

I-beam



Figure 1

NEPD nr: 088E

Approved according to ISO 14025, § 8.1.4

Approved 01-11-2009

Valid until 01-11-2012

Sven Fosdøl

Verification

Independent verification of data and other environmental information has been carried out by Anne Rønning (Østfoldforskning), in accordance with ISO 21930, § 9.1

Anne Rønning

The declaration has been prepared by:

Silje Wærp, SINTEF Byggeforsk

Silje Wærp

PCR

NPCR 015 Solid wood products, approved by the NEPD verification committee, has been applied.

About EPD

EPD from other program operators than The Norwegian EPD Foundation may not be comparable.

Manufacturer information

Organisation Byggma group
 Adress 4700 Vennesla
 Contact person Arne Kringlen tlf 0047 38 13 71 00, arne.kringlen@byggma.no
 Organisation no. 979 165 285
 ISO 14001/EMAS: _____

Product information

Scope of assessment cradle to grave
 Functional unit (FU) 1meter I-beam (h=400mm.), installed and maintained, with an expected average service life of 60 years
 All figures in this document refer to 1 functional unit (FU)
 Expected service life 60 years
 Year of study 2009, with data collection representing 2007
 Production area Norway
 Expected market area Norway

Product description

I-beams from Byggma can be used as masonite beams or studs. They consist of a composite construction with timber flanges and fibreboard webs and have enough mechanical resistance to be used as structural components. Byggma's I-beams are manufactured and approved according to ETA 04/0012. This EPD applies to an I-beam with following dimensions: height 400 mm, flang 47 x 47 mm. For conversion, see product information from Forestia/Byggma.

Origin of round timber 75% of round timbers used in the production of I-beams are certified in accordance with PEFC's standard.

Environmental indicators

Global warming	1,7	kg CO ₂ -eq.
Energy consumption	81	MJ
Amount of renewable materials	97	%
Indoor classification (according to EN 15251:2007)	NA	

Product specification

Table 1

Composition of final product		Input i LCA*		Weight final product	
sawn timber/shavings	kg	2,47	48 %	Norwegian sawn timber	kg 2,354
Sawdust	kg	2,50	49 %	Norwegian sawn timber	kg 2,379
Glue	kg	0,17	3 %	Spesific data	kg 0,159
SUM	kg	5,14	100 %		kg 4,9

*incl. 5 % loss at building site

Resource consumption

Material resources

Table 2

Material resources	Unit	Raw materia	Production	Building site	Use stage	Demolition	Transport	Total
New, renewable resources								
Timber (incl. bark) [m³]	kg	8,16	0,00	0	0	0	0	8,16
Water (fresh) [kg]	kg	5,24	1,98	0,02	0,01	0,02	0,04	7,31
Air [kg]	kg	3,55	3,79	0,01	0,01	0,01	0,04	7,41
Other [kg]	kg	0,01	0,02	5,2E-06	2,6E-06	5,2E-06	6,7E-05	0,03
New, non-renewable resources								
Inert rock [kg]	kg	3,5E-01	1,1E+00	4,4E-03	2,2E-03	4,4E-03	2,0E-02	1,4E+00
Crude oil [kg]	kg	5,8E-02	3,6E-02	7,6E-05	3,8E-05	7,6E-05	1,6E-01	2,5E-01
Natural gas [kg]	kg	1,7E-01	4,3E-02	3,8E-04	1,9E-04	3,8E-04	8,5E-03	2,2E-01
Hard coal [kg]	kg	1,1E-02	9,2E-02	6,1E-04	3,1E-04	6,1E-04	7,0E-04	1,0E-01
Peat [kg]	kg	1,2E-02	4,0E-02	5,7E-09	2,8E-09	5,7E-09	1,6E-05	4,0E-02
Lignite [kg]	kg	5,3E-04	1,2E-02	1,7E-04	8,4E-05	1,7E-04	7,9E-04	3,6E-02
Limestone [kg]	kg	2,3E-02	1,5E-02	1,1E-03	5,4E-04	1,1E-03	3,2E-04	2,6E-02
Soil [kg]	kg	8,0E-03	6,7E-03	9,0E-04	4,5E-04	9,0E-04	4,2E-05	1,1E-02
Sodium chloride (rock salt) [kg]	kg	2,3E-03	3,1E-05	8,8E-07	4,4E-07	8,8E-07	1,5E-07	3,4E-03
Other (ore without minerals and	kg	3,4E-03	7,8E-04	1,0E-04	5,2E-05	1,0E-04	9,1E-05	1,8E-03
Heavy spar [kg]	kg	7,0E-04	2,5E-04	4,6E-07	2,3E-07	4,6E-07	3,8E-04	1,7E-03
Iron [kg]	kg	1,1E-03	2,4E-04	2,2E-05	1,1E-05	2,2E-05	6,6E-05	6,7E-04
Clay [kg]	kg	3,2E-04	2,4E-04	3,7E-05	1,9E-05	3,7E-05	4,2E-05	5,4E-04
Quartz sand [kg]	kg	1,6E-04	5,9E-05	3,6E-06	1,8E-06	3,6E-06	5,1E-05	3,1E-04
Gypsum [kg]	kg	1,9E-04	1,5E-04	2,5E-05	1,2E-05	2,5E-05	5,8E-06	2,9E-04
Aluminum [kg]	kg	7,1E-05	7,5E-06	1,2E-06	6,0E-07	1,2E-06	6,3E-08	3,9E-05
Zinc [kg]	kg	2,8E-05	4,2E-06	5,7E-07	2,9E-07	5,7E-07	6,5E-07	1,1E-05
Lead [kg]	kg	4,5E-06	1,7E-06	1,3E-07	6,4E-08	1,3E-07	1,5E-06	9,6E-06
Copper [kg]	kg	6,1E-06	3,9E-06	6,5E-07	3,2E-07	6,5E-07	1,8E-07	8,1E-06
Potassium chloride [kg]	kg	2,4E-06	2,3E-09	3,7E-10	1,9E-10	3,7E-10	6,1E-11	7,6E-06
Unspecified [kg]	kg	7,6E-06	4,3E-02	5,0E-03	2,5E-03	5,0E-03	2,8E-04	6,8E-02
Feedstock energy, renewable resources [MJ]								19,88
Feedstock energy, non-renewable resources [MJ]								0,38

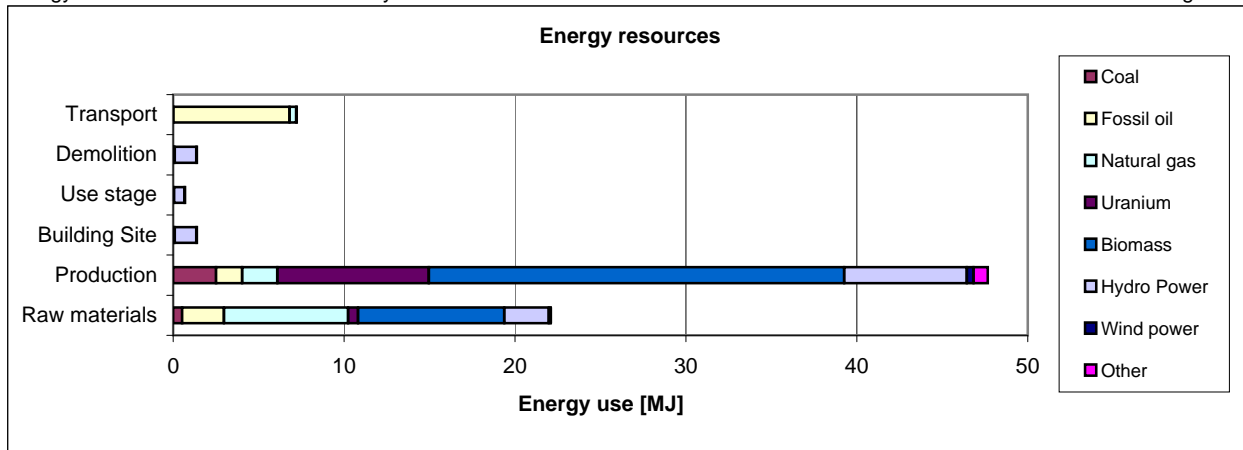
Land use and water resources

Land use has not been quantified. Water consumption is included in Table 2.

Energy resources

Energy carrier distribution for each life cycle fase

Figure 2



Energy carrier distribution for each life cycle fase

Table 3

	Unit	Raw materia	Production	Building Site	Use stage	Demolition	Transport	Total
Fossil energy								
Coal	MJ	0,52	2,52	0,02	0,01	0,02	0,03	3,11
Fossil oil	MJ	2,46	1,53	3,2E-03	1,6E-03	3,2E-03	6,80	10,79
Natural gas	MJ	7,26	2,06	0,02	0,01	0,02	0,39	9,75
Uranium	MJ	0,58	8,85	0,06	0,03	0,06	0,04	9,61
Renewable energy								
Biomass	MJ	8,56	24,31	1,4E-05	7,0E-06	1,4E-05	1,9E-06	32,87
Hydro Power	MJ	2,60	7,17	1,27	0,63	1,27	0,01	12,95
Wind power	MJ	0,12	0,39	0,05	0,02	0,05	0,00	0,63
Other	MJ	0,01	0,85	3,4E-05	1,7E-05	3,4E-05	0,00	0,86
Total	MJ							80,57

The calculation of electricity use in the production phase is based on Nordel-mix (Gabi).

Emissions and environmental impacts

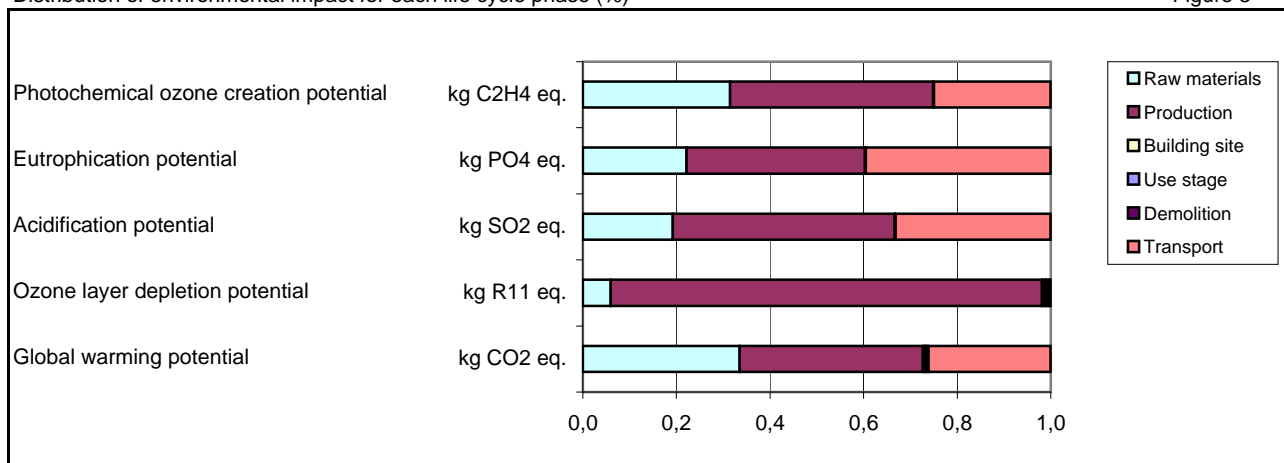
Environmental impacts

Table 4

Indicator	Unit	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
Global warming potential	kg CO ₂ eq.	0,57	0,67	7,8E-03	3,9E-03	7,8E-03	0,45	1,71
Ozone layer depletion potential	kg R11 eq.	1,6E-08	2,4E-07	1,5E-09	7,7E-10	1,5E-09	9,7E-10	2,6E-07
Acidification potential	kg SO ₂ eq.	2,1E-03	5,1E-03	6,4E-06	3,2E-06	6,4E-06	3,6E-03	1,1E-02
Eutrophication potential	kg PO ₄ eq.	3,5E-04	6,0E-04	9,1E-07	4,5E-07	9,1E-07	6,2E-04	1,6E-03
Photochemical ozone creation poteri	kg C ₂ H ₄ eq.	3,3E-04	4,5E-04	4,9E-07	2,4E-07	4,9E-07	2,6E-04	1,0E-03

Distribution of environmental impact for each life cycle phase (%)

Figure 3



Emissions and waste

Table 5

	Raw materials	Production	Building site	Use stage	Demolition	Transport	Total
Emissions to air							
NH ₃ [g]	0,176	0,490	1,3E-05	6,5E-06	1,3E-05	0,003	0,669
CO ₂ [g]	513,097	687,308	7,638	3,819	7,638	432,769	1652,268
CO [g]	2,718	7,815	0,002	0,001	0,002	0,709	11,248
HCl [g]	0,001	0,019	3,0E-05	1,5E-05	3,0E-05	0,001	0,021
Hg [g]	1,4E-06	4,6E-06	4,9E-08	2,5E-08	4,9E-08	4,6E-07	6,6E-06
CH ₄ [g]	1,848	1,254	0,005	0,003	0,005	0,492	3,607
N ₂ O [g]	0,067	0,135	7,1E-05	3,5E-05	7,1E-05	0,006	0,208
NO _x [g]	1,355	2,927	0,006	0,003	0,006	4,695	8,991
NM VOC [g]	0,474	0,152	3,5E-04	1,8E-04	3,5E-04	0,294	0,921
Particles [g]	0,022	0,127	0,001	3,0E-04	0,001	0,081	0,232
Pb [g]	0,000	0,000	1,8E-06	8,9E-07	1,8E-06	0,000	0,000
SO ₂ [g]	0,779	1,994	0,002	0,001	0,002	0,266	3,045
Emissions to water							
BOD [g]	0,006	0,000	8,1E-06	4,0E-06	8,1E-06	0,001	0,007
COD [g]	0,538	0,129	0,005	0,002	0,005	0,019	0,698
N [g]	0,216	0,017	1,0E-04	5,1E-05	1,0E-04	0,001	0,234
P [g]	0,000	0,000	8,5E-07	4,2E-07	8,5E-07	0,000	0,001
Waste							
Waste to landfill [kg]	0,340	1,087	1,055	0,003	0,495	0,020	2,528
Hazardous waste [kg]	0,351	1,090	0,005	0,003	0,005	0,020	0,465

Waste treatment of final product

Landfilling of organic wastes is prohibited from January 1st, 2009.

The final product is sorted as wood waste and can be recycled or energy recovered. According to present technology and practice, approximately 10% of the end product needs to be treated separately at an incineration plant with authorized flue gas cleaning system.

Energy recovery from the final product after the end of life belongs to the system utilizing the energy.

Only feed stock energy is included in this analysis.

Use of chemicals

Chemicals

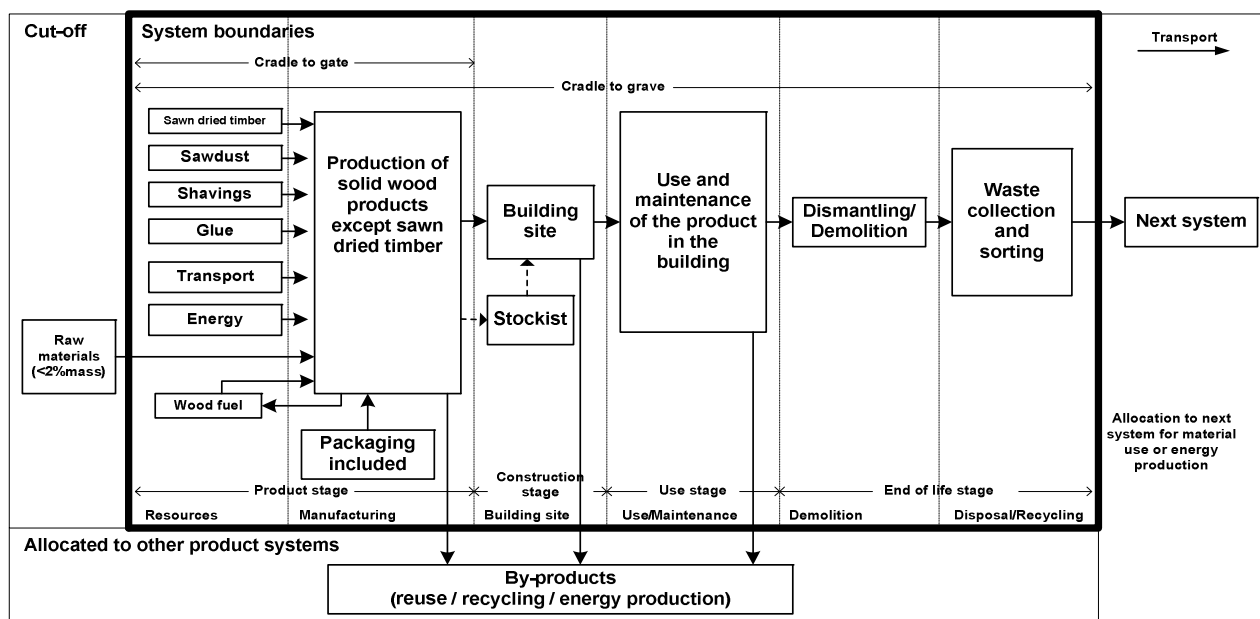
Table 6

Description	Quantity	CAS-nr.	R-phrases	Raw materia	Health ^[4]	Environment ^[4]
Lambda-cyhalotrin [g]	8,3E-05	91465-08-6	R21, R25, R26, R50/53	Timber	class 2	class 2
Imidakloprid [g]	6,2E-05	13826-41-3	R22		class 4	-
Glyphosate [g]	1,2E-03	1071-83-6	R41, R51/53		class 4	class 3
Formaldehyde [g]	0,7	50-00-0	R23/24/25,34,43,40	Glue	class 1	-
Methanol [g]	2,9	67-56-1	R 11,23/24/25/39/		class 2	-
Formic acid [g]	5,6	64-18-6	R 35		class 3	-
Aluminum sulfate [g]	4,4	10043-01-3	R 41	Production	class 4	-
Ferrous sulfate [g]	0,9	7782-63-0	R22		class 4	-

Methodology

System boundaries

Figure 4



Referanser

- [1] NS-ISO 14025:2006, Miljømerker og deklarasjoner - Miljødeklarasjoner type III - Prinsipper og prosedyrer
- [2] ISO 21930:2007, Sustainability in building construction - Environmental declaration of building products
- [3] PCR for preparing an environmental product declaration (EPD) for solid wood products, NPCR 015 2009
- [4] Abrahamsen et al. (2008): "EPDs as a tool for documentation/information on chemicals and toxicity in the value chains of products - a pre-study for EPD Norge".
- [5] Flæte, Per Otto (2009): "Energiforbruk og utslipp fra skogproduksjonskjeden med utgangspunkt i aktivitetsdata fra 2007 - fra frø til industritomt"
- [6] Sintef Byggforsk (2009): "Environmental Product Declaration (EPD) of 9 solid wood products", report MIKADO-project
- [7] EN 15251:2007, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics