ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**UNILIN division Panels**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-UNI-20150014-IBA1-EN
Issue date	21.05.2015
Valid to	20.11.2020

Medium-density fibreboard (MDF)

UNILIN division Panels

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

1. General Information

UNILIN Division Panels

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number
EPD-UNI-20150014-IBA1-EN

This Declaration is based on the Product Category Rules:
Wood based panels, 07-2012
(PCR tested and approved by the independent expert committee)

Issue date
21.05.2015

Valid to
20.11.2020

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

Medium Density Fibreboard

Owner of the Declaration
UNILIN division Panels
Zone Industrielle
08209 SEDAN Cedex
France

Declared product / Declared unit
1m³ of medium-density fibreboard

Scope:
This EPD refers to the production of 1m³ (670kg/m³) medium-density fibreboard (MDF).The production site is located in France (Bazeilles).The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification

The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration according to ISO 14025
☐ internally ☒ externally

Dipl. Geog. Stefan Seum
(Independent tester appointed by SVA)

2. Product

2.1 Product description
This Environmental Product Declaration refers to the production of 1 m³ medium-density fibreboard (MDF). Medium-density fibreboard is a wood based panel that is produced from wood fibres. The board consists of a mix of wood fibres of different species that are bonded together by a thermohardening glue. The board is a single layer product with a homogeneous, fine core and surface layers that are densified to get a good surface quality.

2.2 Application
MDF is often used as a base material in the furniture industry (kitchen, bathroom furniture, interior finishing) and for internal decoration. The surface allows many different types of coatings and surface finishings to be applied.
The board is especially suited for applications where a fine core structure is needed.

2.3 Technical Data
General requirements in accordance with /EN622-5/.

Constructional data (indicative values)

Name	Value	Unit
Gross density acc. to EN 323	600 - 730	kg/m³
Tensile strength rectangular Acc. EN 319	0.45 - 0.65	N/mm²
Thickness swelling 24 h to EN 317 acc. to EN317	10 -20	%
Bending strenght acc. to EN 310	15-23	N/mm²
E-module acc. to EN 310	1500-2700	N/mm²
Moisture content at delivery acc. to EN 322	4 - 8	%

More product specific data can be found in the product datasheets on the website www.unilinpanels.com.

2.4 Placing on the market / Application rules
The following product standard applies for the MDF products:

- EN 622 - 5:2009 - Fibreboards - specifications - Part 5: Requirements for dry process boards.

2.5 Delivery status
Typical standard dimensions are as follows (length - width):

- 2440mm x 1220mm
- 3050mm x 1220mm
- 2800mm x 2070mm

Other dimensions are also possible according to client specifications.
The boards are available in thicknesses from 5 to 38mm.

2.6 Base materials / Ancillary materials

MDF board is a wooden material based on wood fibres. Apart from wood fibres, MDF comprises binding agents and other additives. The wood that is used, is a mix of hardwood and softwood.
The MDF board has the composition presented below:

- wood: 80 to 84%
- water: 4 - 8%
- (M)UF glue (melamine urea formaldehyde): 8 to 12%
- Others (wax, hardeners,...): < 2%

The product contains one substance (formaldehyde), which is included in the current 'Candidate List of Substances of Very High Concern for Authorization' /REACH/.

2.7 Manufacture

Round wood (logs and chips) are used in the production of MDF. The bark is removed from the logs (roundwood). The logs are chopped to woodchips. Woodchips from different species of wood are mixed and boiled. The boiled woodchips are defibrated under high pressure in a refiner and then glue is applied. The glued fibres are dried and a single layer fibremat is formed. This fibremat is introduced in a press that compresses the mat under high pressure and temperature. In this way a board is fabricated. The mat is pressed at high temperatures and then pressed into panels.

2.8 Environment and health during manufacturing

The production conditions do not demand any special health protection measures over and beyond those designated by French authorities.

2.9 Product processing/Installation

MDF boards can be sawn, milled and drilled using conventional machinery. Processing recommendations are available in the respective data sheets. Correct structural installation must be ensured. During product processing, standard protective measures (dust mask, gloves, dust extraction, etc.) must be used.

2.10 Packaging

The MDF bundles are covered with a plastic foil. The boards are stacked and placed on wooden beams or on beams produced from woodbased panels. The beams are bonded to the boards using metal or PET (polyethylene terephthalate) straps.
A cardboard or plastic cover can be placed on the stack for extra protection. The boards are to be stored in a dry environment without exposing them to rain or high moisture.

2.11 Condition of use

The substantial composition during the use phase refers to the composition during the manufacturing. The conditions of use are described in the producer's documentation. See http://www.unilinpanels.com/.

2.12 Environment and health during use

Environmental protection: When the products are used as designated and according to the current state of knowledge, there are no hazards for water, air and soil.
Health protection: When used in accordance with the designated purpose, no health risks or restrictions are to be anticipated by MDF in line with the current state of knowledge.

2.13 Reference service life

Due to the many application areas it is not possible to define a product reference service life.
The reference service life depends on the application classes /EN 622/.

2.14 Extraordinary effects

Fire

According to EN 13501 - 1 the MDF panel has the following performances:

Name	Value
Building material class	D
Burning droplets	d0
Smoke gas development	S2

Water

No ingredients are washed out which could be hazardous to water. UNILIN MDF boards are not resistant to permanent exposure to water. Damaged areas can be replaced on site.

Mechanical destruction

In case of mechanical destruction, sharp edges can arise at points of rupture.

2.15 Re-use phase

In the case of selective de-construction the MDF boards can be collected separately and re-used for the same or another application provided that they are untreated.
In case of selective collection, the MDF boards can be shredded and re-used as raw material for the production of MDF boards or particle boards.

2.16 Disposal

The MDF post-consumer waste can be used as secondary fuel in a biomass power plant. The local requirements for waste disposal and recycling shall always be followed.
Classification according to /EWC/: 17 02 01

2.17 Further information

For more information on the MDF panels, please visit Unilin's website: www.Unilinpanels.com.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1m³ of MDF.

Declared unit

Name	Value	Unit
Declared unit	1	m^3

Declared unit	-	m^2
Conversion factor to 1 kg	0.0015	-
Mass reference	670	kg/m^3

3.2 System boundary

Type of EPD: cradle-to-gate - with options

1a) Declaration of a specific product from a manufacturer's plant.

Modules A1-A3 include processes that provide materials and energy input for the system, manufacturing and transport processes up to the factory gate, as well as waste processing.

It is assumed that post-consumer MDF panel waste reaches the end-of-waste state and is 100% incinerated in a European biomass power plant. Module D includes benefits from all net flows in the end-of-life stage that leave the product boundary system after having passed the end-of-waste state. In module C3 only the release of biotic CO2 is declared. Loads from material incineration (excluding biotic CO2 emissions) and resulted energy credits are declared within module D.

3.3 Estimates and assumptions

Specific life cycle inventories are available for nearly all input materials. Data-gaps are filled with approximated LCIs.
MDF boards are commonly used as secondary material for energy recovery. They reach the end-of-waste state after being dismantled in a building.
It is assumed that post-consumer MDF panel waste is 100% incinerated in a European biomass power plant.

3.4 Cut-off criteria

In this assessment all data for the production process is considered. This includes input flows with a contribution of less than 1% of mass or energy. The transport expenditure for all raw materials are considered. Impacts relating to the production of machines and facilities required during production are outside the scope of this assessment.

3.5 Background data

For life cycle modelling of the considered products, the GaBi Software System for Life Cycle Engineering, developed by PE INTERNATIONAL AG, has been used. All relevant background datasets are taken from the /GaBi 6/ software database. The datasets from the GaBi database are documented in the online documentation /GaBi 6/.

3.6 Data quality

The data quality can be described as good. The primary data collection was done thoroughly, all flows were considered. Technological, geographical and temporal representativeness is given. Primary data refers to the year 2013. Background datasets were taken from the /Gabi 6/ software database. The last update of the database was 2013.

3.7 Period under review

The period under review is the year 2013.

3.8 Allocation

The overall production of Unilin comprises further products beside the product considered in this study. Data for thermal and electrical energy as well as auxiliary material refer to the declared product. During data collection the allocation is done via volume (m^3). Specific information on allocation within the background data is given in the GaBi dataset documentation.
(http://www.gabi-software.com/databases/).

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

4. LCA: Scenarios and additional technical information

Reuse, recovery and/or recycling potentials (D), relevant scenario information

100% of MDF board (670kg/m³) to energy recovery in a European biomass power plant.

Name	Value	Unit

5. LCA: Results

In module C3 only the release of biotic CO_2 is declared. Loads from material incineration (excluding biotic CO_2 emissions) and resulted energy credits are declared within module D.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1m³ UNILIN MDF

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	-6.83E+2	1.02E+3	-5.88E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.44E-7	IND	-3.07E-7
Acidification potential of land and water	[kg SO_2-Eq.]	1.19E+0	IND	-5.43E-1
Eutrophication potential	[kg $(PO_4)^{3-}$ Eq.]	2.66E-1	IND	4.55E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	4.26E-1	IND	6.08E-2
Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	6.05E-5	IND	-7.01E-5
Abiotic depletion potential for fossil resources	[MJ]	5.12E+3	IND	-9.38E+3

RESULTS OF THE LCA - RESOURCE USE: 1m³ UNILIN MDF

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	4.33E+3	IND	IND
Renewable primary energy resources as material utilization	[MJ]	1.02E+4	IND	IND
Total use of renewable primary energy resources	[MJ]	1.45E+4	IND	-1.46E+3
Non renewable primary energy as energy carrier	[MJ]	6.27E+3	IND	IND
Non renewable primary energy as material utilization	[MJ]	1.22E+3	IND	IND
Total use of non renewable primary energy resources	[MJ]	7.48E+3	IND	-1.23E+4
Use of secondary material	[kg]	IND	IND	IND
Use of renewable secondary fuels	[MJ]	IND	IND	IND
Use of non renewable secondary fuels	[MJ]	IND	IND	IND
Use of net fresh water	[m³]	2.59E+0	IND	-2.80E+0

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1m³ UNILIN MDF

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	3.22E-1	IND	-1.10E+0
Non hazardous waste disposed	[kg]	6.62E+0	IND	8.38E+0
Radioactive waste disposed	[kg]	9.34E-1	IND	-1.15E+0
Components for re-use	[kg]	IND	IND	IND
Materials for recycling	[kg]	IND	IND	IND
Materials for energy recovery	[kg]	IND	IND	IND
Exported electrical energy	[MJ]	IND	IND	IND
Exported thermal energy	[MJ]	IND	IND	IND

One inventory does not support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories, do not contribute significantly to the production. The indicators can be displayed; the uncertainty of these values is increased (decision of IBU advisory board 2013-01-07).

6. LCA: Interpretation

The negative value in the production stage is determined by the CO_2 bound in wood. This CO_2 is locked in the wooden product until it is released into the atmosphere in the EoL-incineration process. The release of biotic CO_2 is declared in C3 (carbon neutrality).
The global warming potential (GWP) value in life cycle stage D is the sum of loads and benefits for the next product system. In this stage the loads are determined by the incineration process of the panel (excluding biotic CO_2 emissions which are declared in C3) and the benefits by energy substitution of fossil fuels. The overall GWP of D results in a negative value.

Production stage (A1-A3):
The environmental impact categories (except GWP) and the non-renewable primary energy demand are mainly determined by the production of resin in the supply chain and the energy consumption necessary for the described production step.
For abiotic depletion potential for non fossil resources (ADP elements), ADP fossil, EP (Eutrophication potential) and primary energy (PE) non-renewable the impact from resin is most important, followed by the environmental impact caused by energy consumption.

Depletion potential of the stratospheric ozone layer (ODP) and Acidification potential (AP) are mainly determined by the environmental impact of the energy consumption.
For formation potential of tropospheric ozone photochemical oxidants (POCP) the formaldehyde emissions from the production process and the environmental impact from energy consumption are very important.
The wood plays an important role in GWP. The negative value for GWP in A1-A3 results from the greenhouse gas carbon dioxide which is incorporated via photosynthesis and locked in the wood during the use stage of the product. In the category GWP the environmental impact (positive value) of resin and energy consumption in the production stage is fairly important. The overall CO_2 balance for A1-A3 is negative.
PE renewable is mainly determined by the wood (approx. 80%) and thermal energy from renewable resources (approx.20%).

7. Requisite evidence

7.1 Certificate of factory production control-Formaldehyde
The product fulfills the requirement according to /EN 622-1:2003 E1/. Test institute CTIB - TCHN.

7.2 **PEFC certificate:**
The product fulfills the requirement according to /PEFC ST 2202:2010/.

7.3 FSC certificate:
The product fulfills the requirement according to /FSC - STD-40-004/ V2 -1.

7.4 VOC emissions:
VOC emission tests were perfomed: Chamber emission test of a medium density fibreboard - Test report No. MIAC-2009-0301/

7.5 Lindan/PCP
The cocentration of Lindan/PCP is determined by means of gas chromatography after extraction by ethyl alcohol - internal procedure /PT-08-D61 CTIB-TCHN/.

8. References

EN 13501
EN 13501 - 1: Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

EN 622
EN622 - 5: 2009 - Fiberboards - specifications - Part 5: requirements for dry process boards.

EN 322:1993
EN323:1993 - Wood-based panels – Determination of moisture. content

EN 323:1994
EN 323:1994 - Wood-based panels - Determination of density.

EN 319:1993
EN 319:1993 - Particleboards and fibreboards. Determination of tensile strength perpendicular to the plane of the board.

EN 317:1193
EN 317:1993 - Particleboards and fibreboards – Determination of swelling in thickness after immersion in water.

EN 310:1993
EN 310:1993 - Wood-based panels: Determination of modulus of elasticity in bending and of bending strength.

ISO 16000-6:2011
ISO 16000-6:2011 - Indoor air - part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax A sorbent, thermal desorption and gas chromatography using MS or MS-FID

ISO 16000-9:2006
ISO 16000-9:2006 - Indoor air - part 9: Determination of the emissions of volatile organic compounds from building products and furnishing - Emission test chamber method.

ISO 16000-11:2006
ISO 16000-11:2006 - Indoor air - part 11: Determination of the emissions of volatile organic compounds from building products and furnishing - Sampling, storage of samples and preparation of test specimens.

Formaldehyde
Test institute CTIB -TCHN - Hof ter Vleesdreef 3 - 1070 Brussels - Belgium. The rapport number of the certificate is CTIB-TCHN 0241.

PEFC certificate
"Chain of custody of Forest Based Products - Requirements" - dated 26/11/2010.
SGS South Africa (Pty) Ltd, Qualifor Programme - PO Box 82582 Southdale 2135, 58 Melvill Street Booysens Johannesburg 2091 South Africa. Certificate No. CH07/0115.

FSC certificate
FSC certificate - SGS Société Générale de Surveillance SA - System & Services Certification - Technoparkstrasse 1 - 8005 Zurich - Switzerland. Certificate No. SGS-COC-001011.

VOC emissions:

VOC emission tests were perfomed: Chamber emission test of a medium density fibreboard - Test report No. MIAC-2009-0301 - Wilhelm-Klauditz-Insitut, Materrial Analysis and Indoor Chemistry - Bienroder Weg 54 E D-38108 Braunschweig.

Lindan/PCP
The cocentration of Lindan/PCP is determined by means of gas chromatography after extraction by ethyl alcohol - internal procedure PT-08-D61 CTIB-TCHN). Dosage de PCP et de lindane dans un panneau MDF - CTIB-TCHN - Hof ter Vleest dreef 3 - 1070 Brussel - Belgium.

PCR – Part B
Institut Bauen und Umwelt e.V.: Requirements on the EPD for wood based panels

EWC
EWC 2002: Commission Decision 2000/532/EC of 3 May 2000 replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste

GaBi
GaBi Software Databases, www.gabisoftware.com/databases/ (2014)

REACH
Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin (pub.): Generation of Environmental Product Declarations (EPDs);

General principles
for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013-04
www.bau-umwelt.de

PCR Part A
Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. April 2013
www.bau-umwelt.de

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012-04: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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