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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	Forestia AS
Program operator	The Norwegian EPD Foundation
Publisher	The Norwegian EPD Foundation
Declaration number	NEPD00274E
ECO EPD Ref. No.	00000145
Issue date	14.10.2014
Valid to	14.10.2019

Forestia particleboard

Forestia AS

www.epd-norge.no

FORESTIA

General information

Product
Forestia particleboard

Program holder
The Norwegian EPD Foundation
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Declaration number:
NEPD00274E

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serve as core PCR
NPCR010 rev1 Building boards (12/2013)

Declared unit:
Production of 1 m^3 particleboard (standard/ekstra)

Declared unit with option:
1 m^3 particleboard (standard/ekstra) produced, installed and waste managed with an lifetime of 60 yrs.

Functional unit:

Owner of the declaration
Forestia AS
Contact person: Hans Kristian Eig
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Manufacturer
Forestia AS
Damsvegen 31, NO-2435 Braskereidfoss
Norway

Place of production:
Braskereidfoss, Norway

Management system:
NS-EN ISO 9001:2008, NS-EN ISO 14001:2004, PEFC ST 2002:2013

Org. No:
NO 981 393 961 MVA

Issue date
14.10.2014

Valid to
14.10.2019

The EPD has been worked out by:
Lars G. F. Tellnes
Norsk Treteknisk Institutt

Treteknisk

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 ☐

Christofer Skaar, PhD
(Independent verifier approved by EPD Norway)

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:
2013-2014

Approved

Dagfinn Malnes
Managing Director of EPD-Norway

Declared unit:
Production of 1 m3 particleboard (standard/ekstra)

Key environmental indicators	Unit	Cradle to gate A1 - A3	Transport *****	Module A4
Global warming	kg CO_2 -eqv	-861/-711†	3,5/3,7	33/35
Energy use	MJ	4861/6322	61/64	571/601
Dangerous substances	*	-	-	-
Share of renewables in energy use	%	64/50	1	2
Indoor air classification (Rakennustieto)	M1/M2/M3	M1	-	-

† Includes sequestration of 1057 kg carbon dioxide during wood growth.

* The product contains no substances from the REACH Candidate list or the Norwegian priority list

***** Transport from production place to central storage in Norway. See additional Norwegian requirements p. 7.

Product

Product description:
Particleboard for load-bearing and non load-bearing application in buildings and furnitures according to classification requirements in NS-EN 312:2010: P1 - General purpose boards for use in dry conditions, P2 - Boards for interior fitments (including furniture) for use in dry conditions, P3 - Non load-bearing boards for use in humid conditions, P4 - Load-bearing boards for use dry conditions, P5 - Load-bearing boards for use in humid conditions, P6 - Heavy duty load-bearing boords for use dry conditions.

Technical data:
Density of 630-700 kg/m^3, thickness 6-40 mm.
Classification requirements in NS-EN 312:2010.

Product specification
Standard particleboard with sanded surface are used for flooring, walls, ceilings and furniture. Ekstra particleboards can be used in humid contidions for flooring, walls, ceilings, roofs and furniture.

Market:
Norway / Nordic / Europe. The scenarios beyond gate are based on the situation in the Norwegian market.

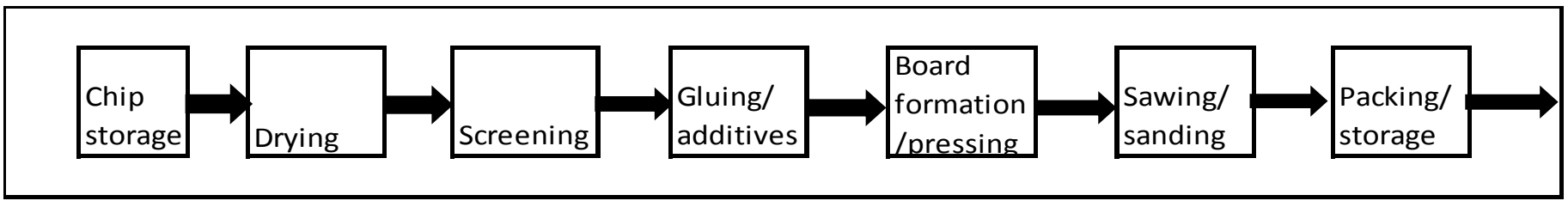
	Standard	Ekstra	
Materials	kg	kg	%
Wood	575,56	575,56	82-86
Glue	80,45	108,47	12-15
Wax	5,46	11,51	1,6
Ammonia solution	0,23	0,37	<1
Ammonium nitrate	3,44	4,43	<1
Urea	2,18	1,99	<1
Total	667	702	

Reference service life:
The reference service life is the same as the building and is usually set to 60 years.

LCA: Calculation rules

Declared unit with option:
1 m3 particleboard (standard/ekstra) produced, installed and waste managed with an lifetime of 60 yrs.

System boundary:
Flow chart of the particleboard production is shown bellow. Modul D is calculated by energy substitution and is explained in the scenarios.



Data quality:
Data from production of particleboard is from the average in 2013. LCI- data from the production of glue is from the specific supplier and is based on the average in 2011. Upstream data and transport is from Ecoinvent v2.2 released in 2010, while waste treatment of particleboards are from data in ELCD 3.0, released in 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:
Allocation is done in accordance to NS-EN 15804:2012. In the production chain of wood, this is economic allocation and the values used are the default in Ecoinvent v2.2.

Beregning av biokarbon:
Sequestration and emissions of biogenic carbon is calculated in accordance to NS-EN 16449:2014. With an dry wood content of 576,4 kg per m^3 particleboard, this gives 1057 kg CO_2 per m^3 particleboard.

LCA: Scenarios and additional technical information

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

Al production are first transported to a building merchant or directly to larger projects. It is accounted in the scenario a distance of 250 km on large lorry and 50 km on a smaller lorry to the building site.

Transport from production place to user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption		Value (l/t)
Truck	75	Lorry, >32t, EURO4	250	0,026	l/tkm	
Truck	39	Lorry, 3.5-7.5t, EURO4	50	0,11	l/tkm	

It is assumed 1 MJ of electricity use on building site and that 10% of the particleboard is wasted.

Installation in the building (A5)

	Unit	Value
Auxiliary	kg	
Water consumption	m^3	
Electricity consumption	MJ	1
Other energy carriers	MJ	
Material loss	kg	66,7/70,2
Output materials from waste treatment	kg	
Dust in the air	kg	

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 for Norway in 2007 and was 85 km. In addition, the share that is exported to Sweden is estimated to 67% by truck, 9% by rail and 24% by boat. The transport distances to Sweden are assumed to be 200 km by truck, 400 km by rail and 800 km by boat.

Transport to waste processing (C2)

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

The benefits beyond the life cycle is calculated by the sum of exported energy of the life cycle. For the share that is recovered in Norway, this is substitution of Norwegian electricity and district heating mixes and different types of industrial fuels. For the share that is exported to Sweden, generic data from ELCD 3.0 is used.

The particleboards are to be sorted as mixed wood waste at buildings site. The scenarioet for treatment of wood waste is based on the Norwegian waste accounts in 2011. Among the waste treatments used that year, it is assumed that only energy recovery, combustion without energy recovery and landfilling are practiced for post construction wood.

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Standard particleboard		
Substitution of electric energy	MJ	919
Substitution of thermal energy	MJ	2780
Extra particleboard		
Substitution of electric energy	MJ	967,404
Substitution of thermal energy	MJ	2926

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	667/702
Reuse	kg	
Recycling	kg	
Energy recovery	kg	607/639
Combustion without energy recovery	kg	47/49
To landfill	kg	13/14

Additional technical information

Recalculations of the results from 1 m^3 to per m^2 can be done by multiplying with actuall thickness of the board in meters.

LCA: Results

The results for global warming potential in A1-A3 have large contribution from the sequestration of 1057 kg carbon dioxide during wood growth, the same amount are counted as emitted during waste treatment in C3 and C4.

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	MND	MND	MND	MND	MNR	MNR	X	X	X	X	X

Environmental impact Standard boards P1, P2, P4 and P6

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2 -eqv	-8,61E+02	3,32E+01	2,69E+01	1,17E-02	1,85E+01	9,82E+02	9,70E+01	-2,71E+02
ODP	kg CFC11-eqv	7,46E-06	5,27E-06	1,71E-06	1,04E-09	2,82E-06	1,42E-06	1,39E-07	-2,40E-05
POCP	kg C_2H_4 -eqv	4,58E-02	4,30E-03	7,20E-03	1,39E-06	3,17E-03	1,70E-02	1,73E-03	-7,70E-02
AP	kg SO_2 -eqv	9,72E-01	1,26E-01	1,52E-01	2,72E-05	9,97E-02	2,89E-01	2,92E-02	-1,54E+00
EP	kg PO_4^{3-}-eqv	1,79E-01	3,48E-02	3,24E-02	1,43E-05	2,68E-02	7,62E-02	7,36E-03	-2,46E-02
ADPM	kg Sb-eqv	2,47E-04	1,19E-04	3,75E-05	3,55E-08	4,01E-05	-2,77E-05	-2,93E-06	-5,40E-05
ADPE	MJ	3,01E+03	4,95E+02	4,08E+02	1,56E-01	2,71E+02	2,75E+02	2,59E+01	-3,04E+03

Environmental impact Ekstra boards P3 and P5

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2 -ekv	-7,11E+02	3,50E+01	4,23E+01	1,17E-02	1,95E+01	9,83E+02	9,71E+01	-2,85E+02
ODP	kg CFC11-ekv	8,35E-06	5,55E-06	1,85E-06	1,04E-09	2,96E-06	1,49E-06	1,46E-07	-2,53E-05
POCP	kg C_2H_4 -ekv	7,02E-02	4,53E-03	9,77E-03	1,39E-06	3,33E-03	1,79E-02	1,83E-03	-8,10E-02
AP	kg SO_2 -ekv	1,51E+00	1,33E-01	2,09E-01	2,72E-05	1,05E-01	3,04E-01	3,08E-02	-1,63E+00
EP	kg PO_4^{3-}-ekv	2,48E-01	3,67E-02	4,01E-02	1,43E-05	2,82E-02	8,02E-02	7,75E-03	-2,59E-02
ADPM	kg Sb-ekv	3,36E-04	1,25E-04	4,71E-05	3,55E-08	4,22E-05	-2,91E-05	-3,09E-06	-5,68E-05
ADPE	MJ	5,01E+03	5,21E+02	6,14E+02	1,56E-01	2,85E+02	2,90E+02	2,73E+01	-3,20E+03

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 Standard boards P1, P2, P4 and P6

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	2,08E+03	8,94E+00	1,03E+03	1,04E+00	3,97E+00	7,38E+03	7,67E+02	-4,97E+03
RPEM	MJ	1,10E+04		2,19E+01			-9,97E+03	-7,67E+02	0,00E+00
TPE	MJ	1,30E+04	8,94E+00	1,05E+03	1,04E+00	3,97E+00	-2,58E+03	7,87E-01	-4,97E+03
NRPE	MJ	1,74E+03	5,62E+02	4,03E+02	2,16E-01	3,03E+02	1,29E+03	1,30E+02	-3,86E+03
NRPM	MJ	1,42E+03		2,85E+00			-1,30E+03	-9,97E+01	
TRPE	MJ	3,16E+03	5,62E+02	4,06E+02	2,16E-01	3,03E+02	-6,00E+00	3,08E+01	-3,86E+03
SM	kg								
RSF	MJ	1,04E+03		1,04E+02					
NRSF	MJ								
W	m^3	2,95E+02	5,15E+01	3,90E+01	3,70E-01	2,29E+01	1,57E+01	3,45E-01	-4,43E+02

Resource use Ekstra boards P3 and P5

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	2,15E+03	9,41E+00	1,03E+03	1,04E+00	4,18E+00	7,39E+03	7,67E+02	-5,23E+03
RPEM	MJ	1,10E+04		2,19E+01			-9,97E+03	-7,67E+02	
TPE	MJ	1,31E+04	9,41E+00	1,05E+03	1,04E+00	4,18E+00	-2,58E+03	8,28E-01	-5,23E+03
NRPE	MJ	3,13E+03	5,92E+02	5,85E+02	2,16E-01	3,19E+02	1,64E+03	1,67E+02	-4,06E+03
NRPM	MJ	2,08E+03		6,41E+01			-1,30E+03	-1,34E+02	
TRPE	MJ	5,21E+03	5,92E+02	6,49E+02	2,16E-01	3,19E+02	3,36E+02	3,24E+01	-4,06E+03
SM	kg								
RSF	MJ	1,04E+03		1,04E+02					
NRSF	MJ								
W	m^3	3,09E+02	5,42E+01	4,08E+01	3,70E-01	2,41E+01	1,65E+01	3,63E-01	-4,66E+02

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 Standard boards P1, P2, P4 and P6

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HW	kg	1,20E+00	1,48E-02	1,64E-01	6,00E-06	5,73E-03	3,75E-01	3,89E-02	-2,70E-02
NHW	kg	4,71E+01	3,71E+00	5,38E+00	9,81E-03	1,90E+00	9,84E-01	8,60E-02	-1,25E+01
RW	kg	1,41E-03	5,47E-04	6,29E-03	9,40E-07	2,55E-04	5,50E-02	5,70E-03	-3,27E-02

End of life - Waste Ekstra boards P3 and P5

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HW	kg	1,79E+00	1,56E-02	2,25E-01	6,00E-06	6,03E-03	3,94E-01	4,10E-02	-2,85E-02
NHW	kg	7,79E+01	3,90E+00	8,50E+00	9,81E-03	2,00E+00	1,04E+00	9,05E-02	-1,31E+01
RW	kg	1,53E-03	5,76E-04	6,63E-03	9,40E-07	2,68E-04	5,79E-02	6,00E-03	-3,44E-02

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

End of life - Output flow Standard boards P1, P2, P4 and P6

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CR	kg								
MR	kg			5,06E-01					
MER	kg			1,58E+01			1,58E+02		-1,74E+02
EEE	MJ			8,51E+01			8,51E+02		-9,19E+02
ETE	MJ			2,94E+02			2,94E+03		-2,78E+03

End of life - Output flow Ekstra boards P3 and P5

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CR	kg								
MR	kg			5,06E-01					
MER	kg			1,66E+01			1,66E+02		-1,83E+02
EEE	MJ			8,15E+01			8,15E+02		-9,67E+02
ETE	MJ			2,81E+02			2,81E+03		-2,93E+03

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, with some adjustment to be equal to emission factors published by EPD-Norway.

Greenhouse gas emissions: 0,0117 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 16.06.2014) 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
This transport scenario is not realistic, but is calculated based on requirements from EPD-Norway.

Indoor environment
The product meets the requirements for low emissions (M1) according to EN15251: 2007 Appendix E.

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 Forestia AS. LCA-report nr. 321133-1 from Norwegian Institute of Wood Technology, Oslo, Norway.*
NPCR010 rev.1	*Product category rules for building boards, rev1, December 2013*
NS-EN 16485:2014	*Round and sawn timber - Environmental Product Declaration - Product category rules for wood and wood-based products for use in construction*
NS-EN 16449:2014	*Wood and wood-based products - Calculation of the biogenic carbon content of wood and conversion to carbon dioxide*
Rakennustieto	*Emission Classification of Building Materials. Forestia AS classification document valid until 19.6.2016. The Building Information Foundation RTS (Rakennustieto). Helsinki, Finland.*

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