ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

epd-norge.no
The Norwegian EPD Foundation

Owner of the declaration	Norwegian Wood Industry Federation
Publisher	The Norwegian EPD Foundation
Declaration number	NEPD-310-180-EN
Issue date	09.03.2015
Valid to	09.03.2020

Exterior cladding with waterborne paint

Product

Norwegian Wood Industry Federation

Owner of the declaration

Treindustrien

Photo: Ivan Brody

General information

Product
Exterior cladding with waterborne paint

Owner of the declaration
Norwegian Wood Industry Federation
Contact person: Espen Tuveng
Phone: +47 97 68 07 20
e-mail: espen.tuveng@trelast.no

Program holder
The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo
Phone: +47 23 08 82 92
e-mail: post@epd-norge.no

Manufacturer
The declaration is valid for the members of Norwegian Wood Industry Federation, for updated members list: http://www.treindustrien.no/

Declaration number:
NEPD-310-180-EN

Place of production:
Norway

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serve as core PCR
NPCR015 rev.1 (2013/08)

Management system:
Most producers have chain-of-custody certification for sustainable forestry according to PEFC ST 2002:2010. Updated list available at: www.pefcregs.info

Declared unit:
Production of 1 m^2 folded cladding with primer and a dimension of 19 mm x 148 mm.

Org. No:
980 308 952

Declared unit with option:
1 m^2 painted folded cladding with a dimension of 19 mm x 148 mm and a reference service life of 60 years.

Issue date
09.03.2015

Functional unit:

Valid to
09.03.2020

The EPD has been worked out by:
Lars G. F. Tellnes
Norwegian Institute of Wood Technology

Treteknisk

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

Year of study:
2014

Verification:
Independent verification of data, other environmental information and EPD has been carried out in accordance with ISO14025, 8.1.3 and 8.1.4

externally ☑ internally ☐

Catherine Grini, M.Sc.
(Independent verifier approved by EPD Norway)

Approved

Dagfinn Malnes
Managing Director of EPD-Norway

Declared unit:
Production of 1 m2 folded cladding with primer and a dimension of 19 mm x 148 mm.

Key environmental indicators	Unit	Cradle to gate A1 - A3	Transport *****	Module A4
Global warming	kg CO_2 -eqv	-11†	0,05	0,21
Energy use	MJ	76	0,84	3,37
Dangerous substances	*	-	-	-
Share of renewable energy used	%	74	1	1
Share of renewable materials	%	99,5	-	-

† Includes sequestration of 12,21 kg carbon dioxide during wood growth.
* The product contains no substances from the REACH Candidate list or the Norwegian priority list

***** Transport from production site to central warehouse in Norway

Product

Product description:
Exterior cladding is produced by members of the Norwegian Wood Industry Federation for use as exterior claddings on buildings. The raw materials are Nordic sawn wood. The cladding is usually added primer at the factory, but can also be produced with one or two paint layers. The surface treatment added after the factory is assumed to be waterbourne acrylic paint. The environmental data for the production of paint is from the main suppliers of industrial coating to the Norwegian Wood Industry.

Product specification
The cladding dimension in the declared unit is representative for all claddings produced by the members of Norwegian Wood Industry Federation. The cladding type used in the calculations folded with an dimension of 19 x 148 mm. For 1 m^2 cladding 0,0185 m^3 planed wood is used.

Materials	kg	%
Planed wood of spruce	7,77	99,2
Primer	0,04	0,5
Plastic packaging	0,02	0,3
Total	7,83	100

Technical data:
The wood in cladding is most commonly spruce with a density of 420 kg/m^3 and has an moisture level of 17% ±2 relative to dry weight.
The cladding is produced according to SN/TS 3186:2009. Several producers are part of the cladding control scheme that aims to secure uniform quality and declaration of industrial coated cladding.

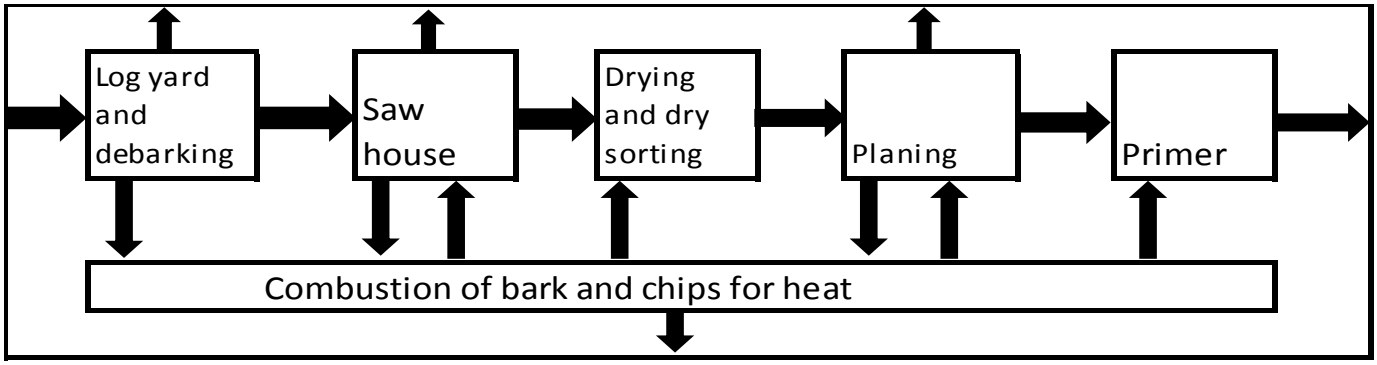
Market:
Norway

Reference service life:
Reference service life is 60 years and is based on SINTEF planning guide 700.320 and medium stress.

LCA: Calculation rules

Declared unit with option:
1 m2 painted folded cladding with a dimension of 19 mm x 148 mm and a reference service life of 60 years.

System boundary:
Flow chart for the production (A3) of cladding is shown below, while the rest of the modules are shown on page 5. Modul D is calculated with energy substitution and is further explained in the scenarios section.



Data quality:
Data for the production of planed wood is collected from an representative selection of member companies and weighted to an average. These are representative for 2013 and includes volume balances, economic allocation, transport distances, energy use and packaging. Data for production of primer and paint is collected from the two largest suppliers to the Norwegian Wood Industry. Otherwise generic data is collected from Ecoinvent v2.2 (2010) and ELCD 3.0 (2013).

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 performed according to the EN 15804:2012. In the production chain of wood this is economic allocation since the value of the by-products are relatively low. The economic values are collected from Norwegian sawmills.

Calculation of biogenic carbon content:
Sequestration and emissions of biogenic carbon is calculated according to EN16485:2014. This approach is based on the modularity principle in EN15804:2012 that states that all impacts are declared in the life cycle where they appear. The amount of carbon dioxide is calculated according to NS-EN 16449:2014 with a moisture of 17% and a density of 420 kg/m^3. This gives 660 kg CO_2 per m^3 wood and 12,21 kg CO_2 per m^2 cladding.

LCA: Scenarios and additional technical information

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

The transport of cladding to building site is mainly with lorry and is either directly from production or through a builders merchant. In some cases it is also transported by boat, but that has not been included in the normal scenario.

Transport from production place to user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Value (l/t)
Truck	62,5	Lorry, 16-32t	100	l/tkm	
Truck	75	Lorry, >32t	100	0,026 l/tkm	

It is assumed 5% wastage during installation and application of two layers of paint. Nails are not included.

Installation in the building (A5)

	Unit	Value
Auxiliary paint for top layers	kg	0,3
Water consumption	m^3	
Electricity consumption	MJ	0,0185
Other energy carriers	MJ	
Material loss	kg	0,391
Output materials from waste treatment	kg	
Dust in the air	kg	

The product does not require any operationl energy or water consumption.

Operational energy (B6) and water consumption (B7)

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

It is assumed that the cladding is maintained by adding two layers of paint every 10th year and that the paint consumption is 0,15 kg per m^2 per layer. Cleaning before painting is also included. It is assumed that the cladding need some repair during normal stress and which makes that 10% is replaced. With low stress it can be assumed that no repair is needed and the values in B3 are zero.

Maintenance (B2)/Repair (B3)

	Unit	Value
Maintenance cycle* painting & cleaning	Yr	10
Auxiliary paint per cycle	kg	0,3
Other resources	kg	
Water consumption	m^3	
Electricity consumption	kWh	
Other energy carriers	MJ	
Material loss 10% during repair	kg	8,35

With normal stress it is assumed that there is no need for complete replacement of the cladding during 60 years. With large stress this could be neccessary and can be calculaed by dividing the parameter in B3 with 0,1. With low stress the expected service life can be much longer than 60 years.

Replacement (B4)/Refurbishment (B5)

	Unit	Value
Replacement cycle*	Yr	60
Electricity consumption	kWh	
Replacement of worn parts		

* Number or RSL (Reference Service Life)

The transport of wood waste is based on average distance in 2007 in Norway and is at 85 km. It is estimated that 46% are further transported to Sweden for treatment. It is estimated that 67% of this is on truck, 9% by rail and 24% is by boat, the transport distances to Sweden were assumed.

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Value (l/t)
Truck	50	Lorry, 20-28t	85	0,05 l/tkm	
Truck	75	Lorry, >32t	200	0,026 l/tkm	
Railway		Freight train	400	0,239 MJ/tkm	
Boat	71	Barge	800	0,011 l/tkm	

Benefits beyond the life cycle is calculated on the exported energy and the substitution of conventional energy production and fuels. For the share recovered in Norway, this is substitution of Norwegian el-mix, district heating mix and different types of industrial fuels. For the share exported to Sweden generic data from ELCD 3.0 is used.

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Substitution of biofuel	kg	2,4
Substitution of electric energy	MJ	11,5
Substitution of thermal energy	MJ	40,6

Painted cladding is sorted as mixed wood waste at building site. The scenario for further treatment is based on the Norwegian waste accounts in 2011. It is assumed that energy recovery, incineration and landfill are relevant for painted cladding.

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	9,6
Reuse	kg	
Recycling	kg	
Energy recovery	kg	8,7
Incineration without energy recovery	kg	0,7
To landfill	kg	0,2

LCA: Results

The results for global warming in A1-A3 gives large contribution of the sequestration of 12,21 kg carbon dioxide during wood growth, while the same amount gives an large contribution when emitted during waste treatment in C3 and C4.

The uncertainty of the results are estimated to be approx. 10-20 % in relative standard deviation of GWP, POCP, AP, EP and ADPE, while ODP have approx. 25 % and ADPM approx. 40 %. The high uncertainties of the ODP and ADPM are caused by high uncertainties of database data. The difference between production sites are not found to have a large influence on the uncertainty of the results.

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

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	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	MND	X	X	X	X	X	X	X	X	X	X	X

Environmental impact

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5
GWP	kg CO_2-eqv	-1,10E+01	2,12E-01	8,21E-01	MNA	2,92E+00	5,23E-01	0,00E+00	0,00E+00
ODP	kg CFC11-eqv	1,55E-07	3,41E-08	1,18E-07	MNA	3,34E-07	3,59E-08	0,00E+00	0,00E+00
POCP	kg C_2H_4-eqv	5,60E-04	2,67E-05	2,31E-04	MNA	9,65E-04	9,42E-05	0,00E+00	0,00E+00
AP	kg SO_2-eqv	8,77E-03	8,23E-04	4,25E-03	MNA	1,77E-02	1,72E-03	0,00E+00	0,00E+00
EP	kg PO_4^{3-}-eqv	1,84E-03	1,68E-04	5,85E-04	MNA	1,45E-03	3,38E-04	0,00E+00	0,00E+00
ADPM	kg Sb-eqv	3,80E-06	6,06E-07	5,01E-06	MNA	6,67E-06	1,01E-06	0,00E+00	0,00E+00
ADPE	MJ	1,79E+01	3,16E+00	1,19E+01	MNA	4,75E+01	3,83E+00	0,00E+00	0,00E+00

Environmental impact

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
GWP	kg CO_2-ekv	0,00E+00	0,00E+00	2,16E-04	2,46E-01	1,36E+01	1,35E+00		-4,10E+00
ODP	kg CFC11-ekv	0,00E+00	0,00E+00	1,93E-11	3,75E-08	1,27E-08	1,15E-09		-3,51E-07
POCP	kg C_2H_4-ekv	0,00E+00	0,00E+00	2,57E-08	4,22E-05	7,43E-05	6,91E-06		-1,17E-03
AP	kg SO_2-ekv	0,00E+00	0,00E+00	5,03E-07	1,33E-03	1,84E-03	1,72E-04		-2,35E-02
EP	kg PO_4^{3-}-ekv	0,00E+00	0,00E+00	1,05E-07	2,86E-04	4,59E-04	4,41E-05		-1,28E-03
ADPM	kg Sb-ekv	0,00E+00	0,00E+00	6,56E-10	5,34E-07	1,22E-07	1,13E-08		-6,93E-07
ADPE	MJ	0,00E+00	0,00E+00	2,89E-03	3,60E+00	1,64E+00	1,28E-01		-9,23E+00

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	B2	B3	B4	B5
RPEE	MJ	5,59E+01	4,49E-02	9,70E+00	MNA	2,71E+00	1,82E+01	0,00E+00	0,00E+00
RPEM	MJ	1,27E+02	INA	1,33E-01	MNA	INA	2,66E-01	0,00E+00	0,00E+00
TPE	MJ	1,82E+02	4,49E-02	9,83E+00	MNA	2,71E+00	1,85E+01	0,00E+00	0,00E+00
NRPE	MJ	1,99E+01	3,33E+00	1,16E+01	MNA	4,27E+01	5,36E+00	0,00E+00	0,00E+00
NRPM	MJ	4,56E-01	INA	1,27E+00	MNA	9,00E+00	-1,28E+00	0,00E+00	0,00E+00
TRPE	MJ	2,04E+01	3,33E+00	1,29E+01	MNA	5,17E+01	4,08E+00	0,00E+00	0,00E+00
SM	kg	INA	INA	INA	MNA	INA	INA	INA	INA
RSF	MJ	INA	INA	INA	MNA	INA	INA	INA	INA
NRSF	MJ	INA	INA	INA	MNA	INA	INA	INA	INA
W	m^3	6,51E+00	2,62E-01	1,69E+00	MNA	6,05E+00	9,13E-01	0,00E+00	0,00E+00

Resource use

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
RPEE	MJ	0,00E+00	0,00E+00	1,92E-02	5,24E-02	1,08E+02	8,34E+00		-6,61E+01
RPEM	MJ	0,00E+00	0,00E+00	INA	INA	-1,15E+02	-8,86E+00		INA
TPE	MJ	0,00E+00	0,00E+00	1,92E-02	5,24E-02	-6,74E+00	-5,20E-01		-6,61E+01
NRPE	MJ	0,00E+00	0,00E+00	3,78E-03	3,80E+00	1,39E+01	1,06E+00		-5,48E+01
NRPM	MJ	0,00E+00	0,00E+00	INA	INA	-1,35E+01	-1,04E+00		INA
TRPE	MJ	0,00E+00	0,00E+00	3,78E-03	3,80E+00	4,04E-01	2,57E-02		-5,48E+01
SM	kg	0,00E+00	0,00E+00	INA	INA	INA	INA		INA
RSF	MJ	0,00E+00	0,00E+00	INA	INA	INA	INA		INA
NRSF	MJ	0,00E+00	0,00E+00	INA	INA	INA	INA		INA
W	m^3	0,00E+00	0,00E+00	6,84E-03	3,05E-01	3,39E-01	1,72E-02		-5,90E+00

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	B2	B3	B4	B5
HW	kg	1,14E-03	8,42E-05	2,92E-03	MNA	4,12E-03	4,52E-03	0,00E+00	0,00E+00
NHW	kg	2,53E-01	2,38E-02	1,13E-01	MNA	4,82E-01	5,45E-02	0,00E+00	0,00E+00
RW	kg	3,98E-05	2,74E-06	1,85E-05	MNA	7,53E-05	6,87E-06	0,00E+00	0,00E+00

End of life - Waste

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
HW	kg	0,00E+00	0,00E+00	1,11E-07	7,64E-05	3,73E-02	3,69E-03		-8,68E-04
NHW	kg	0,00E+00	0,00E+00	1,82E-04	2,53E-02	1,19E-01	1,15E-02		-1,63E-01
RW	kg	0,00E+00	0,00E+00	1,74E-08	3,39E-06	4,16E-06	1,57E-07		-2,05E-05

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	B2	B3	B4	B5
CR	kg	INA	INA	INA	MNA	INA	INA	INA	INA
MR	kg	INA	INA	2,00E-02	MNA	INA	2,00E-03	INA	INA
MER	kg	INA	INA	1,12E-01	MNA	INA	2,21E-01	INA	INA
EEE	MJ	INA	INA	5,49E-01	MNA	INA	1,06E+00	INA	INA
ETE	MJ	INA	INA	1,87E+00	MNA	INA	3,72E+00	INA	INA

End of life - Output flow

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
CR	kg	INA	INA	INA	INA	INA	INA		INA
MR	kg	INA	INA	INA	INA	INA	INA		INA
MER	kg	INA	INA	INA	INA	2,10E+00	INA		-2,42E+00
EEE	MJ	INA	INA	INA	INA	1,00E+01	INA		-1,15E+01
ETE	MJ	INA	INA	INA	INA	3,53E+01	INA		-4,06E+01

INA = Indicator not assessed

MNA = Module not assessed

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

Electricity
Norwegian consumption mix at medium voltage is used at the production site and is calculated based on the average for 2008-2010, but also adjusted to be the same as emission factors published by EPD-Norge.

Greenhouse gas emissions: 0,012 kg CO_2 - eqv/MJ

Dangerous substances
None of the following substances have been added to the product: Substances on the REACH Candidate list of substances of very high concern (of 16.10.2014) or substances on the Norwegian Priority list (of 11.11.2013) or substances that lead to the product being classified as hazardous waste. The chemical content of the product complies with regulatory levels as given in the Norwegian Product Regulations.

Transport
Transport from production site to central warehouse in Norway is: 50 km

The scenario of transport from production site is not realistic, but is calculated as a requirement from EPD-Norge.

Indoor environment
Not relevant, the product is for outdoor use only.

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

Bibliography

ISO 14025:2006	*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	*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*
Tellnes, L.G.F.	*LCA-report for Norwegian Wood Industries Association. Report nr. 380034-1 from Norwegian Institute of Wood technology, Oslo, Norway.*
NPCR015 rev1 08/2013	*Product category rules for wood and wood-based materials for use in construction*
Ecoinvent v2.2	*Swiss Centre of Life Cycle Inventories. www.ecoinvent.ch*
ELCD 3.0	*European reference Life-Cycle Database. Http://eplca.jrc.ec.europa.eu/*
NS-EN 16449:2014	*Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide*
NS-EN 16485:2014	*Round and sawn timber - Environmental Product Declarations - Product category rules for wood and wood-based products for use in construction*
SN/TS 3186:2008	*Solid softwood cladding for exterior use*

epd-norge.no
The Norwegian EPD Foundation

Program holder and publisher
The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo
Norway
Phone: +47 23 08 82 92
e-mail: post@epd-norge.no
web www.epd-norge.no

Treindustrien

Owner of the declaration
Norwegian Wood Industry Federation
P.O. Box 5487 Majorstuen, N-0305 Oslo
Norway
Phone: +47 976 02 543
Fax -
e-mail: trelast@trelast.no
web www.treindustrien.no

Treteknisk

Author of the Life Cycle Assessment
Lars G. F. Tellnes
P.O. Box 113 Blindern, N-0314 Oslo
Norway
Phone: +47 98 85 33 33
Fax -
e-mail: firmapost@treteknisk.no
web www.treteknisk.no