ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Lindner Group**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-LIN-20160235-IAA1-EN
Issue date	30.12.2016
Valid to	29.12.2021

Raised Floor System, Type LIGNA

Lindner Group

Institut Bauen und Umwelt e.V.

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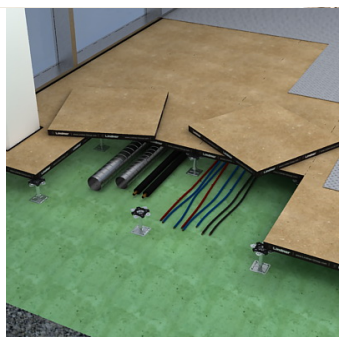


1. General Information

Lindner Group

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

Declaration number
EPD-LIN-20160235-IAA1-EN

This Declaration is based on the Product Category Rules:
System floors, 11.2014
(PCR tested and approved by the SVR)

Issue date
30.12.2016

Valid to
29.12.2021

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

Dr. Burkhart Lehmann
(Managing Director IBU)

Raised Floor System, Type LIGNA

Owner of the Declaration
Lindner Group
Bahnhofstr. 29
94424 Arnstorf

Declared product / Declared unit
1 m² raised floor system, Type LIGNA without surface covering

Scope:
This EPD relates to the LIGNA raised floor system. The collected production data refer to the year 2015. The life cycle assessment (LCA), which is based on plausible, transparent and comprehensible base data, represents the above-named system product on a full scale (100%). This document is translated from the German Environmental Product Declaration into English. It is based on the German original version EPD-LIN-20160235-IAA1-DE. The verifier has no influence on the quality of the translation.

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

Dr. Frank Werner
(Independent verifier appointed by SVR)

2. Product

2.1 Product description / Product definition

LIGNA raised floor systems are industrially factory-prefabricated in the factory as modular components that provide installation space to accommodate all kinds of installation, supply and disposal lines and allow free access into this cavity at any time and at any point.

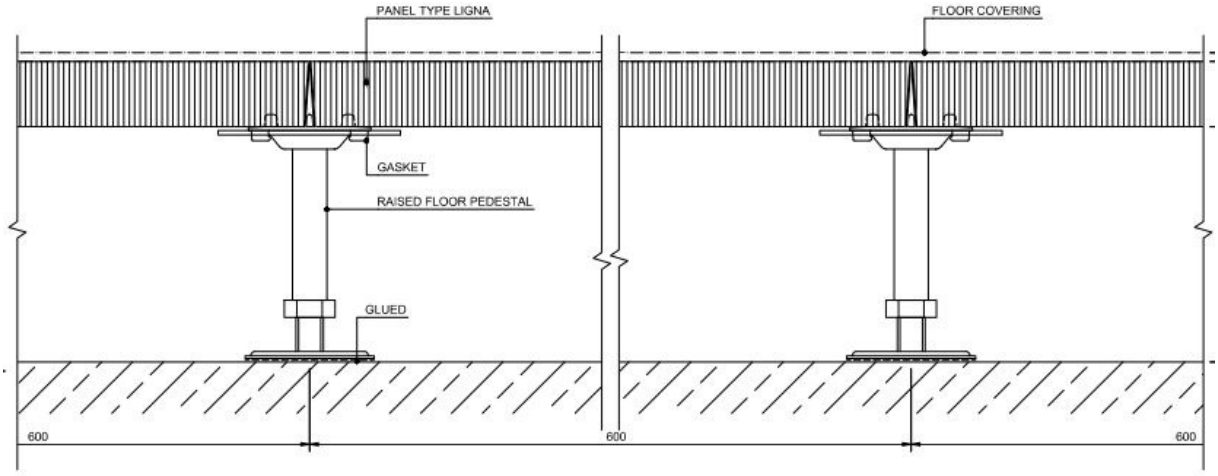
The raised floor system is mainly formed by using raised floor panels and a substructure. Additional parts or products are required for assembly (support plates, bare floor sealant, support adhesive, thread sealant, edge sealant and wall connection strip).

LIGNA raised floor panels are manufactured from high-density wood-based sheet material (gross density range approx.. 600 – 720 kg/m³ with panel thicknesses of 28 – 38 mm). Raised floor panels are by default delivered in dimensions 600 x 600 mm and produced with edge bands adhered to the sides. The upper and/or lower surfaces of the panels are coated with sheet steel or moisture protection.

Steel supports are used for the substructure and these cater for different construction heights (28 – 2,000 mm). Assembly of the individual components into a composite surface (installation in the premises) creates the raised floor form of construction. The panel types (density and panel thickness) and dimensioning of the substructure are to be determined according to the specific requirements.

Use of this product is subject to the respective national provisions at the place of use, in Germany for example the building regulations of the federal states and the technical provisions based on this legislation.

A surface covering is not considered in the life cycle assessment, since there is a great variety of surface coverings such as parquet, linoleum, carpet, etc. Therefore, consideration of surface coverings would not be meaningful for the LIGNA raised floor panel.



2.2 Application

The raised floor system named in 2.1 and made from high-density wood-based sheet material, raised floor supports and supplementary components is mainly intended for creating cavities / installation spaces in public, commercial and private buildings. Raised floor systems can be covered with all the usual floor coverings, but must be aligned to the system variants.

2.3 Technical Data

Construction Data

Name	Value	Unit
System construction (total, FFL)	148 - 159	mm
Layer thickness Base course layer thickness (from – to)	28 - 38	mm
Substructure from – to)	120	mm
Grammage Surface weight / system weight	26 - 41	kg/m^2
Weight Weight of each system	24	kg
Density Base course density	650	kg/m^3
Point load Statik (EN 12825 / EN 13213)	2 - 4	kN
Fire protection (EN 13501/DIN 4102) construction material class carrier plate*	B-s2, d0-C-s1,d0	-
Fire protection (EN 13501/DIN 4102) fire resistance*	F30 REI 30	-
Electrostatics (DIN EN 1081)	10^6	Ω
Sound insulation (laboratory values; VDI 3762 is to be observed)* standard side noise level difference D nfw	45 - 54	dB
Sound insulation (laboratory values; VDI 3762 is to be observed)* sound insulation Rw	62	dB
Sound insulation (laboratory values; VDI 3762 is to be observed)* standard side noise level L nfw	66 - 45	dB
Sound insulation (laboratory values; VDI 3762 is to be observed)* footfall noise level reduction ΔL w	20 - 33	dB

*= The listed values show the complete testing range of the LIGNA raised floor system. Values for the specific raised floor system were evidenced by individual test reports.

Product performance values in terms of its characteristics as per the decisive technical stipulation (no CE approval mark).

2.4 Delivery status

LIGNA raised floor panels (standard 600 x 600 mm) are delivered stacked on a pallet. The stack height depends on the thickness of the panels and the respective covering applied. Steel supports are delivered in cardboard packaging also on pallets.

2.5 Base materials / Ancillary materials

Name	Value	Unit
High density wood-based panel	75-90	%
Supports (galvanized steel)	4-6	%
Sheet steel (galvanized steel)	10-20	%
Moisture protection (aluminium / aluminium-PET)	<0,5	%
Dispersion adhesive	<0,5	%
Hot melt (EVA) (EVA) adhesive	<0,5	%
Edge strip (PVC/ABS)	<0,5	%

Other components for raised floor installation include: Lindner support adhesive, wall connection strip (amount required dependent on the extent of the premises), support plates, solvent-free thread sealant, bare floor sealant concentrate, solvent-free edge sealant and levelling plates. These materials are not covered by this declaration (see the LIGNA installation instructions for further details).

2.6 Manufacture

Production and treatment of the raised floor panel: The high density wood-based sheet material delivered in large format is cut to size in a first production step.The panels are then coated top and bottom with sheet steel or moisture protection in further production steps. Edge strips are adhered to the edges of the wood-based sheet material.

Production of the supports:The supports are produced by resistance welding or clinching the individual components; tubes, threaded rods and sheet steel.Dimensions of the individual components are based on technical specifications. Electroplating (galvanic zinc coating) applies a zinc coating to the supports to protect them from corrosion.

Lindner Group operates a quality management system in conformity with /EN ISO 9001/.

2.7 Environment and health during manufacturing

The production of raised floor panels from wood materials and of raised floor supports is carried out in facilities approved under environmental protection provisions. Incidental wood waste is used for the generation of energy.

Lindner Group operates an energy management system in conformity with /EN ISO 50001/ and an environmental management system in accordance with /EN ISO 14001/.

2.8 Product processing/Installation

The individual components delivered to a construction site are joined to create a LIGNA flooring system. Please refer to the raised floor installation guideline for further instructions. Installation must be carried out by trained personnel.

2.9 Packaging

Raised floor panels are delivered stacked on pallets, wrapped with paper or cardboard, strapped with plastic tape and wrapped in plastic film, if required. Raised floor supports and the other individual components are stacked or layered in cardboard packaging.

The packaging material is easy to separate and may, where applicable, be used or utilised elsewhere. The remainder – having been correctly separated - can be collected and taken to the regional recycling centre. Residual materials are to be disposed of according to the relevant national provisions.

The packaging specifications for all standard Lindner products are always defined in the packaging data sheets.

2.10 Condition of use
The wood required for manufacture of the chipboard binds 35.66 kg of CO2 as carbon.

2.11 Environment and health during use
No health hazards and impairments are to be expected based on current knowledge in the case of normal, appropriate use intended for raised floor systems. For further details see Section 7 *(Indoor Air Comfort Gold Label*).
According to the current state of knowledge proper use of the described products will not cause any exposure to air, water and soil .

2.12 Reference service life
A reference service life according to ISO 15686 cannot be calculated for this product. The technical service life is therefore derived from the table "Service life of components for life-cycle analysis according to the rating system for sustainable construction (Bewertungssystem Nachhaltiges Bauen – BNB) – Code No. 352.911" of the Federal Office for Construction and Regional Planning /BBSR/. The BNB assumes that raised floor systems will have a service life of more than 50 years. The stated service life is subject to proper use, preservation and care .

2.13 Extraordinary effects

Fire
LIGNA raised floor panels are "flame retardant" according to /EN 13501- 1/ and classified in building material class B-s2,d0 or C-s1,d0.

Fire prevention

Name	Value	Unit
Building material class	B or C	-
Smoke gas development	s1 or s2	-
Burning droplets	d0	-

Water
Lindner's LIGNA raised floor system is to be installed indoors and should not generally come into contact with water. Short exposure to moisture will not damage the system provided it can dry completely afterwards. Exposure of the raised floor system to greater amounts of water over a longer period will not give rise to the leaching of substances that may pollute watercourses. This may, however, impairme its technical properties, as Lindner raised floor systems are not water resistant and the panels tend to swell and the supports corrode in very damp or wet surroundings.

Mechanical destruction
The durability and functionality of the system will be impaired in the event of mechanical destruction. Depending on the extent of the destroyed areas, these can be rebuilt by replacement or new installation without impairing functionality.

2.14 Re-use phase
Removal / reuse
The raised floor panels can be removed in a non-destructive wayand reused in unaltered form for the same purpose. Prior separation of other construction materials on the construction site is recommended for the remaining subsequent types of use / disposal.

Further use / recycling
Reuse of stripped wood-based panels (recycling) is achieved by means of conditioning and crushing. The recycled wood can be reintroduced as a raw material for the production of new panels.
Given their high calorific value, LIGNA panels are typically used for generating energy in cases where reuse or material recycling is not practical.

It is recommended that the raised floor supports are 100% recycled.

2.15 Disposal
Any raised floor panel remnants on the construction site or from dismantling activities should first and foremost be sent for material recycling. If this is not possible, they must be used for energy recovery instead of being disposed of in a landfill. (AVV 170201)

2.16 Further information
Further product information is available at:
www.Lindner-Group.com

3. LCA: Calculation rules

3.1 Declared Unit
The declared unit relates in each case to 1 m² of LIGNA raised floor without floor covering and with an average floor panel thickness of 37.52 mm and an average density of 644.31 kg/m³.
The declared unit has an overall weight for the panel of 24.17 kg/m² plus 1.3488 kg for the associated supports (4 pieces per m² of raised floor) with a weight of 0.3372 kg per support. Any
surface covering is not considered in the life cycle assessment, since there is a great variety of surface coverings such as parquet, linoleum, carpet, etc.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Grammage (incl. substructure)	25.95	kg/m^2
Conversion factor to 1 kg	0.03853	-

3.2 System boundary
The life cycle analysis for the LIGNA raised floor system includes the stages "cradle to gate with options".

It sets out with the production and processing of the raw materials and / or cutting of the chipboard. Also included is the production of the other auxiliary materials and consumables, such as fuels for transport

and packaging for the system floors and steel supports ready for delivery. Consideration is given to Modules A1–A3 as a combined module for the production phase, A4–A5 (deployment phase), B1–B5 (use phase), C1–C4 (disposal phase), D (credits and debits beyond the system boundaries).

In particular, the following processes were included in the information module A1–A3 for the production of the LIGNA raised floor system:
- Raw material provision processes (wood-based sheet material, steel) (A1)
- Transport of raw and auxiliary materials and consumables to the plant (A2)
- Production processes for the system product in the plant, including energy costs (power, thermal energy and disposal of residual substances (A3)
- Production of packaging materials (A3)
- Transport from the factory gate to the construction site (A4). No further materials are considered for installation within the building; module A5 includes the environmental impact caused by the disposal of the packaging.

The modules are declared with 0 for the use phase (B1–B5). During the use phase the product causes no environmental impacts. The product itself does not require any maintenance; floor cleaning will always depend on the type of surface covering and usage. The EPD refers purely to the raised floor construction. With normal use, repair or replacement is not to be expected during use of the building. Modules B6 and B7 are not considered. The disposal stage considers the dismantling and removal of the product from the building, including initial manual sorting on the construction site (C1) and transportation to a local recycling centre (C2). The chipboard never reaches the end of waste status. This is to be burned as waste in C3 and the exported energy declared; the averted environmental impacts to produce this energy are duly reflected in D. It is assumed that the steel supports reach end of waste status after transport to the recycling yard. A specialist disposal company will receive credit for the sorted steel. The steel therefore becomes a reusable material. The steel supports are recycled in Module D. No environmental impacts arise in Module C4. This is therefore declared with 0.

3.3 Estimates and assumptions

Specific or material average data inventories are not available for all materials. The data set for plastic granulate is used for the plastic edge strip and approximate data sets are applied for certain chemicals used in the process for electroplating the raised floor supports.

3.4 Cut-off criteria

In the case of all specified data collected from operational data, i.e. all source materials used following production guidelines, the thermal and electrical energy are taken into account. Materials with a proportion of less than 1 percent are ignored. The sum of ignored amounts of materials and energy is below 5% according to mass, energy or environmental relevance.

3.5 Background data

The software system for holistic balancing developed by thinkstep AG was used for modelling the life cycle of the product concerned (/GaBi 6/ Service Pack 29). The data required for the prior chain, for which no specific details are available, were taken from the GaBi database: /http://www.gabi-software.com/support/gabi/gabi-database-2016-lci-documentation/.

3.6 Data quality

Small uncertainties arise from the background data resulting from provision of the GaBi databases and these have to be considered in interpreting the results. The background data are not more than 5 years old. The quality of the data can be rated as good.

3.7 Period under review

The base data for the life cycle assessment was collected in 2015.

3.8 Allocation

No by-products are generated during the production process. The applied software model therefore includes no such allocation. The data collection values for thermal and electrical energy and auxiliary materials accordingly relate to the product being declared. The quantities of raw and auxiliary materials and consumables used at the raised floor panel production unit in the reference year 2015 are well known, so a clear distribution by mass, surface area and weight is possible. The same applies to the production unit for the supports, here a conversion based on the existing input materials and the number of supports was taken into account.

Small quantities of metal waste (swarf, punching residue and offcuts) arise from processing of the steel. This scrap does directly reach the end of waste status. No environmental impact is considered for the input quantity of steel scrap. Equally the arising production residues leave the system without environmental debits or credits. In the end-of-life scenario, the entire "steel support" product undergoes a recycling process (electric arc furnace). The resulting quantity of secondary steel (yield 95%) is calculated to avert environmental impacts corresponding to the quality of the general blast furnace route. The data inventory of this steel billet contains 15.5% scrap. The quantity of steel resulting from this pragmatic modelling technique, whereby negative values are duly reflected in Module D for the avoidance of its production, is somewhat lower compared to the mathematical approach of the net flow calculation.

Any combustible production waste (wood dust) and the product (chipboard) are to be used to generate energy at the end of life. The resulting electrical and thermal energy is accounted for within Modules A1–A3 or is duly reflected for the subsequent system (Module D). The thermal energy released during thermal waste incineration can be regarded as equivalent to the required thermal process energy.
All combustion processes used are reflected by partial flow analyses for the respective materials.
The primary energy content is calculated with the awareness of a certain inaccuracy with a flat-rate calorific value of 11.2 MJ/kg of chipboard. This value is duly reflected as renewable primary energy. Account is taken of the fact that the proportion of approx. 30% wood scrap is to be deducted.
The values for the packaging are used as a reference point. Precise values for the water content of the pallets are not available.

An R1 factor of greater than 0.6 is assumed for all waste incineration plants. The credits are made using

the German average data for electrical energy and thermal energy from natural gas.

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. The GaBi database was used (see Section 8, References).

4. LCA: Scenarios and additional technical information

Below find a more detailed description of the scenarios upon which the life cycle assessment was based.

Transport from the manufacturer to the point of use (A4)

This product is packed in the factory and loaded onto a lorry. It is assumed that the lorry travels a distance of 500 km to get to the construction site.

Name	Value	Unit
Litres of fuel	0.0437	l/100km
Transport distance to site	500	km

Installation in the building (A5)

The raised floor panels are to be mechanically installed at the construction site by professionals; the packaging is to be removed prior to installation; the raised floor panels will be installed afterwards. There are no environmental impacts connected with such installation.

Module A5 only includes the environmental impacts for disposal of the packaging

Name	Value	Unit
Auxiliary material (not included)	0	kg
Water consumption (not relevant)	0	m^3
Other resources	0	kg
Electricity consumption (not relevant)	0	kWh
Other energy carriers (not relevant)	0	MJ
Material loss (not included)	0	kg
Output substances following waste treatment on site (packaging of the panel)	0.426	kg

Use (B1) see Section 2.12 "Use"

The modules are declared with 0 for the use phase (B1–B5). There are no environmental impacts from use as recommended by the manufacturer.

Name	Value	Unit

Maintenance and repair (B2)

The product itself does not require any maintenance; floor cleaning will always depend on the kind of surface covering and usage. The EPD refers purely to the raised floor construction. With normal userepair or replacement is not to be expected during use of the building.

Name	Value	Unit
Information on maintenance	0	-
Maintenance cycle	0	Number/RSL
Water consumption	0	m^3
Auxiliary material	0	kg
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Material loss	0	kg

Repair (B3)

The product itself has no need of repair.

Name	Value	Unit
Information on the repair process	0	-
Information on the inspection process	0	-
Repair cycle	0	Number/RSL
Water consumption	0	m^3
Auxiliary	0	kg
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Material loss	0	kg

Replacement (B4) / modification / renewal (B5)

The product does not require renewal during the RSL.

Name	Value	Unit
Replacement cycle	0	Number/RSL
Electricity consumption (not relevant)	0	kWh
Litres of fuel (not relevant)	0	l/100km
Replacement of worn parts (not relevant)	0	kg

Reference service life

A reference service life cannot be calculated for this product. A technical service life of around 50 years is assumed according to the BNB.

Name	Value	Unit

End of life cycle (C1-C4)

The steel supports are to be fully recycled, the raised floor panels are to be taken to a waste incineration plant.

Name	Value	Unit
Recycling (Floor supports)	1.34	kg
For waste incineration (Raised floor panels)	24,2	kg

Reuse, recovery and recycling potential (D), relevant scenario information

The product is to be recycled at the end of life in the same composition as described in the declared unit. It is assumed that the panels are carried a distance of 100 km by lorry from the construction site to the nearest recycling plant. Thermal recycling in a waste incineration plant is assumed for the chipboard. The exported energy substitutes fuels from fossil sources, assuming that the thermal energy was produced from natural gas. The substituted power corresponds to the German electricity mix from the year 2012. The steel supports are to be recycled; whereby losses occurring in the recycling process are taken into account. The averted environmental impacts of the resulting secondary steel are duly reflected according to the input composition in module D.

Name	Value	Unit

5. LCA: Results

Information on the environmental impacts is determined using the characterisation factors given in the CML publication dated April 2015. Long-term emissions are not taken into account.
The characterisation factors applied comply with the requirements of Annex C of DIN EN 15804.

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 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	X	X	X	X	X	X	X	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² LIGNA raised floor system

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	-2.84E+1	6.30E-1	5.00E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.24E-1	4.35E+1	0.00E+0	-1.57E+1
ODP	[kg CFC11-Eq.]	7.10E-9	1.32E-12	1.37E-13	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.58E+0	1.58E-10	0.00E+0	-4.25E-10
AP	[kg SO_2-Eq.]	4.50E-2	1.00E-3	7.13E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.84E-4	1.40E-2	0.00E+0	-2.20E-2
EP	[kg $(PO_4)^{3-}$-Eq.]	5.60E-3	3.60E-4	1.01E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.07E-5	3.56E-3	0.00E+0	-2.88E-3
POCP	[kg ethene-Eq.]	7.00E-3	-4.00E-4	5.18E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-8.81E+0	9.88E-4	0.00E+0	-2.66E-3
ADPE	[kg Sb-Eq.]	3.81E-5	4.81E-8	2.67E-9	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.44E-9	4.17E-7	0.00E+0	-3.38E-6
ADPF	[MJ]	1.90E+2	8.64E+0	1.25E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.70E+0	1.08E+1	0.00E+0	-1.96E+2

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - RESOURCE USE: 1 m² LIGNA raised floor system

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
PERE	[MJ]	5.89E+0	5.89E-1	4.05E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.16E-1	1.83E+2	0.00E+0	-3.56E+1
PERM	[MJ]	1.88E+2	0.00E+0	-5.47E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.83E+2	0.00E+0	0.00E+0
PERT	[MJ]	1.94E+2	5.89E-1	-1.42E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.16E-1	1.32E+0	0.00E+0	-3.56E+1
PENRE	[MJ]	2.07E+2	8.67E+0	1.40E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.70E+0	1.24E+1	0.00E+0	-2.17E+2
PENRM	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	2.07E+2	8.67E+0	1.45E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.70E+0	1.24E+1	0.00E+0	-2.17E+2
SM	[kg]	7.42E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.03E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m³]	9.35E-2	8.90E-4	1.21E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.74E-4	9.91E-2	0.00E+0	-2.05E-2

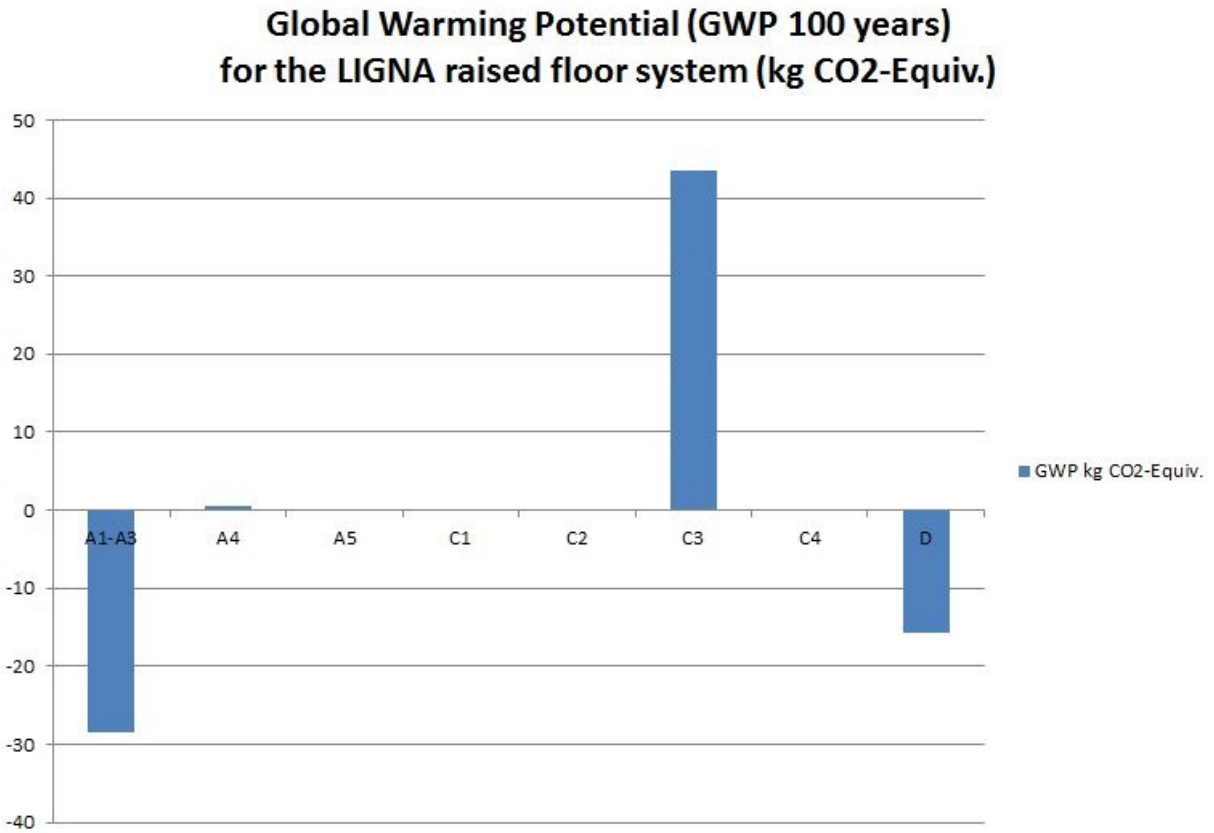
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² LIGNA raised floor system

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
HWD	[kg]	1.47E-6	1.16E-6	8.88E-11	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.19E+0	8.63E-9	0.00E+0	-1.15E+0
NHWD	[kg]	3.69E-1	1.00E-3	1.69E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.00E-4	9.19E-2	0.00E+0	-1.22E-1
RWD	[kg]	6.60E-3	1.17E-5	8.05E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.31E+0	6.00E-4	0.00E+0	-8.40E-3
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	1.34E-1	0.00E+0	8.58E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.29E+0	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	7.27E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.27E+1	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	1.73E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.93E+1	0.00E+0	0.00E+0

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

6. LCA: Interpretation



Global warming potential (GWP)
The global warming potential for the overall product (wood + metal) is negative relating to the pure production phase. The wood required for manufacture of the chipboard binds 35.66 kg of CO2 as carbon. A 23.3 kg panel has an ATRO timber content of 19.45 kg and a recognised biogenic carbon content of 0.5 kg. The production of steel leads to greenhouse gas emissions. Although this value is lower than the CO2 bound in the chipboard.
Combustion of the chipboard in a waste incineration process is assumed for the end of life scenario. The carbon stored in the wood is released again as a biogenic CO2 emission (C3). The transport processes (A4, C2) only have a very slight impact on the global warming potential. The electrical and thermal energy resulting from the combustion is available to a subsequent system. The averted environmental impacts for their production are duly reflected as a negative value in D.

Ozone depletion potential (ODP)
The very low values in the impact category ODP result from emissions during steel production (A1–A3).

Eutrophication potential (EP) and acidification potential (AP)
Contributions to these environmental impacts are caused mainly by production of the chipboard (A1–A3). The negative values in Module D result mainly from avoided environmental impacts due to energy generation during combustion of the chipboard and the secondary steel being available to a subsequent system.

Photochemical oxidant creation potential (POCP)
The photochemical oxidant creation potential is mainly caused by the provision of raw materials. A4 and C2 indicate small negative values due to NO emissions, with transport processes allocated a negative characterisation factor under CML.

Abiotic degradation potential for fossil fuels (ADPF) and PENRT Fossil fuels are mainly required in the production of the steel supports. The recycling at end of use also requires energy, but less than the production of new material so that a negative contribution remains in Module D.

7. Requisite evidence

7.1 Formaldehyde

Inspections of the formaldehyde content in the raised floor panels were conducted as per the perforator method according to /EN 120/ and correspond to E1 quality. (Threshold of 6.5 mg (half-year average) or 8.0 mg (single value)).
Result: The thresholds under /EN 120/ are met.
Measuring point: Depending on the respective wood-

based sheet material supplier. Project-related verification can be requested.

7.2 MDI

Testing for MDI and other isocyanates is conducted according to the respective wood-based sheet material supplier using the following methods: NIOSH (National Institute for Occupational Safety and Health) physical and chemical analytical method 142 (P&CAM142) or BIA 7670 or RAL UZ-76.
Result: Emissions of MDI and other isocyanates lie below the detection limit. Measuring point: Depending on the respective wood-based sheet material supplier. Project-related verification can be requested.

7.3 Inspection for pretreatment of the input materials

Result: The thresholds of the Federal Waste Wood Ordinance are observed. Measuring point: Depending on the respective wood-based sheet material supplier. Project-related verification can be requested.

7.4 Toxicity of fire gases

No toxicological studies were conducted.

7.5 VOC emissions

Test Report No. G 17285A/B is available for the raised floor panel. The test institute was /Eurofins Product Testing/ A/S, Smedeskovvej 38, DK-8464 Galten, Denmark.
Result: The LIGNA raised floor panel investigated meets the requirements for award of the Eurofins Air Comfort Gold Label, Version 3.1.

German Committee for Health-Related Evaluation of Building Products (AgBB) performance summary (28 days)

Name	Value	Unit
TVOC (C6 - C16)	0 - 5	µg/m³
Sum SVOC (C16 - C22)	0 - 5	µg/m³
R (dimensionless)	0 - 1	-
VOC without NIK	0 - 5	µg/m³

According to /AgBB/ the investigated product "LIGNA raised floor system" is suitable for use in indoor areas in accordance with the "admission principles for health-related evaluation of building products in indoor spaces" (DIBt report 10/2008) in connection with the /AgBB/ NIK values in the version dated March 2008. The raised floor panel meets the requirements of the American standard /California Specification/ Section 01350 (CA/DHS/EHLB/R-174) – Version of July 15, 2004 – as well as the requirements for award of the Eurofins Air Comfort Gold Label, Version 3.1.

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