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The Norwegian EPD Foundation

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

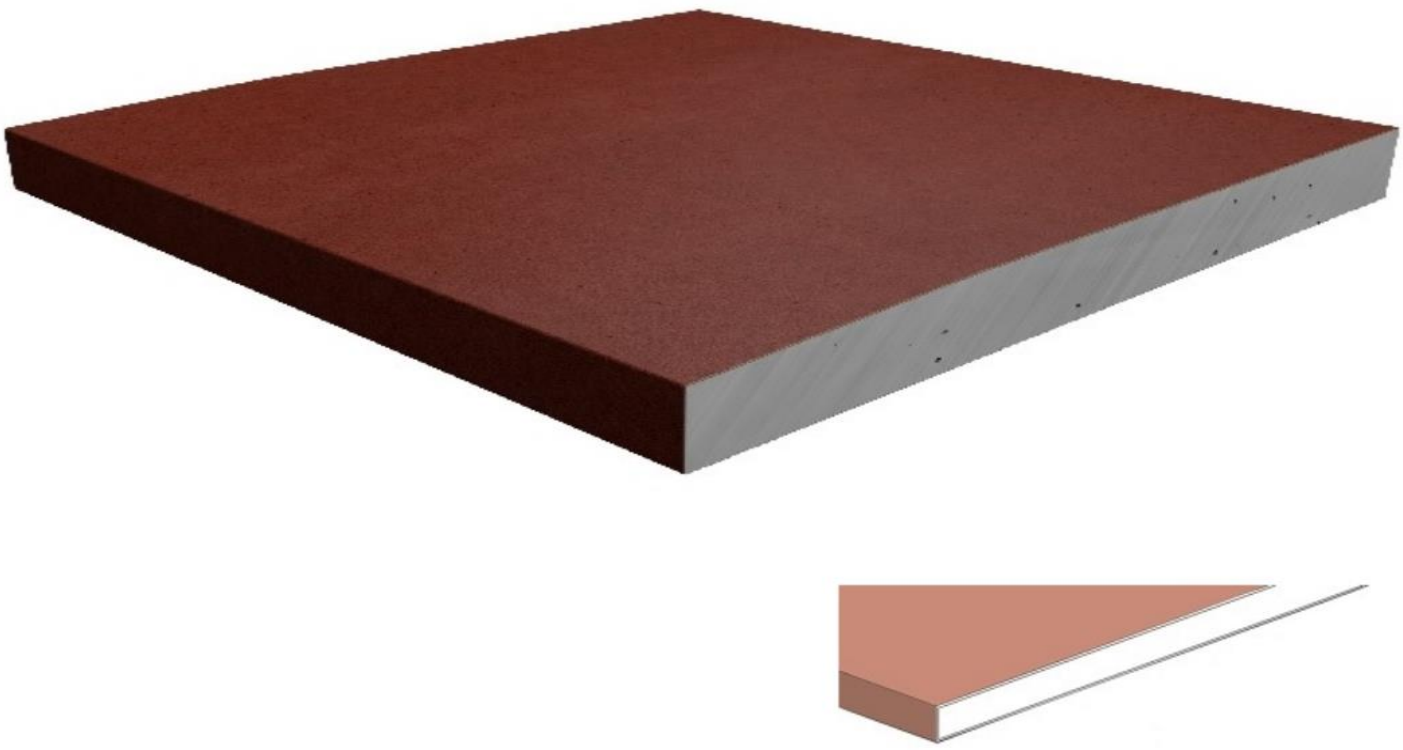
Owner of the declaration:	Norgips Norge AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-2138-966-EN
Registration number:	NEPD-2138-966-EN
ECO Platform reference number:	-
Issue date:	20.04.2020
Valid to:	20.04.2025

Norgips Windliner-X/Utvendig-X type EH2 (GU-X)

Norgips Norge AS

www.epd-norge.no

NORGIPS



General information

Product:
Norgips Windliner-X/Utvendig-X type EH2 (GU-X)

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Manufacturer:
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Postboks 655 Strømsø
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Declaration number:
NEPD-2138-966-EN

Place of production:
Svelvik, Norway

ECO Platform reference number:

Management system:
NS-EN ISO 14001:2015

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serves as core PCR
NPCR010 v3.0 Building boards (04/2019).

Organisation no:
NO 986034757 MVA

Statement of liability:
The owner of the declaration shall be liable for the underlying information and evidence. EPD Norway shall not be liable with respect to manufacturerinformation, life cycle assessment data and evidences.

Issue date:
20.04.2020

Valid to:
20.04.2025

Declared unit:

Year of study:
2019

Declared unit with option:
1 m2 of installed gypsum board, including waste treatment at end of life.

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

Functional unit:

The EPD has been worked out by:
Clara Valente & Lars G. F. Tellnes

Østfoldforskning

Verification:

The CEN Norm EN 15804 serves as the core PCR.
Independent verification of the declaration and data, according to ISO14025:2010

☐ internal ☐ external

Third party verifier:

Ole M. K. Iversen
(Independent verifier approved by EPD Norway)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
Gypsum plasterboard composed of a plaster core encased in and firmly bonded to paper liners. The front and back paper liners are overlapped and glued together on the backside of the board. The front paper, colored in red, is impregnated with a natural preservative that makes the surface water repellent. For use as wind sheathing board and wind bracing

Technical data:
The product is in compliance with EN 520

Weight: 7,2 kg/m^2 ± 2 %,
Thickness: 9,5 mm ± 0.5 mm
For more information from the product data sheet, see
www.norgips.no / www.norgips.se

Product specification:
Gypsum board is produced in various width and length, but at the same thickness and it is therefore no variations of the product per square meter.

Materials	kg	%
Gypsum	6.70	93.06 %
Cardboard	0.35	4.90 %
Glass fibre reinforcement	0.00	0.00 %
Additives	0.06	0.84 %
Water	0.09	1.21 %
Total for product	7.20	100 %
Plastic packaging	0.003	
Wood packaging	0.008	
Wooden pallet	0.046	
Total product + packaging	7.26	

Market:
Norway and Sweden

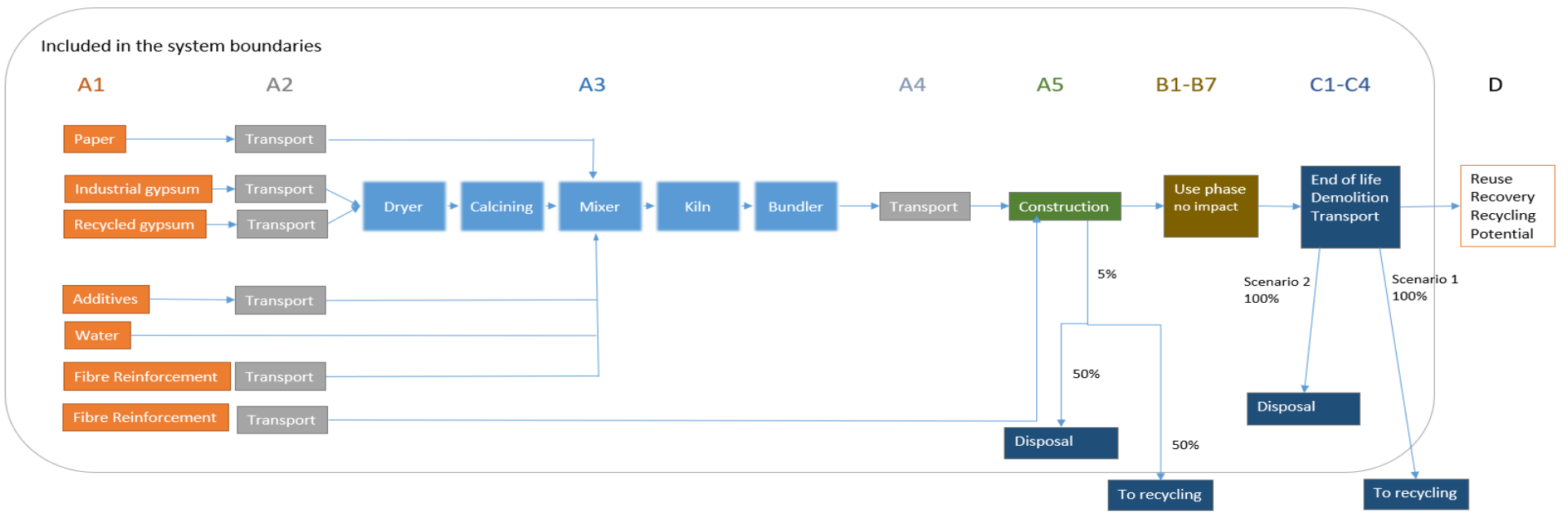
Reference service life, product:
60

Reference service life, building:
60

LCA: Calculation rules

Declared unit:
1 m2 of installed gypsum board, including waste treatment at end of life.

System boundary:
Flow chart for the complete life cycle (A1-C4) with system boundaries are shown in the figure below. Modul D is also declared outsitde the life cycle with material and energy substitution from net recovery and is further explained in the scenarios.



Industrial gypsum and recycled gypsum are mixed and dried before the mixture is calcined. The calcined gypsum is transferred to the mixer where water and additives are added. The slurry is distributed to a plasterboard liner where the edges are folded and a new layer of plasterboard liner is glued on to form a sandwich. The board line is continuous transferred along the production line, cut to suitable lengths and dried in a kiln. The dried boards are cut to the correct lengths and stacked in pallets.

Data quality:
The manufactring data for Norgips was collected in 2019 and represents an average for 2018. Other data are from ecoinvent v3.5, released in 2018, but with some changes to improve representativeness.

Cut-off criteria:
All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

Allocation:
The allocation is made in accordance with the provisions of EN 15804. Energy use is sub-divided between different process and allocated with physical relationships to the different types of boards. Packaging, water use and waste production is allocated equally among all products through mass allocation. Effects of primary production of recycled materials allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

Calculation of biogenic carbon:
Uptake and emissions of biogenic carbon are calculated according to EN 16485:2014. This is based on the modularity principle in EN 15804:2012, where the emissions shall be accounted in the module where it ocurs. Net contributrion of biogenic carbon is calculated for each module on page 8.

LCA: Scenarios and additional technical information

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

All products are either first transported to a building mechant or directly to a building site. It is included a scenario for directly to building site and with a distance of 360 km.

Transport from production place to user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Unit
Truck	55	EURO6	360	0.0227	l/tkm
Truck					

It is assumed 0.0012 MJ of electricity use in assembly and 5 % wastage of the product, in addition to waste management of the packaging. Jointing compound and tape are also added to smooth the surface between boards.

There are no LCA-related environmental impacts during use.

Assembly (A5)

	Unit	Value
Auxiliary - jointing tape	kg	0.0042
Auxiliary - jointing compound	kg	0.33
Water consumption	m^3	0
Electricity consumption	MJ	0.0012
Other energy carriers	MJ	0
Material loss	kg	0.36
Output materials from waste treatment	kg	0.057
Dust in the air	kg	0

Use (B1)

	Unit	Value
Relevant emissions during use	kg	0

It is assumed no need for maintenance nor repair under a normal scenario.

Maintenance (B2)/Repair (B3)

	Unit	Value
Maintenance cycle*		
Auxiliary	kg	0
Other resources	kg	0
Water consumption	m^3	0
Electricity consumption	kWh	0
Other energy carriers	MJ	0
Material loss	kg	0

It is assumed no need for operational energy nor water under a normal scenario.

Operational energy (B6) and water consumption (B7)

	Unit	Value
Water consumption	m^3	0
Electricity consumption	kWh	0
Other energy carriers	MJ	0
Power output of equipment	kW	0

It is assumed no need for replacement nor refurbishment under a normal scenario.

Replacement (B4)/Refurbishment (B5)

	Unit	Value
Replacement cycle*		
Electricity consumption	kWh	0
Replacement of worn parts	0	0

* Number or RSL (Reference Service Life)

The product is collected as gypsum. The most common treatment is recycling and landfilling. Both scenarios are declared as separate 100 % scenarios.

End of Life (C1, C3, C4)

	Unit	Value
Collected as gypsum waste	kg	7.2
Collected as mixed construction waste	kg	0.0
Reuse	kg	0.0
Recycling - scenario 1	kg	7.2
Energy recovery	kg	0.0
To landfill - scenario 2	kg	7.2

The transport of gypsum waste is assumed to be 50 km for landfilling scenario and 300 km for recycling.

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Unit
Scenario 1 - recycling					
Truck		Unspecified	300	0.027	l/tkm
Scenario 2 - landfill					
Truck		Unspecified	50	0.027	l/tkm

The benefits and loads beyond system boundaries are calculated from the net flows shown in the tables below. The exported energy from municipal incineration was calculated from amounts in 2015 and that substitutes Norwegian electricity mix and district heating mix. The recycling output of gypsum is assumed at 90 % of the weight of the product and the raw material substitution is modelled with mined gypsum. The net output flow of gypsym is however negative and will give a net load in module D.

Scenario 1 - Recycling - Benefits and loads beyond the system boundaries (D)

	Unit	Value
Substitution of electric energy	MJ	0.9
Substitution of thermal energy	MJ	6.4
Substitution of raw materials	kg	-0.4
Substitution of fuels	kg	0.0
Substitution of products	kg	0.0

Scenario 2 - Landfilling - Benefits and loads beyond the system boundaries (D)

	Unit	Value
Substitution of electric energy	MJ	0
Substitution of thermal energy	MJ	0
Substitution of raw materials	kg	-7.08
Substitution of fuels	kg	0
Substitution of products	kg	0

LCA: Results

The results for global warming of the different modules have a large contribution from uptake and emission of biogenic carbon. The net contribution of biogenic carbon to each module is shown on page 8.

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	X	X	X	X	X	X	X

Environmental impact

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1			
GWP	kg CO_2 -eqv	1.56E+00	2.14E-01	3.58E-01	0.00E+00	1.07E-05			
ODP	kg CFC11-eqv	1.74E-07	4.29E-08	2.47E-08	0.00E+00	9.97E-13			
POCP	kg C_2H_4 -eqv	3.26E-04	4.04E-05	3.12E-04	0.00E+00	2.21E-09			
AP	kg SO_2 -eqv	6.67E-03	7.04E-04	7.14E-03	0.00E+00	4.81E-08			
EP	kg PO_4^{3-}-eqv	1.47E-03	1.55E-04	3.51E-04	0.00E+00	1.20E-08			
ADPM	kg Sb-eqv	4.13E-06	8.87E-07	1.01E-06	0.00E+00	1.67E-10			
ADPE	MJ	3.86E+01	3.63E+00	8.82E+00	0.00E+00	1.04E-04			

Environmental impact		Scenario 1 - Recycling				Scenario 2 - Landfill			
Parameter	Unit	C2	C3	C4	D	C2	C3	C4	D
GWP	kg CO_2 -eqv	2.84E-01	9.39E-01	4.80E-03	-6.31E-02	4.73E-02	2.90E-02	1.11E+00	1.95E-02
ODP	kg CFC11-eqv	5.31E-08	8.10E-09	1.15E-09	-6.24E-09	8.85E-09	5.14E-09	2.36E-08	2.50E-09
POCP	kg C_2H_4 -eqv	4.66E-05	1.06E-05	4.34E-04	-4.93E-05	7.77E-06	5.91E-06	8.60E-03	4.92E-06
AP	kg SO_2 -eqv	9.23E-04	3.45E-04	1.09E-02	-3.24E-04	1.54E-04	2.16E-04	2.12E-01	2.67E-04
EP	kg PO_4^{3-}-eqv	1.52E-04	8.19E-05	5.29E-06	-9.22E-05	2.54E-05	4.68E-05	3.89E-04	6.01E-05
ADPM	kg Sb-eqv	7.85E-07	5.71E-08	5.66E-09	-6.20E-07	1.31E-07	2.49E-08	1.19E-07	2.96E-08
ADPE	MJ	4.36E+00	5.22E-01	1.07E-01	-6.78E-01	7.27E-01	4.15E-01	2.24E+00	2.43E-01

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

Resource use									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**			
RPEE	MJ	1.15E+01	2.32E-01	2.72E+00	0.00E+00	1.37E-03			
RPEM	MJ	6.54E+00	0.00E+00	-1.23E-01	0.00E+00	0.00E+00			
TPE	MJ	1.80E+01	2.32E-01	2.59E+00	0.00E+00	1.37E-03			
NRPE	MJ	3.62E+01	3.71E+00	4.69E+00	0.00E+00	1.82E-04			
NRPM	MJ	4.54E+00	0.00E+00	1.16E+00	0.00E+00	0.00E+00			
TRPE	MJ	4.07E+01	3.71E+00	5.85E+00	0.00E+00	1.82E-04			
SM	kg	5.69E+00	0.00E+00	5.53E-01	0.00E+00	0.00E+00			
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
W	m^3	4.27E-02	1.42E-03	6.11E-03	0.00E+00	7.51E-08			

Resource use		Recycling scenario				Landfill scenario			
Parameter	**Unit**	**C2**	**C3**	**C4**	**D**	**C2**	**C3**	**C4**	**D**
RPEE	MJ	4.74E-02	5.79E+00	3.52E-03	-6.44E+00	7.91E-03	1.11E-01	7.54E-02	9.80E-03
RPEM	MJ	0.00E+00	-5.67E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPE	MJ	4.74E-02	1.18E-01	3.52E-03	-6.44E+00	7.91E-03	1.11E-01	7.54E-02	9.80E-03
NRPE	MJ	4.44E+00	5.44E-01	1.14E-01	-9.77E-01	7.39E-01	4.25E-01	2.39E+00	2.57E-01
NRPM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRPE	MJ	4.44E+00	5.44E-01	1.14E-01	-9.77E-01	7.39E-01	4.25E-01	2.39E+00	2.57E-01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	-1.88E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	-1.93E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
W	m^3	8.46E-04	9.80E-04	1.08E-04	-4.87E-04	1.41E-04	4.36E-05	2.23E-03	4.72E-05

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-A3**	**A4**	**A5**	**B1-B7**	**C1**			
HW	kg	4.37E-05	3.25E-06	6.02E-05	0.00E+00	2.36E-10			
NHW	kg	5.83E-01	3.53E-01	3.48E-01	0.00E+00	1.23E-05			
RW	kg	6.81E-05	2.41E-05	9.65E-06	0.00E+00	1.34E-09			

End of life - Waste		Recycling scenario				Landfill scenario			
Parameter	**Unit**	**C2**	**C3**	**C4**	**D**	**C2**	**C3**	**C4**	**D**
HW	kg	2.80E-06	1.06E-06	9.29E-08	-1.28E-06	4.66E-07	2.23E-07	1.97E-06	2.78E-07
NHW	kg	3.04E-01	1.23E-02	3.77E-01	-5.36E-02	5.07E-02	3.15E-03	7.73E+00	5.21E-03
RW	kg	3.00E-05	3.32E-06	6.87E-07	-6.04E-06	4.99E-06	2.94E-06	1.42E-05	1.47E-06

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

End of life - Output flow									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**			
CR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00			
MR	kg	8.64E-03	0.00E+00	1.74E-01	0.00E+00	0.00E+00			
MER	kg	1.74E-05	0.00E+00	3.23E-03	0.00E+00	0.00E+00			
EEE	MJ	7.61E-03	0.00E+00	1.97E-02	0.00E+00	0.00E+00			
ETE	MJ	8.01E-02	0.00E+00	1.63E-01	0.00E+00	0.00E+00			

End of life - Output flow		Recycling scenario				Landfill scenario			
Parameter	**Unit**	**C2**	**C3**	**C4**	**D**	**C2**	**C3**	**C4**	**D**
CR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	0.00E+00	6.81E+00	0.00E+00	4.43E-01	0.00E+00	0.00E+00	0.00E+00	7.08E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	MJ	0.00E+00	7.57E-01	0.00E+00	-9.27E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	MJ	0.00E+00	6.22E+00	0.00E+00	-6.37E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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
National consumption mix with import on low voltage (production of transmission lines, in addition to direct emissions and losses in grid) are applied electricity for the manufacturing prosess (A3).

Data source	Amount	Unit
Ecoinvent v3.5 (2018)	31.7	CO_2-eqv/kWh

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
Emissions to indoor air are tested by RISE in 2020 and evaluated according to EN 16516. The summary of the test results are listed below for Norgips Standard 12,5 mm Type A.

TVOC	<10	µg/m²h	
Sum carcinogenic VOCs	<1	µg/m²h	
Sum VOC with LCI	<2	µg/m²h	
Sum VOC without LCI	<2	µg/m²h	
Sum VVOC	3	µg/m²h	
Formaldehyde	3	µg/m²h	
Sum SVOC	<2	µg/m²h	
R= Sum Ci/LCIi	0.07		

Carbon footprint
In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator for GWP has been sub-divided into the following:
GWP-IOBC Climate impacts calculated according to the principle of instantanious oxidation
GWP-BC Climate impacts from the net uptake and emission of biogenic carbon from each module.

Climate impacts

Parameter	Unit	A1-A3	A4	A5	B1-B7	C1			
GWP-IOBC	kg CO_2 -eqv	2.21E+00	2.14E-01	3.12E-01	0.00E+00	1.07E-05			
GWP-BC	kg CO_2 -eqv	-6.43E-01	0.00E+00	4.63E-02	0.00E+00	0.00E+00			
GWP	kg CO_2 -eqv	1.56E+00	2.14E-01	3.58E-01	0.00E+00	1.07E-05			

Climate impacts		Recycling scenario				Landfill scenario			
Parameter	Unit	C2	C3	C4	D	C2	C3	C4	D
GWP-IOBC	kg CO_2 -eqv	2.84E-01	3.73E-01	4.80E-03	-6.31E-02	4.73E-02	2.90E-02	5.42E-01	1.95E-02
GWP-BC	kg CO_2 -eqv	0.00E+00	5.66E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.66E-01	0.00E+00
GWP	kg CO_2 -eqv	2.84E-01	9.39E-01	4.80E-03	-6.31E-02	4.73E-02	2.90E-02	1.11E+00	1.95E-02

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 21930:2007	*Sustainability in building construction - Environmental declaration of building products*
EN 16485:2014	*Round and sawn timber - Environmental Product Declaration - Product category rules for wood and wood-based products for use in construction*
EN 16516	*Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air*
NPCR010 V3.0	*Product category rules for building boards. April 2019. EPD-Norge.*
Ecoinvent v3.5	*Swiss Centre of Life Cycle Inventories. www.ecoinvent.ch*
EN 520	*Gypsum plasterboards - Definitions, requirements and test methods*
Valente & Tellnes (2020)	*LCA-report for Norgips AS. Report OR.06.20 from Østfoldforskning, Kråkerøy, Norway.*

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