e.g. as foundation wall protection. Undamaged products can be re-used, e.g. dismantled wood cement boards can be re-cut.

Re-use and recycling

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

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

Disposal

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

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

7 Life cycle assessment

7.1 Production of wood cement board

Declared unit

The declared unit is the production of one tonne of average wood cement board.

The apparent density of wood cement boards is 1650 kg/m³.

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

System limits

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

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

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

The examined products are solely produced in the Neubeckum factory.

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

Cut-off criterion

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

Transport

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

Period under consideration

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

Background data

The software system GaBi 4 was used to model the life cycle for the production of Duripanel wood cement boards. All background data records relevant for the board production were taken from the GaBi 4 software database.

The production of one tonne of Duripanel was, where available, calculated with specific data from Eternit, alternatively, average data records were used. ETEX/ETERNIT supplied a data record for the modelling of the use phase; this data is based on Belgian system limits.

Assumptions

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

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

Data quality

All data used is less than 5 years old. The data for the examined wood cement product was acquired directly in the Neubeckum factory. Most of the data for the pre-chains comes from industrial sources, which were surveyed under consistent time and methodological boundary conditions. The process data and the background data used are consistent. ETEX/ETERNIT supplied a data record as an aggregated process for modelling the use phase; detailed assessment of these processes was not possible.

Allocation

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

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

Notes on the use phase

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

The use phase calculations for the wood cement boards in this declaration are based on cleaning of the boards every 10 years using a fungicide. Consumption of the fungicide refers to 100 m² wood cement product.

No cleaning is included for the uncoated board.

7.2 Description of the balances and analyses

Life cycle inventory

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

Primary energy

Table 3 shows the primary energy consumption (renewable and non-renewable), broken down into production, raw material supply, coating, transport and packaging of one tonne of Textura / B1.

Production of the uncoated Duripanel accounts for almost 63 % of the consumption of non-renewable primary energy requirement (electricity and thermal energy from heating oil). Among the raw materials, the production of cement uses the most non-renewable energy with 35 %.

Compared to this, the coating of Duripanel Textura requires 52 % of the non-renewable primary energy. Production and the raw materials account for lower amounts with 31 % and 20 % respectively. The high proportion required for the coating results from production of the paint.

Renewable energy accounts for around 38 % of the total energy requirement (uncoated Duripanel) and 23 % (coated Duripanel). More than 95 % of the total 4190 MJ/ t of renewable primary energy requirement (Duripanel uncoated) is for supply of the industrial wood (spruce) and the wooden pallets (packaging). This is the proportion of solar energy stored in the wood during growth of the trees and which can be converted into combustion heat. The same conditions apply to Duripanel Textura.

Table 3: Energy input for production of the wood cement product Duripanel

Duripanel wood cement boards								
Parameter	Type	Units per t	Total	R	B	P	T	V
Primary energy, non-renewable	B1	[MJ]	6869	2795	-	4348	17	-291
	Textura	[MJ]	14229	2795	7360	4348	17	-291
Primary energy, re-newable	B1	[MJ]	4190	3783	-	129	0	278
	Textura	[MJ]	4195	3783	5	129	0	278

(Abbreviations: R = raw materials; B = coating; P = production; T = transport; V = packaging)

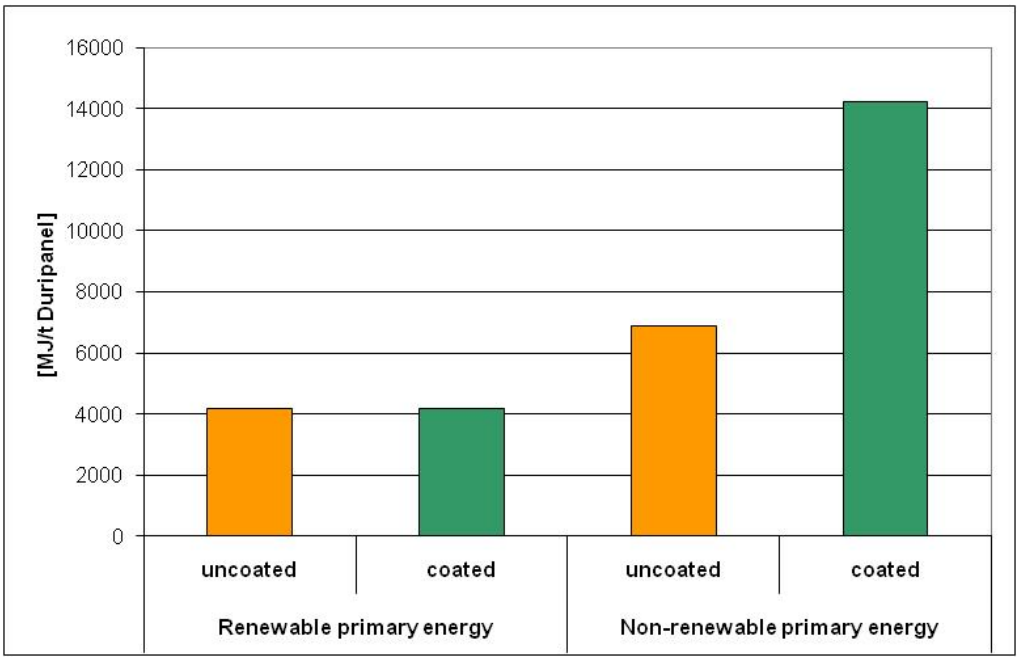

Figure 1: Use of renewable and non-renewable primary energy for the production of one tonne of Duripanel (uncoated / coated)

Closer examination of the energy required to produce one tonne of Eternit Duripanel, uncoated, shows that mineral oil is the main non-renewable primary energy source used (35 %), followed by coal and uranium (21 %), lignite coal (18 %) and natural gas with 5 %.

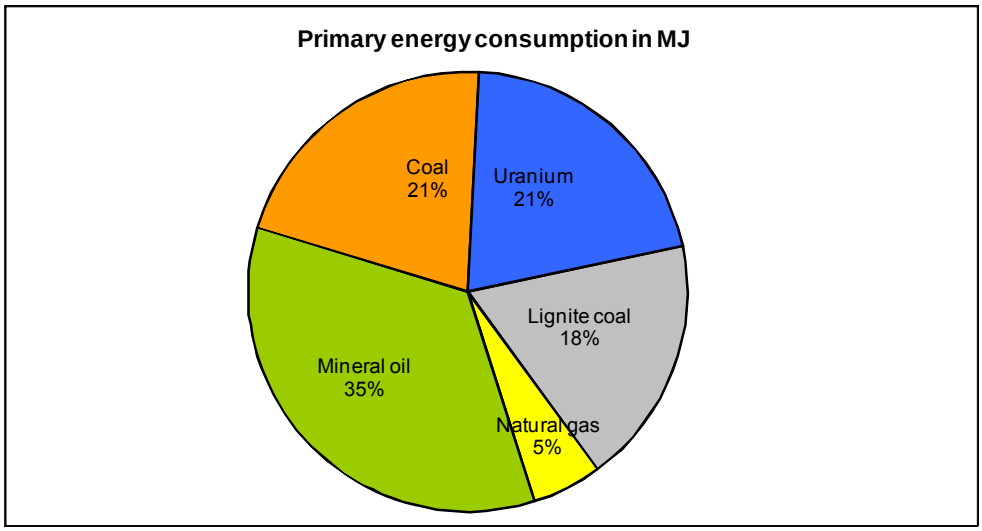

Figure 2: Distribution of the non-renewable primary energy consumption during the production of 1 t Duripanel (uncoated)

Closer examination of the energy required to produce one tonne of Eternit Duripanel, coated, shows that here the main primary energy source is mineral oil with 37 %, followed by natural gas with 22 %, uranium with 17 %, coal (14 %) and lignite coal with 10 %. The high proportion of mineral oil required results from production of the coating paints.

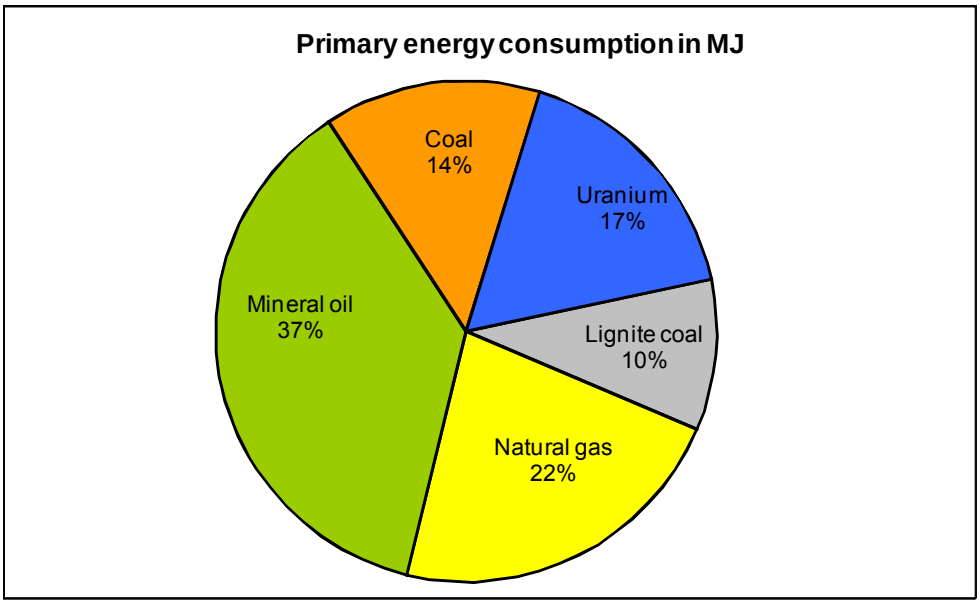

Figure 3: Distribution of the non-renewable primary energy consumption during the production of 1 t Duripanel (coated)

The high proportion of the primary energy consumption provided by renewable energy is due to the high proportion of wood-based materials used. The renewable energy resources can be divided into the following categories. Solar energy with 96 %, energy from hydropower with 2 % and energy from wind power with 2 %.

Water

Assessment of the water consumption to produce 1 t product is shown separately for surface water and groundwater.

Table 4: Water consumption

Water consumption [kg / t]	Duripanel B1 (uncoated)	Duripanel Textura (coated)
Surface water	2074	2124
Groundwater	1306	2714
Other	56	105
Total	3436	4943

Wastes

The assessment of the waste produced in manufacturing 1 t Textura / B1 is shown separately for the three fractions: overburden/stockpile dump (including ore processing residues), municipal wastes (including household rubbish and commercial wastes) and hazardous waste incl. radioactive wastes (Table 5 / Table 6).

Table 5: Wastes during the production of the wood cement product Duripanel B1

Duripanel wood cement boards B1 (uncoated)	
Parameter	Production [kg / t]
Overburden/stockpile dump	1926.41
Household-type commercial waste	0.02
Hazardous waste (incl. radioactive wastes)	1.15

Table 6: Wastes during the production of the wood cement product Duripanel Textura

Duripanel wood cement boards Textura (coated)	
Parameter	Production [kg / t]
Overburden/stockpile dump	2028.08
Household-type commercial waste	1.05
Hazardous waste (incl. radioactive wastes)	1.91

Overburden accounts for the largest quantity of the **stockpile dump** materials, followed by treatment residues and ore extraction residues. Overburden is mainly produced during the upstream process for the production of electricity (coal mining). Treatment residues arise during the production of cement and ore extraction residues are produced as a result of the extraction and processing of ore concentrates.

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

Hazardous wastes are essentially waste materials which arise during the production of cement and roof tile dispersion.

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

Impact assessment

The following figure shows the contributions of the production, raw material supply, coating, transport and packaging of one tonne of Eternit Textura / B1 to the impact

categories: global warming potential (GWP), ozone depletion potential (ODP), acidification potential (AP), eutrophication potential (EP) and photochemical ozone creation potential (POCP).

In all environmental impacts, almost 100 % are attributable to the raw material supply and the production (including electricity and thermal energy) of one tonne of uncoated Duripanel. The transport processes account for a small proportion only. The packaging processes provide a credit with respect to the impact category GWP.

If the production of one tonne of coated Duripanel is examined, a different view is obtained of the percentage distribution of the groupings considered. Coating accounts for more than 50 % of the impact categories: acidification, eutrophication and photochemical ozone creation. This is followed by the raw materials grouping with 19-36 % and a small proportion for production (~10 %). The global warming potential is uniformly distributed and the coating's share of the ozone depletion potential is negligibly small. Otherwise, as for the uncoated Duripanel, the transport processes has a small effect and the packaging processes provide a credit in the impact category GWP.

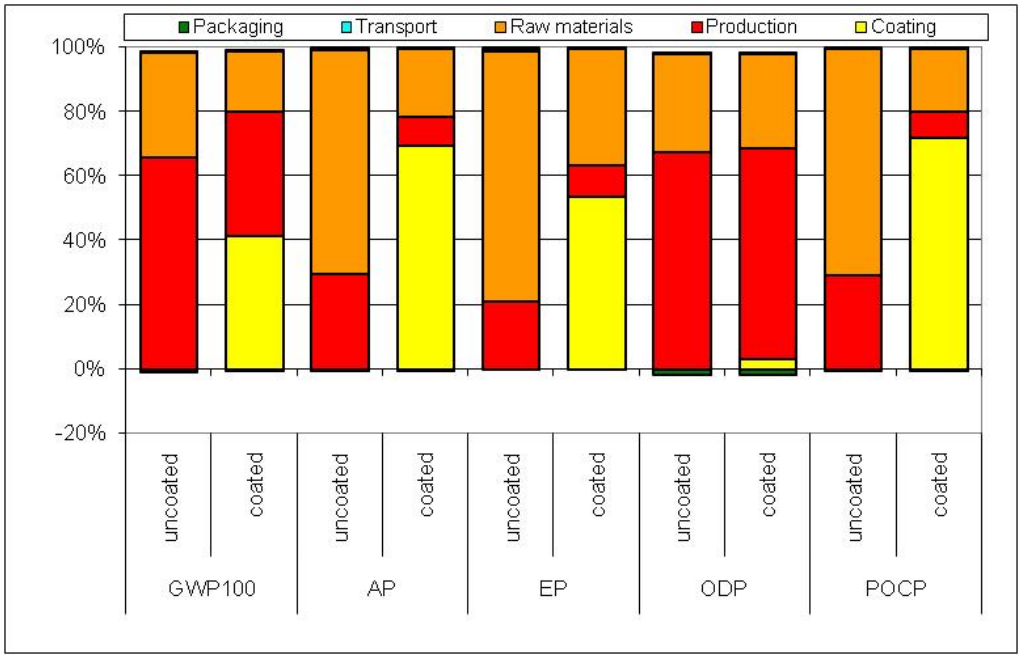

Figure 4: **Relative contributions of individual categories to the environmental impacts of the wood cement product Duripanel**

The absolute contributions of the Eternit wood cement board Duripanel (uncoated) to the individual environmental impacts, broken down into production, raw materials, coating, transport and packaging, are shown in Table 7. Table 8 shows the contributions of the coated Duripanel wood cement board.

Table 7: Absolute contributions of the Duripanel B1 product (uncoated) per tonne

	Unit	R	B	P	T	V
Global Warming Potential (GWP 100 years)	kg CO_2 equiv.	145	-	293	1.2	-4.8
Ozone Depletion Potential (ODP)	kg R11 equiv.	$12 \cdot 10^{-6}$	-	$27 \cdot 10^{-6}$	$2.0 \cdot 10^{-9}$	$-0.7 \cdot 10^{-6}$
Acidification Potential (AP)	kg SO_2 equiv.	1.05	-	0.37	$7.8 \cdot 10^{-3}$	$-1.8 \cdot 10^{-3}$
Eutrophication potential (EP)	kg phosphate equiv.	0.14	-	0.038	$1.4 \cdot 10^{-3}$	$0.5 \cdot 10^{-3}$
Photochem. Ozone Creation Potential (POCP)	kg ethene equiv.	0.09	-	0.037	$0.67 \cdot 10^{-3}$	$-79 \cdot 10^{-6}$

(Abbreviations: R = raw materials; B = coating; P = production; T = transport; V = packaging)

Table 8: Absolute contributions of the Duripanel Textura product (coated) per tonne

	Unit	R	B	P	T	V
Global Warming Potential (GWP 100 years)	kg CO_2 equiv.	145	315	293	1.2	-4.8
Ozone Depletion Potential (ODP)	kg R11 equiv.	$12 \cdot 10^{-6}$	$1.4 \cdot 10^{-6}$	$27 \cdot 10^{-6}$	$2.0 \cdot 10^{-9}$	$-0.7 \cdot 10^{-6}$
Acidification Potential (AP)	kg SO_2 equiv.	1.05	3.4	0.37	$7.8 \cdot 10^{-3}$	$-1.8 \cdot 10^{-3}$
Eutrophication potential (EP)	kg phosphate equiv.	0.14	0.21	0.038	$1.4 \cdot 10^{-3}$	$0.5 \cdot 10^{-3}$
Photochem. Ozone Creation Potential (POCP)	kg ethene equiv.	0.09	0.33	0.037	$0.67 \cdot 10^{-3}$	$-79 \cdot 10^{-6}$

(Abbreviations: R = raw materials; B = coating; P = production; T = transport; V = packaging)

Assessment of the **global warming potential** shows that the total sum is essentially made up of the manufacture of raw materials, production and, in the case of Textura, the coating. Almost 60% of the total greenhouse gas emissions of 865 kg CO_2 equiv. of uncoated Duripanel is for manufacture of the cement. The electrical energy contribution is 19 % and the proportion of thermal energy from light heating oil is 15 %. For the coated Duripanel, the proportion of the total greenhouse gas emissions (1181 kg CO_2 equiv./t product) for manufacture of the cement is 43 %. Here the coating also accounts for a significant share (26 %). Equally, the proportion of electrical energy is 13 % and the proportion of thermal energy is 11 %. The greenhouse gas emissions of both products are offset by CO_2 capture of 431 kg CO_2/t.

The credit from the packaging results from its energetic recovery. The captured combustion heat, which is used to produce electricity and steam, is greater than the consumptions necessary during production of the packaging.

Around 69 % of the **ozone depletion potential** is due to the production of electricity. Supply of the raw material cement accounts for 31 %.

Raw material supply, with around 70 %, and production (30 %) are decisive for the **acidification potential** of the uncoated Duripanel. These values are mainly attributable to the production of electricity (61 %) and the production of light heating oil (38 %). The distribution for the coated Duripanel is: 70 % for manufacture of the coating materials, 21 % for raw material supply and 9 % for production.

78 % of the **eutrophication potential** is accounted for by raw material supply and 21 % is determined by production of the Duripanel product B1 (uncoated). Of the raw materials, cement (71 %) accounts for the largest proportion of the eutrophication potential and for the production the generation of electricity (12 %) and light heating oil (9 %) are the greatest contributors.

The coating of the coated Duripanel accounts for the greatest proportion with 54 %, followed by raw material supply (36 %) and then production with 10 %. Whereby raw material manufacture is made up of 33 % for cement manufacture and the production is made up of 5 % electricity generation and 4 % for the production of light heating oil.

Assessment of the **photochemical ozone creation potential (POCP)** shows that raw material supplies (69 %) and production (30 %) dominate this impact category with respect to uncoated Duripanel. Above all, the cement raw material used is the most conspicuous (57 %). Production of the light heating oil and electricity each account for 15 % of the photochemical ozone creation potential.

Assessment of the photochemical ozone creation potential of the coated Duripanel product shows a different distribution. The coating share is the highest with 73 %, followed by raw material manufacture (19 %) and production (8 %).

In all the impact categories considered, transport and packaging play a secondary role.

Use phase

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

Table 9: Impact category results of use (cleaning) of 100 m² wood cement board

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

Possible VOC emissions from the use are not taken into account here.

8 Evidence

Eluate analysis

Test laboratory/report/date: University of Osnabrück, Institut für Chemie, Osnabrück; 03.02.2000

Result: The elution (leachate) analysis results for the boards tested in accordance with DIN EN 71, show compliance with both the environment-related limit or guide-line values defined in the (German) Drinking Water Regulations and the limit values for toy materials defined in DIN EN 71, Part 3. There are no misgivings against use of the named products in construction with regard to water hygiene aspects.

Toxicity of the fire gases

Measurement according to DIN 53436

Test laboratory/date: Institut für Chemie, University of Osnabrück; investigation report 20.06.1994

Result: The results of the test according to DIN 53436 show that the gaseous emissions in case of fire in the examined panels are free of sulphur compounds and chlorine com-pounds.

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

Health assess-ment of the emis-sions

Test laboratory/date: Eurofins Product Testing A/S, Galten/DK 29.05.2008

Result: Duripanel B1 is suitable for use in interior rooms in accordance with AgBB "Pro-cedure for the health assessment of emissions of volatile organic compounds (VOC and SVOC) from building products" as published in March 2008

9 PCR document and verification

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

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

10 References

For further references, see PCR document

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In the case of a doubt is the original EPD “EPD-ETE-2008311-D” applicable.