ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Fritz EGGER GmbH & Co. OG Holzwerkstoffe
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-EGG-20200247-IBD1-EN
Issue date	25.05.2021
Valid to	24.05.2026

EGGER DHF

Fritz EGGER GmbH & Co. OG Holzwerkstoffe

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD EN 15804 VERIFIED

1. General Information

Fritz EGGER GmbH & Co. OG Holzwerkstoffe	EGGER DHF
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** Fritz EGGER GmbH & Co. OG Holzwerkstoffe Weiberndorf 20 6380 St. Johann i.T. Austria
Declaration number EPD-EGG-20200247-IBD1-EN	**Declared product / declared unit** 1 m³ EGGER DHF board with an average raw density of 615 kg/m³ and a delivery moisture of approximately 7.5%.
This declaration is based on the product category rules: Wood based panels, 12.2018 (PCR checked and approved by the SVR)	**Scope:** This document refers to DHF boards, which are manufactured in the following plant: Egger Holzwerkstoffe Wismar GmbH & Co. KG Am Haffeld 1, 23970 Wismar, Germany
Issue date 25.05.2021	
Valid to 24.05.2026	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. The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.
	Verification The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2010* ☐ internally ☒ externally
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Dr. Frank Werner (Independent verifier)

2. Product

2.1 Product description/Product definition

EGGER DHF boards are synthetic resin-bonded medium-density wood fibre boards according to *EN 622-5* (board type MDF.RWH), which are manufactured in a dry process. They are mainly based on fibres from softwood. The wood-based panels are fitted with tongue and groove profiles in the edge area. The average data reflects the specific production situation for DHF boards for a density of 615 kg/m³.

Regulation (EU) no. 305/2011 (*CPR*) applies to bringing the product into circulation in the EU/EFTA (with the exception of Switzerland). The product requires a declaration of performance according to *EN 13986*:2004+ A1:2015, Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking and *EN 14964:2006* Rigid underlays for discontinuous roofing - Definitions and characteristics and the CE marking.

2.2 Application

EGGER DHF boards are mainly used as vapour permeable, heat-insulating and partly load-bearing cladding in roofs and walls. They meet the requirements as sub-roofing of type UDP-A according to the guideline of the Central Association of German Roofers (ZVDH).

DHF boards can be used as load-bearing external cladding for walls and roofs in service classes 1 and 2 according to *EN 1995-1-1*, taking into account *DIN 68800-2*.

In addition to the aforementioned application regulations, the respective national regulations must be observed.

2.3 Technical Data

A declaration of performance (DoP) with relevant data for EGGER DHF boards with CE marking according to

EN 13986:2004+A1:2015 and *EN 14964:*2006 are available at www.egger.com.

Structural engineering data

Name	Value	Unit
Gross density according to EN 323	600 - 630	kg/m³
Grammage	9 - 12.6	kg/m²
Bending strength (longitudinal) according to EN 310	14 - 17	N/mm²
E-module (longitudinal) according to EN 310	1600 - 3000	N/mm²
Material dampness at delivery according to EN 322	4 - 11	%
Dimensional change with each 1% change of the humidity content MDF (length/width/thickness) according to CEN/TR 12872	0,05 / 0,05 / 0,7	%
Tensile strength rectangular according to EN 319	11.7	N/mm²
Impact resistance classification	k.A.	-
Joint opening	k.A.	mm
Height difference between elements	k.A.	mm
Thermal conductivity EN 13986	0.1	W/(mK)
Water vapour diffusion resistance factor according to ISO 12572	11	-
Sound absorption degree frequency range 250500 Hz according to EN 13986	0,10	-
Sound absorption degree frequency range 1000-2000 Hz according to EN 13986	0,25	-
Room sound improvement	k.A.	Sone
24 h thickness swelling according to EN 319 according to EN 317	<6,5	%

Performance values of the product according to the declaration of performance in relation to its essential characteristics according to EN 13986:2004+A1:2015 or EN 14964:2006 (not part of the CE marking).

2.4 Delivery status

DHF boards can be delivered in the following sizes:
Thickness: 15 mm + 20 mm
Length: 2500 - 3000 mm
Width: 612 - 1250 mm
Surface: unsanded
Other sizes available upon request.

2.5 Base materials/Ancillary materials

DHF boards with a thickness between 12 and 20 mm and an average density of 600-630 kg/m³ consist of (information in weight % per 1 m³ of production):

- approx. 88 % **wood fibres**: untreated sawmill residues as well as partially untreated, fresh wood from thinning measures (predominantly of the wood species spruce and pine)
- 7 % **water** (wood moisture)
- 3 % **PMDI glue** (polymer diphenylmethane diisocyanate): Here MDI (Diphenyl methane – Di isocyanate), a polyuria pre-product is used, which during the board production is transformed into PUR (polyurethane) and polyuria. These serve the purpose of bonding the wood fibres.
- 1 % **paraffin wax emulsion**: for hydrophobising (improvement of moisture resistance).
- **Additive**: Separating agent to avoid caking on the pressure plate

Chemicals legal information:
1) The product contains substances on the *ECHA List* of substances of very high concern (date 25.06.2020) above 0.1% by weight:

- no

2) The product contains additional CMR substances of the category 1A or 1B that are not on the candidate list, above 0.1 weight %:

- no

3) Biocidal products have been added to this building product or it has been treated with biocidal products (this refers to treated goods within the meaning of the /Biocidal Products Regulation (EU) No. 528/2012):

- no

Download the current certification concerning the use of SVHC substances: www.egger.com/umwelt

2.6 Manufacture

Sawmill residues or debarked logs are crushed to a defined size and then cooked in a high pressure cooker and turned into wood fibres with grinding discs. These wood fibres are coated with glue and strewn in a continuously working dispersing station to form a continuous fibre cake. This cake is then continuously transported through a continuous hot press, and thus constantly compressed to the desired final thickness. After the press, the continuous board strand is cut to the required raw board size and cooled in large star coolers to room temperature. The boards are then cut to final size during finishing and fitted with tongue and groove profiles, packaged, and stored for shipping.

The production includes the following process stages:

1. Peeling logs
2. Chipping the wood to produce chips and wood chips
3. Cooking the chips and wood chips
4. Defibration in the refiner
5. Drying the fibres to approximately 2 – 3 % residual moisture
6. Application of resin to the fibres
7. Spreading the glue-coated fibres onto a forming belt
8. Compression of the fibre mat in a hot press that works continuously
9. Cutting and trimming the fibre strand into rawboard formats
10. Cooling the rawboards in star coolers
11. Piling into large stacks
12. Finishing / tongue and groove line

All waste generated in the course of production (trimming and milling waste) is used thermally with no exceptions.

The Wismar plant is certified with a quality management system according to *ISO 9001*.

2.7 Environment and health during manufacturing

Measures to prevent injuries to health / health encumbrances during the manufacturing process:
Due to the manufacturing conditions no measures for health protection are necessary over and above the legislative and other regulations. Every area of the facility performs significantly below **MAC values** (maximum allowable concentration - *MAC and BEL values list 2016*).

Air:
Exhaust air is cleaned in accordance with the applicable legal regulations. All legal limits are complied with.

Water/soil:
There is no impact on water or soil. Waste water from production is treated internally and returned to production.

Sound insulation:
Noise protection measurements showed that all the values determined within and outside of the production plant were far below the minimum requirements applicable for Germany. Noise intensive plant components such as the chip removal are accordingly encapsulated through structural measures.

The Wismar plant is certified with an energy management system according to *ISO 50001* and an environmental management system according to *ISO 14001*.

2.8 Product processing/Installation

DHF boards can be sawed, milled and drilled with regular (electrical) machines. Hard metal tipped tools are recommended, particularly in the case of circular saws.
The safety measures that are usual for solid wood processing must be observed. Wear a respiratory mask if using hand tools without a dust extraction device.
The boards can be used in applications of service class 2 (humid conditions) according to *EN 1995-1-1*. Extensive information and processing recommendations are available under www.egger.com/bauprodukte.

2.9 Packaging

Underlays made of wood material strips, cardboard, steel bands and recyclable PE films (only tongue and groove boards) are used for transport packaging from the plant, which can be sorted and collected for recycling.

2.10 Condition of use

The component materials of EGGER DHF comply in terms of their proportions to those of the basic material composition described in section 2.5 "Basic materials".

The bonding agents are chemically stable and mechanically bonded to the wood under normal conditions.

2.11 Environment and health during use

Environmental protection:
There is no risk of water, air / atmosphere or ground contamination given currently available knowledge assuming intended use is observed.

Health aspects:
There are no health hazards or effects to be expected from normal use, i.e. in accordance with the intended uses of EGGER DHF. Natural wood constituents may be released in small quantities. Emissions of pollutants are not detectable.

2.12 Reference service life

The service life of the DHF boards depends on the area of application in the specific project, taking into account the use class according to *EN 1995-1-1*, *DIN 68800-2* and appropriate maintenance.

For structural applications, the reference useful life according to *ISO 15686* is at least 50 years.

According to the *BBSR table* 2017, the useful life is 50 years on average.

2.13 Extraordinary effects

Fire
Smoke development / smoke density:
Corresponds to smoke development and smoke density of solid wood.

Toxicity of fire gases:
Under certain fire conditions, hydrogen cyanide (prussic acid), apart from the usual fire gases, may be released from the PMDI resins contained in the boards as a result of the transformation process during combustion. Due to the toxicity of the fumes that are produced, waste portions of the stated products must be combusted in enclosed, specifically approved systems and never in any type of open fire.

Change of the aggregate state (burning drip off/fall off):
Dripping by combustion is impossible because EGGER DHF boards do not liquefy when hot.

Fire protection

Name	Value
Building material class according to EN 13501-1	D
Burning droplets according to EN 13501-1	d0
Smoke gas development according to EN 13501-1	s2

Water
No ingredients are washed out that could pose a hazard for water (cf. 7.3.1 Heavy metals / eluate (EOX) and migration). DHF boards are not resistant to

continuous water influence, damaged parts, however, can easily be locally replaced following, for example, limited flood exposure.

Mechanical destruction
The breaking pattern of EGGER DHF displays a relatively brittle behaviour in which small smooth breaking surfaces occur on the broken edges of the boards. There is no negative impact on the environment.

2.14 Re-use phase
Reuse:
DHF boards fastened with screw connections can be easily collected separately when a building is converted or ends its use phase in the case of selective dismantling and reused for the same application or for applications other than the original one. Exceptions to this are boards that have been bonded over their surface.

2.15 Disposal
Waste code:
030105 / 170201 acc. *AVV* (Waste Regulation)

Material utilisation:
Incidental residuals of DHF boards should first be guided towards material recycling.

Energy utilisation (in plants approved for this purpose):
With the high average calorific value of approximately 16 MJ/kg (depending on board moisture) an energy utilisation for the generation of process energy and electricity (combined heat and energy power plants) from board residues from the construction site as well as from demolition measures are to be preferred over dumping. They may only be burned in suitable and legally permitted facilities. Local stipulations are available from the relevant authorities.

Packaging:
Transport packaging materials can be collected separately and recycled appropriately. In some cases, external disposal can be arranged with the manufacturer.

2.16 Further information
Further information on production, the environment and sustainability, processing recommendations and other information is available at www.egger.com/bauprodukte.

3. LCA: Calculation rules

3.1 Declared Unit
This environmental product declaration is based on a declared unit of 1 m³ EGGER DHF board with an average raw density of 615 kg/m³ and a delivery moisture of approximately 7.5 %.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	m^3
Declared unit	1	m^2
Mass reference	615	kg/m^3

The EGGER DHF boards are manufactured in the Wismar plant in Germany. The calculation of the declared unit was volume weighted.

3.2 System boundary
The LCA of the EGGER DHF includes a cradle-to-gate consideration of the occurring environmental impact with the modules C1-C4 and module D (A1-A3, +C, +D). The following life cycle phases are taken into account in the analysis:

Module A1– A3 | Production stage
The production stage includes the cost of raw material procurement (roundwood, producing the glue system, the emulsion and the separating agent, etc.), as well as related transport relative to the production plant in Wismar. Within the plant boundaries, DHF board production, finishing and the outgoing warehouse including the packaging of the product are taken into account. The majority of the electrical energy used is obtained from the German power grid. Both internal wood waste and scrap wood sourced externally are used in the in-house biomass power plant. The system boundary for the scrap wood used in the production is set after sorting and chopping. It is assumed that the end of the waste status has been reached. The system boundary for secondary raw materials according to *EN 15804* applies.

Module C1 | Dismantling / Demolition
Manual removal was assumed for the DHF boards. The associated efforts are negligible, which means that no environmental impact from the dismantling of the products is declared.

Module C2 | Transport to waste treatment
Module C2 includes transport to waste treatment. For this purpose, transport by lorry over a distance of 50 km is used as a representative scenario.

Module C3 | Waste processing
The wood product and with it the material-inherent properties leave the product system as secondary fuel in module C3. Furthermore, chopping after product disassembly is also considered.

Module C4 | Disposal
The scenario used declares the energy recovery of the wood products, which means that no environmental impact from the waste treatment of the products in C4 are to be expected.

Module D | Credits and charges outside the system limits
The energy utilisation of the product at the end of its life cycle is described in Module D, including energetic substitution potential as a European average scenario.

3.3 Estimates and assumptions
Assumptions and estimates are used in the absence of a representative background data set to represent the environmental impact of certain raw materials. All assumptions are supported with detailed documentation and correspond to the best possible representation of reality given the available data. A

generic data set from the *GaBi* Database for spruce roundwood was used as background data set for roundwood. A large part of the wood processed by EGGER represents coniferous fibrewood. For other wood types used, the data set for spruce roundwood should be considered as an approximation. The present simplification thus corresponds to the best possible approach given the existing data basis. The regional applicability of the background data sets used refers to average data for Germany and Europe.

3.4 Cut-off criteria

All inputs and outputs for which data are available and from which a significant contribution can be expected are included in the LCA model. Missing data were populated when a data basis was available using conservative assumptions for average data or generic data and are documented accordingly. Only data with a contribution of less than 1% were removed. Neglecting these data can be justified by the limited effect to be expected. Thus, no processes, materials or emissions were neglected that are expected to make a significant contribution to the environmental impact of the products under consideration. It can be assumed that the data were recorded in full and that the total sum of the neglected input flows does not exceed 5 % of the energy and mass input.

3.5 Background data

Secondary data are included to represent the background system in the LCA model. These are taken, on the one hand, from the *GaBi* database 2020, SP40 and, on the other hand, from recognised literature sources (e.g. *Rüter & Diederichs 2012)*.

3.6 Data quality

The data was collected via spreadsheets specifically created by EGGER. Questions were answered through an iterative process in writing via e-mail, phone, or in person. Given the intense discussion concerning a representation of material and energy flows in the company that is as close as possible to reality, led by EGGER and Daxner & Merl, the high quality of collected foreground data can be assumed. A consistent and uniform calculating procedure was applied in line with *ISO 14044*.

When selecting the background data, the technological, geographical, and time-related representativeness of the data basis was taken into consideration. When specific data was missing, generic data sets or a representative average were used. The *GaBi* background data sets are not older than ten years.

3.7 Period under review

As part of the collection of the foreground data, the life cycle was recorded for the production year 2018. The data are based on the annual volumes used and produced.

3.8 Allocation

The carbon dioxide content and primary energy content of the products have been balanced on the basis of their inherent material characteristics in line with underlying physical relationships.

Allocation within the forestry chain is based on the publication of *Hasch 2002* and its update by *Rüter & Albrecht 2007*. For DHF production, sawing by-products were also used in addition to roundwood. A price allocation according to *Rüter & Diederichs 2012* was used to calculate the environmental impact of these by-products from the sawing system.

The thermal and electrical energy generated in the combined heat and power systems is allocated according to exergy.

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.

The used background database has to be mentioned

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic Carbon
The biogenic carbon content quantifies the amount of biogenic carbon in the declared building product.

Information describing the biogenic carbon content at the plant gate

Name	Value	Unit
Biogenic carbon (in the product)	271	kg C/m³
Stored carbon dioxide (in the product)	955	kg CO2-Äq./m³

Since the end-of-life of the product packaging is not declared in module A5, its carbon uptake is not included in modules A1-A3.

The following technical information represents the basis for the declared module or can be used for the development of specific scenarios in the context of a building evaluation if modules are not declared (MND).

Biogenic carbon in the product
The biogenic carbon content quantifies the amount of biogenic carbon in the declared building product.

Name	Value	Unit
Biogenic carbon content (in the product)	271	kg/m³
Stored carbon dioxide (in the product)	995	kg/m³

Since the end-of-life of the product packaging is not

declared in module A5, its carbon uptake is not included in modules A1-A3.

Integration into building (A5)
The end-of-life of product packaging is not declared in module A5.

Name	Value	Unit
Packaging (PE)	0,141	kg/m³
Packaging (cardboard)	0,725	kg/m³
Packaging (squared timber)	0,0138	kg/m³
Packaging (steel strips)	0,0184	kg/m³

Utilisation (B1) see chapter 2.12 Utilisation

Name	Value	Unit

Maintenance (B2)

Name	Value	Unit
Information on maintenance	-	-
Maintenance cycle	-	Number/RSL
Water consumption	-	m³
Auxiliary	-	kg
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Material loss	-	kg

Repair (B3)

Name	Value	Unit
Information on the repair process	-	-
Information on the inspection process	-	-
Repair cycle	-	Number/RSL
Water consumption	-	m³
Auxiliary	-	kg
Other resources	-	kg
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Material loss	-	kg

Replacement (B4)/Conversion/Renovation (B5)

Name	Value	Unit
Replacement cycle	-	Number/RSL
Electricity consumption	-	kWh
Litres of fuel	-	l/100km
Replacement of worn parts	-	kg

Reference utilisation duration
The product is tested according to the normative product requirements. When used according to the rules and the state of the art, the reference service life corresponds to 50 years. This is to be used for further calculations and does not constitute a manufacturer's guarantee.

Name	Value	Unit
Reference service life	50	a
Life Span (according to BBSR)	50	a
Life Span (according to BBSR)	50	a
Declared product properties (at the gate) and finishes	according to EN 14964 and EN 13986	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Underlays with overlapping roofing	-
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	not relevant, given use in interiors	-
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure	for dry and humid conditions	-
Maintenance e.g. required frequency, type and quality and replacement of components	regular visual inspection and replacement in case of damage	-

Operational energy (B6) and water consumption (B7)

Name	Value	Unit
Water consumption	-	m³
Electricity consumption	-	kWh
Other energy carriers	-	MJ
Equipment output	-	kW

End of life cycle (C1-C4)

Name	Value	Unit
For energy recovery [balance moisture 12%]	641	kg/m³

Reuse, recuperation and recycling potential (D), relevant scenarios

Name	Value	Unit
Net flow in module D [balance moisture 12 %]	469	kg/m³
Moisture during thermal reuse	12	%
Processing rate	100	%
Efficiency of the system	61	%

5. LCA: Results

The following table contains the LCA results for a declared unit of 1 m³ EGGER DHF board with an average raw density of 615 kg/m³ (approximately 7.5 % moisture).

Disclaimer:
EP-freshwater: This indicator has been calculated as “kg P eq” as required in the characterization model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml).

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	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	ND	ND	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m³ DHF board (615 kg/m³)

Core Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential - total	[kg CO_2-Eq.]	-5.84E+2	0.00E+0	1.93E+0	9.98E+2	0.00E+0	-3.52E+2
Global warming potential - fossil fuels	[kg CO_2-Eq.]	3.98E+2	0.00E+0	1.92E+0	5.16E+0	0.00E+0	-3.51E+2
Global warming potential - biogenic	[kg CO_2-Eq.]	-9.83E+2	0.00E+0	-3.20E-3	9.93E+2	0.00E+0	-1.02E+0
GWP from land use and land use change	[kg CO_2-Eq.]	5.43E-1	0.00E+0	1.54E-2	7.48E-3	0.00E+0	-3.32E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.60E-11	0.00E+0	3.50E-16	1.13E-13	0.00E+0	-4.98E-12
Acidification potential, accumulated exceedance	[mol H^+-Eq.]	8.73E-1	0.00E+0	6.48E-3	1.14E-2	0.00E+0	2.73E-1
Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg P-Eq.]	1.16E-3	0.00E+0	5.81E-6	1.38E-5	0.00E+0	-6.10E-4
Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	3.42E-1	0.00E+0	2.92E-3	2.53E-3	0.00E+0	6.93E-2
Eutrophication, accumulated exceedance	[mol N-Eq.]	3.69E+0	0.00E+0	3.27E-2	2.66E-2	0.00E+0	8.24E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	9.88E-1	0.00E+0	5.75E-3	6.93E-3	0.00E+0	2.93E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	2.71E-4	0.00E+0	1.54E-7	1.49E-6	0.00E+0	-7.49E-5
Abiotic depletion potential for fossil resources	[MJ]	5.66E+3	0.00E+0	2.55E+1	9.08E+1	0.00E+0	-7.02E+3
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m³ world-Eq deprived]	2.79E+0	0.00E+0	1.86E-2	1.12E+0	0.00E+0	-2.30E+1

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m³ DHF board (615 kg/m³)

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	3.19E+4	0.00E+0	1.47E+0	1.01E+4	0.00E+0	-1.77E+3
Renewable primary energy resources as material utilization	[MJ]	1.01E+4	0.00E+0	0.00E+0	-1.01E+4	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	4.20E+4	0.00E+0	1.47E+0	4.02E+1	0.00E+0	-1.77E+3
Non-renewable primary energy as energy carrier	[MJ]	5.25E+3	0.00E+0	2.56E+1	4.94E+2	0.00E+0	-7.02E+3
Non-renewable primary energy as material utilization	[MJ]	4.03E+2	0.00E+0	0.00E+0	-4.03E+2	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	5.66E+3	0.00E+0	2.56E+1	9.08E+1	0.00E+0	-7.02E+3
Use of secondary material	[kg]	2.54E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	3.39E+3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.70E+3
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.08E+2
Use of net fresh water	[m³]	1.17E+0	0.00E+0	1.71E-3	4.65E-2	0.00E+0	-1.43E+0

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m³ DHF board (615 kg/m³)

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	[kg]	1.79E-5	0.00E+0	1.18E-6	3.76E-8	0.00E+0	-2.38E-6
Non-hazardous waste disposed	[kg]	1.01E+1	0.00E+0	4.05E-3	6.44E-2	0.00E+0	2.57E-1
Radioactive waste disposed	[kg]	1.61E-1	0.00E+0	4.71E-5	1.38E-2	0.00E+0	-6.04E-1
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	6.41E+2	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ DHF board (615 kg/m³)

Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Potential incidence of disease due to PM emissions	[Disease Incidence]	2.00E-3	0.00E+0	3.66E-8	9.56E-8	0.00E+0	-1.48E-6
Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	1.46E+1	0.00E+0	6.95E-3	2.26E+0	0.00E+0	-9.91E+1
Potential comparative toxic unit for ecosystems	[CTUe]	2.90E+3	0.00E+0	1.90E+1	3.88E+1	0.00E+0	-1.72E+3
Potential comparative toxic unit for humans - cancerogenic	[CTUh]	4.48E-7	0.00E+0	3.94E-10	1.07E-9	0.00E+0	-6.80E-9
Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	3.82E-6	0.00E+0	2.27E-8	3.95E-8	0.00E+0	1.99E-6
Potential soil quality index	[-]	8.04E+4	0.00E+0	8.93E+0	2.89E+1	0.00E+0	-1.29E+3

Limitation note 1 - applies to the indicator Potential effect from human exposure to U235:
This impact category mainly addresses the possible effect of low dose ionising radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposure, nor does it consider the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

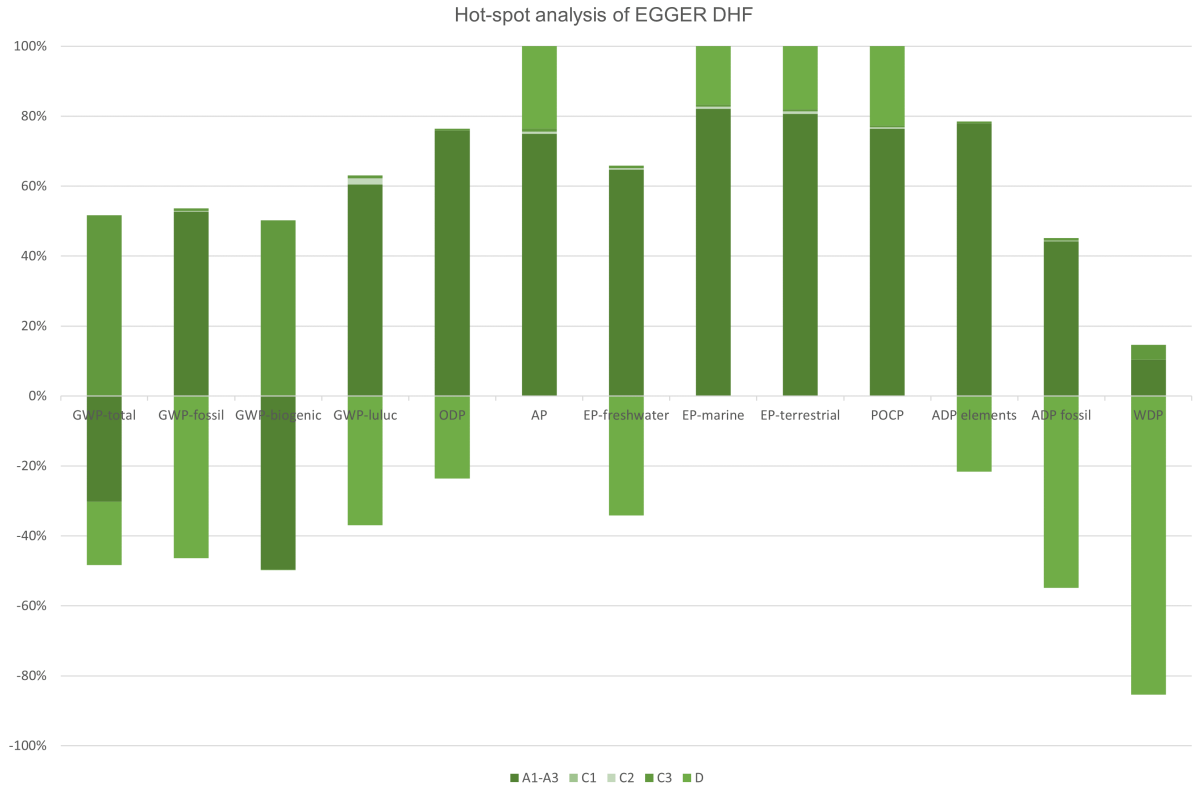
Limitation note 2 - applies to the indicators Potential for Abiotic Resource Depletion - Non-Fossil Resources, Potential for Abiotic Resource Depletion - Fossil Fuels, Water Depletion Potential (User), Potential Ecosystem Toxicity Comparison Unit, Potential Human Toxicity Comparison Unit - Carcinogenic Effect, Potential Human Toxicity Comparison Unit - Non-Carcinogenic Effect, Potential Soil Quality Index:
The results of this environmental impact indicator need to be used with caution as the uncertainties in these results are high or as there is limited experience with the indicator.

6. LCA: Interpretation

The following interpretation includes a summary of the LCA results relative to a declared unit of 1 m³ average EGGER DHF board.

For the global warming potential (GWP) during the production phase (Module A1-A3) of the EGGER DHF board, the total is a negative value. This is due to the material use of wood in the
production. While the tree is growing, the wood stores carbon dioxide as biogenic carbon (negative greenhouse potential) and does therefore not have a greenhouse effect as long as it is stored in the product. Only once the product is utilised energetically at the end of its life (Module C3), the stored carbon is released into the atmosphere as carbon dioxide emissions and contributes to the global warming potential. The energy utilisation of scrap wood was modelled CO2 neutral.

The negative values in Module D can be explained through the fact that the energy generated by the energetic utilisation of the product is able to replace the combustion of fossil fuels. In this way, more emissions of (mainly fossil) fuels are avoided than those emitted through the use of the energy stored in the wood. The environmental impact (AP, EP, POCP) in Module D
is due mainly to emissions from the combustion of the biomass.



The potential environmental impacts from the provision of electricity from the German grid, the PMDI glue system and the timber supply chain represent the most significant influencing factors in almost all impact categories considered.

Considering potential acidification (AP), excessive nutrient input (EP-freshwater, EP-marine, EP-terrestrial) and ground-level ozone formation (POCP), the steam supply at the site also represents a relevant variable.

The use of renewable primary energy (PERT) is due to the material utilisation of the biomass in the product, as well as the use of biomass for the production of electric as well as thermal energy. Looking at the use of non-renewable primary energy (PENRT), this is mainly used for the provision of energy from the German electricity mix, the production of the PMDI glue system and the emulsion.

The results of the previous EPD for EGGER DHF boards (EPD-EGG-20140196-IBA1-DE) are not directly comparable with the present, updated version due to the update of the underlying methodology according to *EN 15804+A2*.

7. Requisite evidence

The following tests are performed for EGGER DHF as part of the on-going external supervision or on request.

7.1 Formaldehyde

Background information: The E1 threshold value is defined at 8.0 mg maximum value or 6.5 mg average value following the perforator method *ISO 12460-5* or at 0.1 ppm according to the chamber method *EN 717-1*.
Measurement centre: Entwicklungs- und Prüflabor Holztechnologie GmbH, Dresden
Test report: 2118074/2020/3/QDF
Results: Determined formaldehyde content (measured according to *EN 717-1*, test chamber):

- DHF: 0.02 ppm

7.2 MDI

Measurement centre: Entwicklungs- und Prüflabor Holztechnologie GmbH, Dresden
Test report: 2520047/1
Result: The DHF boards were tested in accordance with *RAL-UZ 76* (02/2010) and *EN 16516* (01/2018). The emissions of MDI and other isocyanides were below the detection limit. The requirements of *RAL-UZ 76* for MDI emissions are thereby fulfilled.

7.3 Testing for pre-treatment of the applied materials

7.3.1 Heavy metals / eluate (EOX) and migration

Measurement centre: Entwicklungs- und Prüflabor Holztechnologie GmbH, Dresden
Test reports: 2118074/2020/3/QDF
Result: The determination of the heavy metal content was carried out in accordance with the work standard *IHD-W-448* (04/2017) after nitric acid microwave digestion using ICP-OES. The following values were determined (LOD = limit of detection): Arsenic < LOD, Cadmium < LOD, Chromium < LOD, Copper 0.3 mg/kg, Mercury < LOD, Lead < LOD. The limit values required according to *EN 717-3* for all values were undercut.

7.3.2 PCP and lindane

Measurement centre: Fraunhofer-Institut für Holzforschung Wilhelm-Klauditz-Institut WKI, Braunschweig

Test report: QA-2019-0555
Result: The test was carried out according to IKEA *IOS MAT 0010* and *ChemVerbV*. The values for PCP and lindane in DHF boards are below the detection limit and therefore cannot be determined.

7.4 Toxicity of the fire gases

Measurement authority: EPA Energie- und Prozesstechnik Aachen GmbH, Department of Flue Gas Technology
Test report: 16/2014 for DHF boards material number B4061603
Result: The test was carried out according to *EN 53436-1* and *DIN 4102-1*. According to PA-III decision 22/1, the test was carried out with covering of the lateral cut edges. A relative weight loss of 61.7 % of the sample was revealed at a test temperature of 400 °C.
After 30 minutes, only carbon monoxide with a value of 30,000 ppm was measured in the inhalation room. The other compounds (carbon dioxide, hydrogen cyanide, hydrogen chloride and sulphur dioxide) were below the measurability (detection limit = 1 ppm).
After 60 minutes, the concentrations in the inhalation room were as follows: Carbon monoxide 50,000 ppm, carbon dioxide 20,000 ppm, hydrogen cyanide 10 ppm. Hydrogen chloride and sulphur dioxide could not be detected (detection limit = 1 ppm).
The hydrocyanic acid concentration (HCN detection limit = ppm) corresponds to the concentration as emitted by wood under the same conditions.
The gaseous emissions released under the selected experimental conditions correspond largely to the emissions released by wood under the same conditions.

7.5 VOC emissions

DHF boards are used exclusively as external cladding - external sub-roofing
Measurement centre: Entwicklungs- und Prüflabor Holztechnologie GmbH, Dresden
Test report: 2515141
Result: The test was carried out according to the *AgBB scheme, ISO 16000* parts 3, 6 and 9. After 28 days, no more VOC emissions could be measured.

AgBB result overview (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	0	µg/m³
Sum SVOC (C16 - C22)	0	µg/m³
R (dimensionless)	0	-
VOC without NIK	0	µg/m³
Carcinogenic Substances	0	µg/m³

AgBB result overview (3 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	49	µg/m³
Sum SVOC (C16 - C22)	0	µg/m³
R (dimensionless)	0.034	-
VOC without NIK	0	µg/m³
Carcinogenic Substances	0	µg/m³

8. References

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