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The Norwegian EPD Foundation

ECO PLATFORM EPD EN 15804 VERIFIED

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the Declaration:	Knauf AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD314-190-EN
ECO Platform reference number:	00000150
Issue date:	20.03.2015
Valid to:	20.03.2020

Knauf Ultra Board

Valid for all the gypsum boards in the product range carrying the Knauf Ultra Board name.

Knauf A/S

www.epd-norge.no

General information

Product:
Knauf Ultra Board

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Declaration number:
NEPD314-190-EN

Place of production:
Hobro, Denmark

ECO Platform registration number:
00000150

Management system:
ISO 14001:2004
ISO 9001:2008
OHSAS 18001:2008

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serve as core PCR
PCR 010 rev1 Building Boards (12 2013)

Organisation no:
54050313

Scope:
Cradle to grave

Issue date:
20.03.2015

Valid to:
20.03.2020

Declared unit:
1m^2 of Ultra Board, from raw material extraction (A1) to the factory gate (A3).

Year of study:
2014/2015

Declared unit with option:

Comparability:
EPD of construction products may not be comparable if they do not comply with EN 15804 and are seen in a building context.

Functional unit:
1m^2 of installed Ultra Board, with a service lifetime of 60 years, from extraction of raw materials (A1) to the end-of-waste state (C3 and C4).

The EPD has been worked out by:
Reidun Dahl Schlanbusch

SINTEF

Reidun Dahl Schlanbusch

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

☐ internal ☑ external

Third party verifier:

Lars G. F. Tellnes, Norsk Treteknisk Institutt
(Independent verifier approved by EPD Norway)

Approved

Dagfinn Malnes
Managing Director of EPD-Norway

Product

Product description:
The Knauf Ultra Board is a glass fiber reinforced gypsum plasterboard with organic content for enhanced core strength. The product is to be applied for general indoor building construction of walls and ceilings.

Product specification:
The range of the products carrying the name Knauf Ultra Board includes the Ultra Board, Ultra Board Wet and different edge profiles.This EPD is valid for all variations carrying the Knauf Ultra Board name.

The calculations are based on the variation with the highest environmental impact (article number 427605).

Technical data:
According to EN 520:2009 the Ultra Board is classified as type DFIR (gypsum plasterboard with controlled denisty, improved core adhesion at high temperature, enhanced surface hardness and strength). The mass of the declared unit is 15,29 kg and the thickness is 15,5 mm.

Market:
The Nordic Countries; Denmark, Norway and Sweden.

Reference service life:
Reference service lifetime of the Knauf Ultra Board is 60 years when applied according to the product description.

Raw materials	**kg**	**%**
Stucco	12,121	79,30
Polymer	0,666	4,36
Other additives	0,278	1,82
Glue for edge	2,6E-03	0,02
Paper liners	0,400	2,62
Water *	1,820	11,88
Packaging		
Wood pallet	0,212	
Polyethylene foil	4,8E-03	
Carton corners	4,5E-03	
Installation		
Screws	0,025	
Tape	0,015	
Jointing material	0,95	

*In total, 7,61 kg of water is consumed during the production process. Due mainly to the soldification of the gypsum, 5,8 kg water is evaporated during the production process.

Gypsum:
The gypsum used for stucco in the Knauf plasterboard production is originated from mined gypsum (1 % in 2013), FGD gypsum from flue-gas desulphization in coal power plants (81,2 % in 2013) and recycled gypsum (17,8 % in 2013). The recycled gypsum originates from internal waste and from external collection of used gypsum plaster boards.

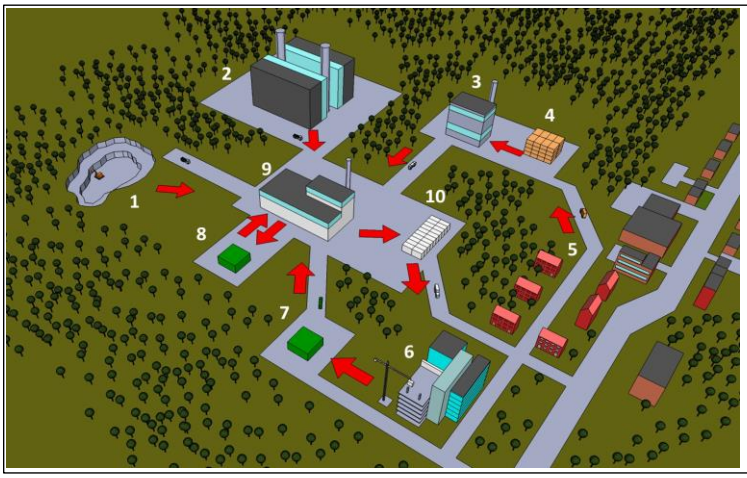
The internal recycling of gypsum boards in the Knauf factory started in 1991 and since 2004 all internal gypsum waste has been recycled and used. In 1998, Knauf started to use recycled gypsum from gypsum plaster boards collected from building sites.

LCA: Calculation rules

Declared unit:
1m^2 of Ultra Board, from raw material extraction (A1) to the factory gate (A3).

System boundary:
Figure 1 is showing a flow diagram of the value chain and the system boundaries from A1-C4. Biogenic carbon is also included in the system boundaries.

Figure 1: A flow diagram showing the value chain and the system boundaries.



1. Quarry, natural gypsum
2. Power station, flue gas gypsum
3. Paper factory, face and back liner
4. Recycled paper
5. Households collecting paper for recycling
6. Building site (A5)
7. Recycled gypsum from building sites (C3)
8. Internal recycling of gypsum
9. Gypsum plasterboard factory (A3)
10. Gypsum plasterboard products at the gate

See also the system boundary table on page six for a tabular presentation of the system boundaries and the modules included.

Data quality:
The data requirements are according to PCR 010 rev1 Building Boards (12 2013) clause 7.3.6. Specific data collected from contractors is applied for the most important raw materials in A1. Specific data from the 2013 production at the manufacturing site is applied in A3. Missing data were susbtituted with generic data from Ecoinvent v.2.2. No data are more than 5 years old.

Cut-off criteria:
All major raw materials and all the essential energy is included. General cut-off criteria are given in standard EN 15804:2012 clause 6.3.5. In compliance with these critera, the infrastructure of the manufacturing site, small parts of the packaging and the electricity used to fasten the screws are excluded from the study. No potentially hazardous materials have been excluded.

Allocation:
The allocation is made in accordance with the provisions of EN 15804:2012. Energy and water consumption in the factory is allocated to the FU by mass allocation. The water consumption is allocated to module A1. Waste production in the factory is allocated on the basis of m^2. Effects of primary production of recycled materials are allocated to the main product in which the material was used. The recycling process of the Knauf Ultra Board is allocated to module C3.

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Important note

This EPD yields for both the Danish and the Norwegian/Swedish market. There is one important difference in the two markets, namely the transport distance from the manufacturing site in Hobro, Denmark, to the building site, module A4. The Norwegian main storage, also serving the Swedish marked, is situated in Drammen, Norway. Two scenarios for transport are therefore given. In the result tables for environmental impact and resource use, the Danish A4 results are shown under A4 D and the Nowegian/Sweish results are shown under A4 N, for the user to choose.

Transport from production place to user (A4) in Denmark

Type	Destination	Type of vehicle	Distance [km]	
Truck	Building site in Denmark	16-32 tons, EURO5	192	

Transport from production place to user (A4) in Norway/Sweden

Type	Destination	Type of vehicle	Distance [km]	
Truck	Hirtshals, Denmark	16-32 tons, EURO5	120	
Boat	Kristiansand, Norway	Freight ship	140	
Truck	Drammen, Norway	16-32 tons, EURO4	422	
Truck	Building site in Norway/Sweden	16-32 tons, EURO4	360	

The plasterboard is considered installed when it is attached with screws in its designated place in the building, and the connection between two boards are finished with tape and joint film (A5). There is no demand for raw materials, energy or other resources during the use phase (0 value in B1-B5). Painting is optional and left out of this EPD.

Assembly (A5)

	Unit	Value
Material loss	%	15
Tape	kg	1,5E-02
Screws	kg	0,02
Jointing material	kg	0,95

Use (B1)

	Unit	Value
Consumption of raw materials		0
Consumption of energy		0
Consumption of other resources		0
Waste		0
Emissions to air, water and soil		0

Maintenance (B2)/Repair (B3)

	Unit	Value
Consumption of raw materials		0
Consumption of energy		0
Consumption of other resources		0
Waste		0
Emissions to air, water and soil		0

Replacement (B4)/Refurbishment (B5)

	Unit	Value
Consumption of raw materials		0
Consumption of energy		0
Consumption of other resources		0
Waste		0
Emissions to air, water and soil		0

* Number or RSL (Reference Service Life)

B6 and B7 are not relevant according to PCR 010 rev1 Building Boards. The end of life scenario is based on the current situation in Norway. The assumption is made that the same scenario applies to Denmark.

Operational energy (B6) and water consumption (B7)

	Unit	Value
Modules not relevant according to PCR		

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	%	0
Collected mixed construction waste	%	0
Reuse	%	0
Recycling	%	40
Energy recovery	%	0
To landfill	%	60

Transport to waste processing (C2)

Type	Destination	Type of vehicle	Distance [km]		
Truck	Recycling facilites	16-32 tons, EURO4	50		
Truck	Landfill	16-32 tons, EURO4	50		

LCA: Results

The calculations are based on the Ultra Board product variation with the highest environmental impact (see product specification). The LCA results of the other products in the Knauf Ultra Board product range is estimated to be between 0 and 5% lower than the results below.
When interpreting the results, it is important to note that 15% product loss is counted into A5, that A3 energy consumption is composed of Danish el-mix and natural gas, and that mass of the declared unit is 15,29 kg.
The GWP includes biogenic carbon uptake and emissions, calculated according to EN 16485:2014. 0,584 kg CO2 is taken up in A1 and emitted in again C3 and C4, so that the net value is zero within the system boundaries.

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Assemby stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
x	x	x	x	x	x	x	x	x	x	MNR	MNR	x	x	x	x	MND

Environmental impact

Parameter	Unit	A1	A2	A3	A4 D	A4 N	A5	C1	C2	C3	C4
GWP	kg CO_2-eqv	1,57	0,42	3,28	0,48	2,28	1,00	0,05	0,13	0,28	0,48
ODP	kg CFC11-eqv	1,2E-07	6,4E-08	3,7E-07	7,6E-08	3,6E-07	1,0E-07	6,7E-09	2,1E-08	2,1E-09	3,2E-08
POCP	kg C_2H_4-eqv	6,2E-04	6,1E-05	2,8E-04	5,9E-05	2,9E-04	2,1E-04	1,1E-05	1,6E-05	5,6E-06	0,01
AP	kg SO_2-eqv	0,01	1,8E-03	4,5E-03	1,4E-03	8,0E-03	3,2E-03	4,1E-04	5,2E-04	1,2E-04	0,29
EP	kg PO_4^{3-}-eqv	1,4E-03	3,1E-04	5,9E-04	2,7E-04	1,5E-03	4,9E-04	8,8E-05	1,1E-04	1,6E-05	1,5E-04
ADPM	kg Sb-eqv	5,2E-06	1,0E-06	1,5E-06	1,3E-06	6,2E-06	2,0E-06	8,5E-09	3,7E-07	6,5E-08	1,6E-07
ADPE	MJ	58,58	6,04	48,48	7,05	33,24	19,49	0,74	1,97	0,54	2,86

GWP Global warming potential; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non fossil resources; ADPE Abiotic depletion potential for fossil resources

INA Indicator not assessed

Resource use

Parameter	Unit	A1	A2	A3	A4 D	A4 N	A5	C1	C2	C3	C4
RPEE	MJ	5,92	0,09	2,98	0,10	0,48	1,80	0,00	0,03	0,13	0,07
RPEM	MJ	5,18	INA	0,06	INA	INA	0,79	INA	INA	INA	INA
TPE	MJ	11,11	0,09	3,04	0,10	0,48	2,59	0,00	0,03	0,13	0,07
NRPE	MJ	64,22	6,45	50,18	7,51	35,44	21,06	0,76	2,10	0,60	3,19
NRPM	MJ	INA	INA	0,14	INA	INA	0,02	INA	INA	INA	INA
TRPE	MJ	64,22	6,45	50,33	7,51	35,44	21,08	0,76	2,10	0,60	3,19
SM	kg	2,64	INA	0,01	INA	INA	INA	INA	INA	INA	INA
RSF	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
NRSF	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
W	m^3	0,01	0,00	0,00	0,00	0,00	0,56	0,00	0,00	0,00	0,00

The packaging, the paper liner, 17,9% of the gypsum and some additives originates from recycled materials.

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life - Waste											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	
HW	kg	INA	INA	1,3E-04	INA	INA	INA	INA	INA	INA	
NHW	kg	INA	INA	0,015	INA	INA	INA	INA	6,51	9,76	
RW	kg	INA	INA	INA	INA	INA	INA	INA	INA	INA	

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life - Output flow											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	
CR	kg	INA	INA	INA	INA	INA	INA	INA	INA	INA	
MR	kg	INA	INA	2,9E-03	INA	INA	INA	INA	6,51	INA	
MER	kg	INA	INA	0,012	INA	INA	INA	INA	INA	INA	
EEE	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	
ETE	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Reading example: 9,0 E-03 = $9,0*10^{-3}$ = 0,009

Additional Norwegian requirements

Greenhous gas emission from the use of electricity in the manufacturing phase
Danish consumption mix including imports, low voltage.

Data source	Amount	Unit
Ecoinvent v2.2	0,172	kg CO_2-eqv/MJ

Dangerous substances

☑ The product contains no substances given by the REACH Candidate list or the Norwegian priority list

☐ The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.

☐ The product contain dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.

☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

Indoor environment
No tests have been carried out on the product concerning indoor climate.

Carbon footprint
Carbon footprint has not been worked out for the product.

Bibliography

ISO 14025:2010	*Environmental labels and declarations - Type III environmental declarations - Principles and procedures*
ISO 14044:2006	*Environmental management - Life cycle assessment - Requirements and guidelines*
EN 15804:2012+A1:2013	*Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products*
ISO 14001:2004	*Environmental management systems - Requirements with guidance for use*
ISO 9001:2008	*Quality management systems - Requirements*
OHSAS 18001: 2007	*Occupational health and safety management systems. Requirements*
EN 520:2009	*Gypsum plasterboards. Definitions, requirements and test methods*
ISO 21930:2007	*Sustainability in building construction - Environmental declaration of building products*
EN 16485:2014	*Round and sawn timber. Environmental Product Declarations. Product category rules for wood and wood-based products.*
Schlanbusch, Reidun Dahl	*LCI/LCA report Knauf Ultra Board, SINTEF Building and Infrastructure, Knauf A/S, Report number 2015 F0087, 2014*
The Norwegian EPD Foundation	*PCR 010 rev1 Building Boards, December 2013*

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