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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:	Masonite Beams AB (Byggma ASA)
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
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Valid to:	10.03.2020 (validity extended to 10.03.2021)

Masonite I-beam

Masonite Beams AB (Byggma ASA)

www.epd-norge.no

General information

Product
Masonite I-beam

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Declaration number:
NEPD-311-186-EN

Place of production:
Rundvik, Sweden

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serve as core PCR
NPCR015 Wood and wood-based products for use in construction (08/2013)

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

Declared unit:
Production of 1 running meter I-beam H300.

Org. No:
556282-8060

Declared unit with option:
1 running meter I-beam H300 with a reference service life of 60 years.

Issue date
10.03.2015

Functional unit:

Valid to
10.03.2020 (validity extended to 10.03.2021)

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:
2013-2014

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 ☐

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

Approved

Dagfinn Malnes
Managing Director of EPD-Norway

Declared unit:
Production of 1 running meter I-beam H300.

Key environmental indicators	Unit	Cradle to gate A1 - A3	Transport *****	Module A4
Global warming	kg CO_2 -eqv	-3,4†	0,53	0,59
Energy use	MJ	87	9,1	9,5
Dangerous substances	*	-	-	-
Share of renewable energy use	%	49	1	1
Indoor air classification(Rakennustieto)	M1/M2/M3	M2	-	-

† Includes uptake of 5,23 kg CO_2 through photosynthesis during wood growth.

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

***** Transport from production site to central storage in Norway. See explenation on page 7.

Product

Product description:
I-beams are light wood-based beams and columns for structural purposes. The beams have an I-shaped cross section and are made of flanges of structural timber and a web of oriented strand board (OSB). I-beams are used for structural purposes and is a strong structural material compared to the weight.

Technical data:
The I-beam is produced and approved in accordance with European Technical Approval (ETA-12/0018).

Product specification
Covers the H-type of I-beam, which has a flange dimension of 47x47 mm and C24 strength with an height of 300 mm.

Market:
Main markets are Sweden and Norway, plus North-Europe. The scenarios beyond cradle-to-gate are based on application in Norway.

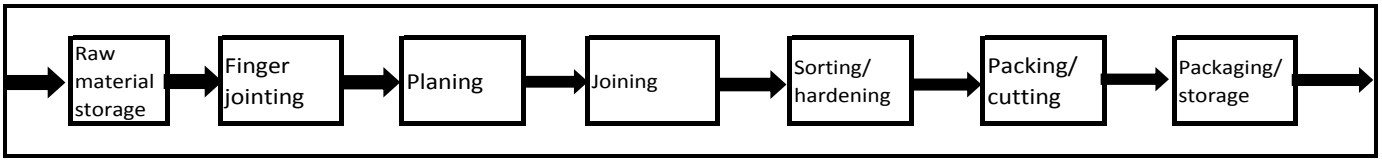
Reference service life:
Reference service life is the same as the building, which is typically set to 60 years.

Materials	kg	%
Timber	1,72	51,8
OSB	1,55	46,7
Resin	0,05	1,5
Total without packaging	3,32	100,0
Wood packaging	0,02	
Steel packaging	<0,01	
Plastic packaging	0,01	
Total with packaging	3,35	

LCA: Calculation rules

Declared unit with option:
1 running meter I-beam H300 with a reference service life of 60 years.

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



Data quality:
Production data for Masonite is based on the average in 2013. Data for the production of glue is also collected specific from the manufacturer. Data for production of timber, OSB, transport and other inputs are from Ecoinvent v2.2, released in 2010, while some of waste data are from 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 performed in accordance to NS-EN 15804:2012. In the production chain of wood, economic allocation has been used because of the low value of by-products. The allocation values are from Ecoinvent v2.2.

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 environmental 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 basic density of 375 kg/m3, this is calculated to be 687,5 kg CO2 per m3 and 2,82 kg CO2 per declared unit. For OSB it is estimated to 1012 kg CO_2 per m^3 and this gives 2,41 kg CO_2 per DE. In total this is 5,23 kg CO_2 per DE.

Estimates and assumptions:
All key assumptions and estimates are either presented in the EPD or can be found in NPCR015 (08/2013).

LCA: Scenarios and additional technical information

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

Transport to building site is based on a scenario with transport from the production site to a storage in Vennesla and then additional transport to a building site 300 km away,

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	1200	0,026 l/tkm	31,2
Truck	62,5	Lorry, 16-32t, EURO4	300	0,04 l/tkm	12

It is assumed 1 MJ of electricity use per m^3 at building site and that 5 % of the I-beams are wasted.

Installation in the building (A5)

	Unit	Value
Auxiliary	kg	
Water consumption	m^3	
Electricity consumption	MJ	0,01
Other energy carriers	MJ	
Material loss	kg	0,168
Output materials from waste treatment	kg	
Dust in the air	kg	

Replacement (B4)/Refurbishment (B5)

	Unit	Value
Replacement cycle*	RSL	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 further 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, 20-32t	85	0,05 l/tkm	4,25
Truck	75	Lorry, >32t	200	0,026 l/tkm	5,2
Railway		Freight train	400	0,239 MJ/tkm	-
Boat	71	Barge	800	0,011 l/tkm	8,8

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.

I-beams can be 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 the wood.

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Substitution of biofuel	kg	1
Substitution of electric energy	MJ	4
Substitution of thermal energy	MJ	14

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	3,35
Reuse	kg	
Recycling	kg	
Energy recovery	kg	3,05
Incineration without energy recovery	kg	0,23
To landfill	kg	0,07

LCA: Results

The results for global warming in A1-A3 gives large contribution of the sequestration of 5,23 kg carbon dioxide during wood growth, while the same amount gives an large contribution when 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

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2 -eqv	-3,42E+00	5,90E-01	1,54E-01	1,17E-04	9,20E-02	5,52E+00	5,05E-01	-3,09E-01
ODP	kg CFC11-eqv	1,78E-07	9,61E-08	1,67E-08	1,04E-11	1,40E-08	3,35E-09	5,10E-10	-2,44E-08
POCP	kg C_2H_4 -eqv	1,00E-03	7,62E-05	7,85E-05	1,39E-08	1,58E-05	2,08E-05	3,09E-06	-6,51E-05
AP	kg SO_2 -eqv	8,14E-03	2,31E-03	8,14E-04	2,72E-07	4,96E-04	5,19E-04	5,45E-05	-1,34E-03
EP	kg PO_4^{3-}-eqv	1,67E-03	4,73E-04	1,61E-04	5,66E-08	1,07E-04	1,29E-04	1,48E-05	-1,80E-04
ADPM	kg Sb-eqv	4,11E-06	1,74E-06	4,17E-07	3,55E-10	2,00E-07	3,06E-08	3,92E-09	-3,28E-07
ADPE	MJ	3,61E+01	8,92E+00	3,32E+00	1,56E-03	1,35E+00	4,75E-01	5,44E-02	-4,31E+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	C1	C2	C3	C4	D
RPEE	MJ	4,28E+01	1,25E-01	5,65E+00	1,04E-02	1,96E-02	5,09E+01	3,92E+00	-2,64E+01
RPEM	MJ	5,70E+01	0,00E+00	7,10E-01	0,00E+00	0,00E+00	-5,16E+01	-3,97E+00	0,00E+00
TPE	MJ	9,98E+01	1,25E-01	6,36E+00	1,04E-02	1,96E-02	-6,68E-01	-5,17E-02	-2,64E+01
NRPE	MJ	4,38E+01	9,37E+00	3,85E+00	2,04E-03	1,42E+00	1,24E+00	1,12E-01	-4,46E+00
NRPM	MJ	8,85E-01	0,00E+00	8,85E-04	0,00E+00	0,00E+00	-8,05E-01	-6,20E-02	0,00E+00
TRPE	MJ	4,47E+01	9,37E+00	3,85E+00	2,04E-03	1,42E+00	4,32E-01	4,99E-02	-4,46E+00
SM	kg	INA	INA	INA	INA	INA	INA	INA	INA
RSF	MJ	INA	INA	INA	INA	INA	INA	INA	INA
NRSF	MJ	INA	INA	INA	INA	INA	INA	INA	INA
W	m^3	2,67E+01	7,32E-01	1,04E+00	3,70E-03	1,14E-01	1,05E-01	6,36E-03	-3,17E+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**	**C1**	**C2**	**C3**	**C4**	**D**
HW	kg	8,98E-03	2,49E-04	1,05E-03	6,00E-08	2,85E-05	0,00E+00	1,01E-03	-3,76E-04
NHW	kg	2,26E-01	7,38E-02	2,49E-02	9,81E-05	9,46E-03	0,00E+00	6,92E-02	-8,64E-02
RW	kg	1,33E-04	7,56E-06	9,57E-06	9,40E-09	1,27E-06	0,00E+00	6,05E-08	-1,0693E-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**	**C1**	**C2**	**C3**	**C4**	**D**
CR	kg	0,00E+00	INA	0,00E+00	INA	INA	INA	INA	INA
MR	kg	0,00E+00	INA	3,00E-02	INA	INA	INA	INA	INA
MER	kg	0,00E+00	INA	3,93E-02	INA	INA	7,86E-01	INA	-8,25E-01
EEE	MJ	0,00E+00	INA	2,08E-01	INA	INA	4,16E+00	INA	-4,37E+00
ETE	MJ	0,00E+00	INA	6,65E-01	INA	INA	1,33E+01	INA	-1,40E+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
Swedish consumption mix at medium voltage is used at the proudction site with from Ecoinvent v2.2 and is based on the year 2005. Norwegian consumption mix at medium voltage is used in module D 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: 0,024 kg CO_2 - eqv/MJ Sweden

Greenhouse gas emissions: 0,0117 kg CO_2 - eqv/MJ Norway

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 or substances (of 17.12.2014) on the Norwegian Priority list (of 01.04.2013) 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: 1200 km

Indoor environment
The beam has been tested for emissions of total volatile organic components (TVOC) and formaldehyde. The results after 28 days shows an emission speed of 250 µ/m^2h for TVOC og 32 µ/m^2h for formaldehyde. The uncertainty is 15% for TVOC og 30% for formaldehyde. In the requirements of the indoor air classification of building materials from Rakennustieto, this is in the M2 class.

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 Masonite beams AB. LCA-report nr. 321153-1 from Norwegian Institute of Wood Technology, Oslo, Norway*
NPCR015 (08/2013)	*Product category rules for wood and wood-based materials for use in construction, August 2013*
NS-EN 16485:2014	*Round and sawn timber - Envrionmental 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. The Building Information Foundation RTS (Rakennustieto). Helsinki, Finland*
Ecoinvent v2.2 (2010)	*European Centre of Life Cycle Inventories. http://www.ecoinvent.ch*
ELCD 3.0 (2013)	*European reference Life-Cycle Database. http://eplca.jrc.ec.europa.eu/ELCD3/*
ETA-12/0018	*European Technical Approacal for Masonite Beams and Columns: Light composite wood-based beams and columns for structural purposes from Masonite Beams AB.*

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