

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

| | |
|--------------------------|--------------------------------------|
| Owner of the Declaration | Lindner Group |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
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| Valid to | 12.06.2030 |

Raised Floor Panel, Type LIGNA Lindner Group

www.ibu-epd.com | <https://epd-online.com>



1. General Information

Lindner Group

Programme holder
IBU – Institut Bauen und Umwelt e.V.
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Germany


Declaration number
EPD-LIN-20240249-IBC1-EN

This declaration is based on the product category rules:
System floors, 01.08.2021
(PCR checked and approved by the SVR)

Issue date
13.06.2025

Valid to
12.06.2030


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Raised Floor Panel, Type LIGNA

Owner of the declaration
Lindner Group
Bahnhofstraße 29
94424 Arnstorf
Germany

Declared product / declared unit
1 m² raised floor panel Type LIGNA without surface covering or substructure.

Scope:
This EPD relates to the production, transport and disposal of an average LIGNA raised floor panel. The results of the EPD are valid for all LIGNA raised access floors with a thickness between 28 and 38 mm. The EPD is only valid for the LIGNA raised floor panel. 4
The panel offers customization with steel sheets applied to one or both sides to meet specific static requirements or customer preferences. The environmental impacts of these options are calculated separately and included in the annex.

The collected production data refers to the year 2022. The production facility is located in Arnstorf, Germany.
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*.

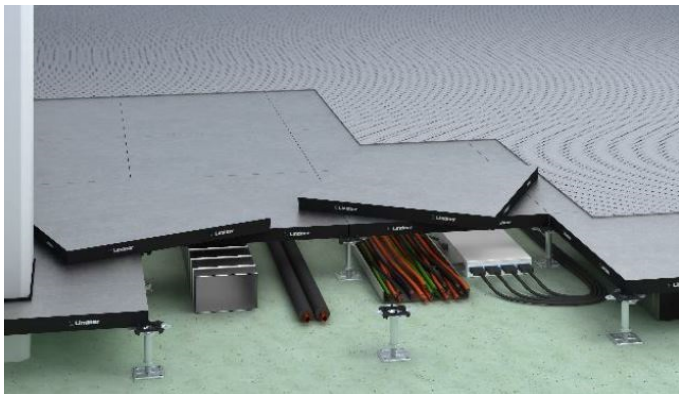
| | |
|--|------------|
| The standard EN 15804 serves as the core PCR | |
| Independent verification of the declaration and data according to ISO 14025:2011 | |
| <input type="checkbox"/> | internally |
| <input checked="" type="checkbox"/> | externally |


Mr Stephen Forson ,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The declared product Lindner raised floor panel type LIGNA is a highly compressed wood-based panel, which is an essential component of the raised access floor system type LIGNA. The declared product has a thickness of 28 - 38 mm and a bulk density range of 600 - 720 kg/m³. The raised access floor panels are manufactured as standard in the dimensions 600 x 600 mm and with edge trim glued to the sides. The underside and/or top side of the panels are coated with steel sheet or humidity protection. The raised access floor panel type LIGNA was developed and tested on the basis of the test and classification standard *EN 12825* (raised access floors). The substructure (pedestals) are not considered in this EPD. In the annex a surface covering as steel sheet on one or both sides is considered. The EPD is only valid for the LIGNA panel. Steel sheets are mentioned in the annex for reference. The panel offers customization with steel sheets applied to one or both sides of the panel to meet specific static requirements or customer preferences, as mentioned in the annex.



2.2 Application

The raised access floor panel is made out of high-density wood-based material and is mainly used in public, commercial and private buildings. In combination with additional components, the raised access floor system LIGNA is created, which is used to create cavities or space for installation rooms. The raised access floor panels can be covered with all standard floor coverings, but it is necessary to match them to the different variants.

2.3 Technical Data

The raised floor system has a layer thickness ranging from 28 to 38 millimeters and a grammage weight of 17 to 27 kilograms per square meter, with a base course density of 650 kilograms per cubic meter. In terms of performance, it can withstand a static point load of 2 to 7 kilonewtons as per *EN 12825* and offers fire protection classified from B-s2, d0 to F30 / REI 30 according to *EN 13501* and *DIN 4102*

Construction Data

| Name | Value | Unit |
|---|------------------|-------------------|
| Layer thickness Base course layer thickness (from – to) | 28 - 38 | mm |
| Grammage weight | 17 - 27 | kg/m ² |
| Density Base course density | 650 | kg/m ³ |
| Point load Static (<i>EN 12825</i>) | 2 - 7 | kN |
| Fire protection (<i>EN 13501/DIN 4102</i>) construction material class carrier plate* | B-s2, d0-C-s1,d0 | - |
| Fire protection (<i>EN 13501/DIN 4102</i>) fire resistance* | F30 / REI 30 | - |
| Sound insulation (laboratory values; <i>VDI 3762</i> is to be observed)* standard side noise level difference D nfw | 45 - 59 | dB |
| Sound insulation (laboratory values; <i>VDI 3762</i> is to be observed)* sound insulation R _w | 62 | dB |
| Sound insulation (laboratory values; <i>VDI 3762</i> is to be observed)* standard side noise level L nfw | 69 - 30 | dB |
| Sound insulation (laboratory values; <i>VDI 3762</i> is to be observed)* footfall noise level reduction ΔL _w | 16 - 33 | dB |

*=The listed values show the complete testing range of the LIGNA raised floor panel.
Product performance values in terms of its characteristics as per 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.

2.5 Base materials/Ancillary materials

| Name | Value | Unit |
|---|--------|------|
| High density chipboard panel | 99 | % |
| Humidity protection (aluminium / aluminium-PET) | <0,05 | % |
| Dispersion adhesive | <0,05 | % |
| Thermoplastic adhesive (EVA) | <0,005 | % |
| Edge trim (ABS) | <0,005 | % |

In addition to the declared raised access floor panel LIGNA, other components that are not part of the declaration are required for the construction of a raised access floor system. (see installation instructions for raised access floor systems).

1) 'This product/article/at least one partial article contains substances listed in the candidate list (date: 01.06.2024) exceeding 0.1 percentage by mass: no'.

2) 'This product/article/at least one partial article contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no'

3) "Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no'

2.6 Manufacture

Production and treatment of the raised access floor panels are follows: the high density chipboard panels are delivered in large format and are then cut to size in a first production step. The panels are then covered with aluminium foil for humidity protection in further production steps. Edge trims are adhered

to the sides of the chipboard panels. 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 made from chipboards is carried out in facilities approved under environmental protection provisions. 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 raised access floor panel LIGNA delivered to the construction site is joined together with other individual components to form a system floor. Further instructions can be found in the installation guidelines for raised access floors. Installation must be carried out by trained personnel.

2.9 Packaging

The product is delivered stacked on pallets and wrapped with cardboard. The packaging material will be disposed accordingly.

2.10 Condition of use

There is no change in the material properties during the utilisation phase. All technical values remain unchanged.

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 access floor panels. For further details see Section 7.

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 – Code No. 352.911" of the Federal Office for Construction and Regional Planning *BBSR*. The *BNB* assumes that raised floor panels will have a service life of more than 50 years. The stated service life is subject to proper use, preservation and care. There is no influence of ageing on the material properties during the utilisation phase.

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 | - |

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is an average of 1 m² of LIGNA raised floor panel without any covering and without substructure. The average panel thickness is 37.04 mm and has an average density of 645 kg/m³.

The declared unit has a weight of 24,66 kg/m².

The results of the EPD are valid for all the LIGNA raised floor panels with a range of thickness between 28 and 38 mm. The heaviest product in the product family could have 9% more weight, the lightest panel could have 28% less weight than the

Water

The LIGNA raised floor panel is to be installed indoors and should generally not come into contact with water. Short exposure to moisture will not damage the panel provided it can dry completely afterwards. Exposure of the raised floor system to greater amounts of water over a longer period may, however, impair its technical properties, as the product is not water resistant and the panels tend to swell in very damp or wet surroundings.

Mechanical destruction

No impacts on the environment following unforeseeable mechanical destruction. Depending on the extent of the destroyed areas, these can be replaced or newly installed without impairing functionality.

2.14 Re-use phase

The following possibilities arise with regard to the phase after the service life:

Energy utilisation

After being separated from other construction debris, the floor panel is suitable for energy recovery.

Further use / reuse

The raised floor panels can be removed in a non-destructive way and reused in unaltered form for the same purpose. Prior separation from other construction materials on the site is recommended.

Refurbishing / further use

Panels are "only" peeled off on the top side either on the construction site or in the factory. The resulting product has then been minimally refurbished and maintains all its technical qualities.

2.15 Disposal

The waste codes for the raised floor panel and its packaging are in accordance with the Waste Catalogue Ordinance (AVV) and the *European Waste Index*:

Product waste

EAK 170904 / wood

Packaging waste

EAK 15 01 03 / packaging from wood

EAK 15 01 01 / packaging from cardboard

2.16 Further information

Further product information is available at:

www.Lindner-Group.com

dU. The results of the life cycle assessment will be representative for the whole family of Ligna panels.

Declared unit

| Name | Value | Unit |
|---------------------------|-------|-------------------|
| Declared unit | 1 | m ² |
| Grammage | 24.66 | kg/m ² |
| Conversion factor to 1 kg | 0.04 | - |
| Gross density | 645 | kg/m ³ |
| Layer thickness | 0.04 | m |

The product might have an optional steel sheet covering on 1 side or both sides. The environmental impact of these options is declared in the annex. In order to calculate the impact of the panel with steel covering, the result of the EPD would be added acc. to the calculation formula.

3.2 System boundary

The life cycle analysis for the LIGNA raised access floor panel includes the stages "cradle to gate with options".

Modules A1-A3 are taken into account as a summarised module for the manufacturing phase, A4-A5 (construction phase), C1-C4 (disposal phase), D (potentials at the end of life and loads outside the system boundary).

In detail, the following processes were included in the information module for the production and disposal of the raised access floor panel:

- Provision processes of raw material (chipboard panel, steel, adhesive) (A1)
- Transport of raw and auxiliary to the plant (A2)
- Manufacturing processes for the floor panel, including energy expenditures and disposal of waste materials (A3)
- Production of packaging materials (A3)
- Transport from the factory gate to the construction site (A4)
- Installation is made manually. Transport of the product to different floors of the building is not taken into account (A5)
- The environmental impact of the disposal of the packaging (A5).
- Dismantling of the product is done manually (C1)
- Transport to an incineration facility C2/1 or return to production facility(C2)
- Waste treatment in an incineration facility (C3/1), refurbishment in C3
- End-of-life potential for the substitution of primary material in module D and D/1.

3.3 Estimates and assumptions

For the chipboard panel it is assumed that there is a portion of 30% wood scrap in the panel. The presumptions are based on data from the majority of the chipboard suppliers, as well as on literature.

The material inventories were to be found in the *LCA FE* database, except for the plastic granulate for the edge trim of the panel.

3.4 Cut-off criteria

In the case of all specified data collected all source materials used following production guidelines, were taken into account. Transport for packaging was taken into account. All the components for the raised access floor panel has been balanced.

3.5 Background data

For modelling the life cycle of the product under consideration, the *LCA FE* software developed by *Sphera* has been used. The

data required for the upstream chain, for which no specific information is available, is taken from the *Sphera* database: <https://sphera.com/2023/xml-data/processes>.

3.6 Data quality

The range of weight deviation is between -27% and +9%, the average has been determined using a family of products with the same name, without options in surfaces. The average product aligns closely with the declared unit, making it representative of the product range.

The production of the whole family takes place in the same processes, and expenditure changes for the production are minimal; for environmental core indicators the biogenic carbon content is reliable and representative of the portfolio. As the release within oxidation will take place anyway under module C3 or C4 and they depend on the weight, the results are declared to be robust. The GWP biogenic has a share in the GWP total of approx. 88% for the production phase.

The data set quality is very good to medium. The background datasets from the *LCA FE* databases used are not older than 5 years. The production process for other products as the declared unit does not differ, the geographical representativity remains identical, as well as the background data.

3.7 Period under review

The base data for the life cycle assessment was collected in 2022.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Global

3.9 Allocation

No by-products are generated during the production process. The applied software model therefore includes no such allocation. The data collection values for 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 are well known, so a clear distribution by mass, surface area and weight is possible. No environmental impact is considered for the input quantity of steel scrap.

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.

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.

3.10 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. *LCA FE* Professional and Additional database, Content Version 2023.2, <https://gabi.sphera.com/databases/gabi-data>

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it shall be separately declared for the product and for any accompanying packaging.

If the total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging, the declaration of biogenic carbon content may be omitted. The mass of packaging containing biogenic carbon shall always be declared.

Information on describing the biogenic Carbon Content at factory gate

| Name | Value | Unit |
|---|-------|------|
| Biogenic carbon content in product | 9.86 | kg C |
| Biogenic carbon content in accompanying packaging | 0.14 | kg C |

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO₂.

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 the construction site.

| Name | Value | Unit |
|---|-------|---------|
| Litres of fuel | 0.053 | l/100km |
| Transport distance to site | 100 | km |
| Capacity utilisation (including empty runs) | 70 | % |

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. 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) | - | kg |
| Water consumption | - | m ³ |
| Other resources | - | kg |
| Electricity consumption (not relevant) | - | kWh |
| Other energy carriers (not relevant) | - | MJ |
| Output substances following waste treatment on site (packaging of the panel) | 0.34 | kg |

The stated service life is subject to proper use, preservation and care.

Reference service life

| Name | Value | Unit |
|---|---------|------|
| Life Span (according to BBSR) | 50 | a |
| Life Span according to the manufacturer | 50 | a |
| Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure (temperature, Grad C) | 15 - 25 | - |

End of life cycle (C1-C4)

There are 2 end of life scenarios:

Scenario 0: 100% Refurbishment for reuse, distance to the manufacturer's plant, 100 km, yield rate 100%

Scenario 1: 100% Incineration, distance to the incineration facility 100 km, yield rate 100%

| Name | Value | Unit |
|-------------------------------------|-------|------|
| Scenario 0: Refurbishment for reuse | 24.66 | kg |
| Scenario 1: Incineration | 24.66 | kg |

5. LCA: Results

The characterisation factors applied correspond with requirement of Annex C in /DIN EN 15804/.

Scenario 0: Refurbishment for reuse- represented by C1, C2, C3, C4, D

Scenario 1: Incineration - represented by C2/1, C3/1, C4/1, D/1

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = 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 | X | X | MND | MND | MNR | MNR | MNR | MND | MND | X | X | X | X | X |

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² LIGNA raised access floor panel

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C2/1 | C3 | C3/1 | C4 | C4/1 | D | D/1 |
|----------------|----------------------------------|-----------|----------|----------|----|-----------|-----------|----------|----------|----------|-----------|-----------|-----------|
| GWP-total | kg CO ₂ eq | -3.19E+01 | 1.82E-01 | 9.9E-02 | 0 | 2E-01 | 2E-01 | 3.58E-01 | 3.69E+01 | 3.62E+01 | 5.62E-03 | -4.25E+01 | -1.09E+01 |
| GWP-fossil | kg CO ₂ eq | 4.71E+00 | 1.8E-01 | 2.92E-02 | 0 | 2E-01 | 2E-01 | 2.79E-01 | 7.73E-01 | 0 | 5.61E-03 | -4.75E+00 | -1.08E+01 |
| GWP-biogenic | kg CO ₂ eq | -3.67E+01 | 5.13E-04 | 5.1E-01 | 0 | -9.34E-04 | -9.34E-04 | 7.88E-02 | 3.62E+01 | 3.62E+01 | 0 | -3.77E+01 | -8.75E-02 |
| GWP-luluc | kg CO ₂ eq | 8.83E-03 | 1.09E-03 | 1.52E-05 | 0 | 1.21E-03 | 1.21E-03 | 3.66E-05 | 8.56E-05 | 0 | 5.7E-06 | -8.8E-03 | -1.09E-03 |
| ODP | kg CFC11 eq | 3.84E-11 | 4.51E-14 | 2.54E-14 | 0 | 4.97E-14 | 4.97E-14 | 5.48E-14 | 4.07E-12 | 0 | 9.26E-15 | -3.89E-11 | -1.53E-10 |
| AP | mol H ⁺ eq | 3.48E-02 | 2.38E-04 | 4.58E-05 | 0 | 2.68E-04 | 2.68E-04 | 3.47E-04 | 1.97E-02 | 0 | 1.8E-05 | -3.47E-02 | -1.17E-02 |
| EP-freshwater | kg P eq | 1.08E-04 | 4.3E-07 | 1.53E-08 | 0 | 4.75E-07 | 4.75E-07 | 4.01E-08 | 1.06E-06 | 0 | 5.08E-09 | -1.07E-04 | -3.38E-05 |
| EP-marine | kg N eq | 1.04E-02 | 8.82E-05 | 1.72E-05 | 0 | 1E-04 | 1E-04 | 1.19E-04 | 9.38E-03 | 0 | 4.52E-06 | -1.03E-02 | -4.24E-03 |
| EP-terrestrial | mol N eq | 1.31E-01 | 1.04E-03 | 2.07E-04 | 0 | 1.18E-03 | 1.18E-03 | 1.32E-03 | 1.09E-01 | 0 | 4.97E-05 | -1.31E-01 | -4.48E-02 |
| POCP | kg NMVOC eq | 3.07E-02 | 2.11E-04 | 4.44E-05 | 0 | 2.37E-04 | 2.37E-04 | 3.24E-04 | 2.41E-02 | 0 | 1.42E-05 | -3.06E-02 | -1.08E-02 |
| ADPE | kg Sb eq | -2.24E-06 | 1.32E-08 | 3.51E-10 | 0 | 1.46E-08 | 1.46E-08 | 1.27E-09 | 3.84E-08 | 0 | 1.54E-10 | 2.23E-06 | -1.07E-06 |
| ADPF | MJ | 9.07E+01 | 2.48E+00 | 7.09E-02 | 0 | 2.74E+00 | 2.74E+00 | 3.51E+00 | 1.21E+01 | 0 | 8.38E-02 | -9.12E+01 | -1.68E+02 |
| WDP | m ³ world eq deprived | 1.82E+00 | 9.59E-04 | 1.12E-02 | 0 | 1.06E-03 | 1.06E-03 | 1.7E-02 | 4.17E+00 | 0 | -7.62E-05 | -1.81E+00 | -1.64E-01 |

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; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² LIGNA raised access floor panel

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C2/1 | C3 | C3/1 | C4 | C4/1 | D | D/1 |
|-----------|----------------|----------|----------|-----------|----|----------|----------|-----------|-----------|----|----------|-----------|-----------|
| PERE | MJ | 1.7E+02 | 1.66E-01 | 1.14E+00 | 0 | 1.84E-01 | 1.84E-01 | 3.3E-02 | 3.96E+02 | 0 | 7.53E-03 | -1.68E+02 | -7.43E+01 |
| PERM | MJ | 3.95E+02 | 0 | -1.14E+00 | 0 | 0 | 0 | -3.94E+02 | -3.94E+02 | 0 | 0 | -3.93E+02 | 0 |
| PERT | MJ | 5.65E+02 | 1.66E-01 | 0 | 0 | 1.84E-01 | 1.84E-01 | -3.94E+02 | 2.1E+00 | 0 | 7.53E-03 | -5.61E+02 | -7.43E+01 |
| PENRE | MJ | 3.45E+01 | 2.49E+00 | 7.09E-02 | 0 | 2.74E+00 | 2.74E+00 | 3.51E+00 | 6.29E+01 | 0 | 8.39E-02 | -3.52E+01 | -1.68E+02 |
| PENRM | MJ | 5.63E+01 | 0 | 0 | 0 | 0 | 0 | -5.63E+01 | -5.63E+01 | 0 | 0 | -5.61E+01 | 0 |
| PENRT | MJ | 9.08E+01 | 2.49E+00 | 7.09E-02 | 0 | 2.74E+00 | 2.74E+00 | -5.28E+01 | 6.57E+00 | 0 | 8.39E-02 | -9.13E+01 | -1.68E+02 |
| SM | kg | 2.9E-01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -1.94E-02 | 0 |
| RSF | MJ | 2.01E+02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.97E+02 |
| NRSF | MJ | 5.67E+01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.31E+01 |
| FW | m ³ | 6.28E-02 | 1.48E-04 | 2.66E-04 | 0 | 1.63E-04 | 1.63E-04 | 8.91E-04 | 9.81E-02 | 0 | 9.44E-07 | -6.27E-02 | -2.63E-02 |

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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² LIGNA raised access floor panel

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C2/1 | C3 | C3/1 | C4 | C4/1 | D | D/1 |
|-----------|------|----------|----------|----------|----|----------|----------|----------|----------|----|----------|----------|-----------|
| HWD | kg | 6.72E-07 | 4.19E-12 | 5.17E-13 | 0 | 4.63E-12 | 4.63E-12 | 1.76E-10 | 8.04E-10 | 0 | 6.93E-12 | -6.7E-07 | -5.63E-09 |

| | | | | | | | | | | | | | |
|------|----|----------|----------|----------|---|----------|----------|----------|----------|---|----------|-----------|-----------|
| NHWD | kg | 4.37E-01 | 3.72E-04 | 4.6E-03 | 0 | 4.11E-04 | 4.11E-04 | 8.44E-03 | 3.04E-01 | 0 | 1.2E-01 | -4.35E-01 | -9.73E-02 |
| RWD | kg | 3.6E-03 | 3.27E-06 | 1.5E-06 | 0 | 3.61E-06 | 3.61E-06 | 3.02E-04 | 5.73E-04 | 0 | 9.75E-07 | -3.63E-03 | -7.69E-03 |
| CRU | kg | 0 | 0 | 2.68E-01 | 0 | 0 | 0 | 2.47E+01 | 0 | 0 | 0 | 0 | 0 |
| MFR | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MER | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EEE | MJ | 2.74E-01 | 0 | 9.6E-02 | 0 | 0 | 0 | 1.16E-01 | 4.59E+01 | 0 | 0 | -2.73E-01 | 0 |
| EET | MJ | 6.16E-01 | 0 | 2.06E-01 | 0 | 0 | 0 | 2.7E-01 | 8.17E+01 | 0 | 0 | -6.13E-01 | 0 |

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; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:

1 m² LIGNA raised access floor panel

| Parameter | Unit | A1-A3 | A4 | A5 | C1 | C2 | C2/1 | C3 | C3/1 | C4 | C4/1 | D | D/1 |
|-----------|-------------------|----------|----------|----------|----|----------|----------|----------|----------|----|----------|-----------|-----------|
| PM | Disease incidence | 6.14E-07 | 1.93E-09 | 3.09E-10 | 0 | 2.19E-09 | 2.19E-09 | 3.15E-09 | 5.9E-08 | 0 | 1.94E-10 | -6.12E-07 | -8.6E-08 |
| IR | kBq U235 eq | 4.99E-01 | 3.51E-04 | 1.77E-04 | 0 | 3.87E-04 | 3.87E-04 | 2.34E-02 | 9.13E-02 | 0 | 1.44E-04 | -5.01E-01 | -8.13E-01 |
| ETP-fw | CTUe | 3.87E+01 | 1.81E+00 | 3.82E-02 | 0 | 2E+00 | 2E+00 | 3.99E-01 | 3.87E+00 | 0 | 2.49E-02 | -3.87E+01 | -3.04E+01 |
| HTP-c | CTUh | 9.21E-08 | 3.61E-11 | 1.95E-12 | 0 | 3.99E-11 | 3.99E-11 | 1.73E-11 | 2.91E-10 | 0 | 2.95E-12 | -9.17E-08 | -2.18E-09 |
| HTP-nc | CTUh | 1.2E-07 | 1.51E-09 | 1.28E-10 | 0 | 1.67E-09 | 1.67E-09 | 9.67E-10 | 4.91E-09 | 0 | 2.82E-10 | -1.2E-07 | -5.38E-08 |
| SQP | SQP | 1.44E+03 | 8.84E-01 | 2.43E-02 | 0 | 9.75E-01 | 9.75E-01 | 5.31E-02 | 3.03E+00 | 0 | 7.83E-03 | -1.43E+03 | -5.16E+01 |

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

Global warming potential (GWP) for 1 m² Ligna Panel for different disposal scenarios

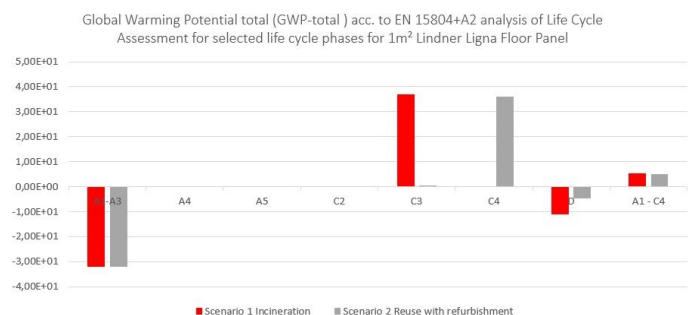
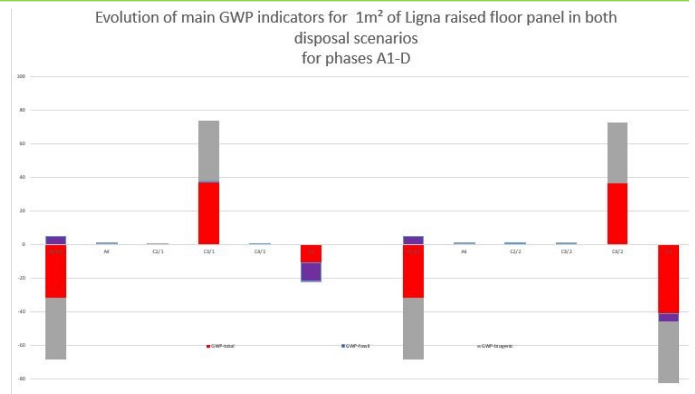
The high biogenic carbon content with its value of 36,15 in module A1 together with the cause GWP fossil in A3 maintain the total GWP value negative in A1-A3.

Modules A4 and A5 have a minimal impact, though for different EoL scenarios the values are different.

In contrast, Scenario 0 (Reuse with Refurbishment) only the refurbishment process in house is booked under module C3 but has a minimal value (0,35 kg CO₂e). The release of the biogenic carbon in this case will be balanced under module C4.

End-of-life choices then diverge: Scenario 1 (Incineration) shows high environmental impact under module C3/1 due to the incineration process, but generates substantial energy recovery potentials under module D/1 from the incinerated raised floor panels. The GWP biogenic will be booked out under the module for incineration, C3/1.

While taking the panel back, the biogenic carbon still exists in the panel, this value for GWP biog. will be declared under D as a reuse potential, as biogenic substance retention. The potential for reuse in this case under D are based on material conservation, for 99,6% of the production of the panel under A1-A3.



7. Requisite evidence

For Lindner LIGNA raised access floor panels, the following tests were carried out as part of ongoing external monitoring or on request.

7.1

Formaldehyde

The tests of the formaldehyde content of the raised access floor panels are carried out in accordance with the provisions of formaldehyde emission according to /EN 717-1/.

Measuring point: Eurofins Product Testing A/S, Galten Denmark

Test Report: 392-2023-00016902_A_EN

Test results: According to the Ordinance on Prohibitions and Restrictions on the Marketing and Distribution of Certain Substances, Mixtures and Products under the Chemicals Act (ChemVerbotsV), Annex 1 (to §3) Prohibitions on Marketing, "Entry 1 Formaldehyde" column 2 (1) Coated and uncoated wood-based materials (chipboard, blockboards, veneer panels and fibreboards) may not be placed on the market if the equilibrium concentration of formaldehyde in the air of a test room caused by the wood-based material exceeds 0.1 ml/cbm (ppm).

The tested material fulfils the requirements of the Chemicals Prohibition Ordinance as follows: ChemVerbotsV [BMU publication test method 2018-11-26] valid from 1 January 2020 Chamber test EN 717-1 [x factor 2.0]: Requirements fulfilled

7.2

MDI

Testing for MDI and other isocyanates is conducted according to the respective chipboard panel supplier using the following methods: determination of methylene diphenyl isocyanate (MDI) emissions from a wood-based panel according to ISO

16000-9 and OSHA Method No. 42

Result: Emissions of MDI and other isocyanates lie below the detection limit.

Measuring point: Depending on the respective chipboard panel supplier. **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 chipboard panel supplier. Project-related verification can be requested.

7.4 Toxicity of fire gases

The toxicity of the fire gases produced when burning raw chipboard corresponds to the toxicity of the fire gases produced when burning untreated wood. **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 the award of the Eurofins Air Comfort Gold Label, Version 3.1.

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

| Name | Value | Unit |
|-------------------------|--------|-------------------|
| TVOC (C6 - C16) | <1.0 | µg/m ³ |
| Sum SVOC (C16 - C22) | 0.1 | µg/m ³ |
| R (dimensionless) | <1 | - |
| VOC without NIK | <0.1 | µg/m ³ |
| Carcinogenic Substances | <0.001 | µg/m ³ |

8. References

Standards

EN 15804

EN 15804:2012+A1 2013, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

EN 15804

EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14025

EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

Further References

Title of the software/database

Title of the software/database. Addition to the title, version. Place: Publisher, Date of publication [Access on access date].

IBU 2021

Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021

www.ibu-epd.com

EN PCR part A

Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN15804+A2:2019 /IBU PART A/. Version 1.4

PCR Part B: System floors, version 19.10.2023, version 1.3

DIN EN 12825

DIN EN 12825:2002-04, Raised floors

DIN EN 13501-1

DIN EN 13501-1:2019-05, Classification of construction products and types into their fire behaviour

DIN 4102-1

DIN 4102-1:1998-05, Fire behaviour of construction materials and components – Part 1: Construction materials; concepts, requirements and inspections

ISO 9001

ISO 9001:2015-09, Quality Management Systems – Requirements

ISO 14001

ISO 14001:2015-09, Environmental Management Systems –

Requirements with
instructions for use

ISO 14044:2006

Environmental management — Life cycle assessment —
Requirements and guidelines

ISO 50001

ISO

50001:2011-06, Energy Management Systems – Requirements
with instructions for
use.

BBSR

Federal Institute for Research on Building, Urban Affairs and
Spatial Development (BBSR): Service lives of construction
components. Service lives of construction components for Life
Cycle Assessments according to the assessment system for
sustainable construction (BNB), in: Federal Ministry for
the Environment, Nature Conservation, Building and Nuclear
Safety (ed.), 2017.

Assessment System for Sustainable Building (BNB)

BNB is an instrument for planning and evaluating sustainable
and usually public construction projects. It complements the
Guideline for Sustainable Building of the Federal Ministry of the
Interior, Building and Community as a holistic assessment
methodology for buildings and their surroundings.

European Chemicals Agency (ECHA)

ECHA, guidance and compliance materials - ensure the safe
use of chemicals - scientific and technical advice on EU
chemical policies www.echa.europa.eu

European Waste Index

Systematic efforts within the European Union to track and
categorize waste generation and management practices across
member states. This involves collecting data on waste types,
quantities, disposal methods, and recycling rates to promote
sustainable waste management and ensure compliance with

EU environmental regulations.

Further references

LCA software GaBi

Sphera's LCA for Experts (GaBi) 10.7.1.28

LCA database

Sphera's LCA for Experts (GaBi) database 2023

AgBB

AgBB 2015-02:

Procedure for the health-related evaluation of emissions of
volatile organic
compounds from construction products

Biocidal Products Regulation

Regulation (EU) No 528/2012 of the European Parliament and
of the Council of 22 May 2012 concerning the making available
on the market and use of biocidal products, Official Journal of
the European Union, 2012

VDI 3762

The specification implies that sound insulation solutions (e.g.,
materials, wall constructions) must achieve a certain
performance level, as measured in a laboratory setting, to meet
the L_nfw standard.

European Waste Catalogue (EWC)

European Waste Catalogue. Code 17 09 04 pertains to
materials like wood products found in mixed construction and
demolition waste. Codes 15 01 03 and 15 01 01 are used for
packaging waste, with the former relating to wooden packaging
materials and the latter to paper and cardboard packaging.

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Annex

For Ligna Raised Floor Panel

to the

ENVIRONMENTAL PRODUCT DECLARATION

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

| | |
|--------------------------|--------------------------|
| Owner of the Declaration | Lindner Group |
| Declaration number | EPD-LIN-20240249-IBC1-EN |
| Issue date | 13.06.2025 |
| Valid to | 12.06.2030 |

www.ibu-epd.com / <https://epd-online.com>



General Information

The raised floor panel LIGNA could get as a characteristic for statics or for customer wishes 1 or 2 steel sheet, on one or both sides. This steel sheet has a weight of 3.11 kg steel per 1 m² for 1 side and 6,23 kg steel for both sides.

The steel sheet is glued in the factory.

Once glued the steel cannot be separated anymore from the chipboard raised floor panel.

The results for the LCA of the steel sheet are subject of the next table:

General Information on use stages

No information to be mentioned during usage.

1. LCA: Calculation rules

In order to calculate the results the LCA for a Ligna panel with 1 or 2 steel sheet, next formula should be used for each *module*:

ICI (Ligna with 1 steel sheet) = ICI (Ligna panel) + ICI (1 steel sheet)

ICI (Ligna with 2 steel sheet) = ICI (Ligna panel) + ICI (1 steel sheet)*2

ICI = Impact category indicator

Example:

GWP tot (A1-A3) (Ligna with 1 steel) = GWP tot (A1-A3) (Ligna)+ GWP tot (A1-A3) (1 steel sheet)

2. LCA: Scenarios and additional technical information

Scenario 1 – Incineration of 1 steel sheet

Both panel and steel sheet will be sent to an incineration facility. Recycling potential for the steel has been calculated to a rate of 90%., 10% will be landfilled.

Scenario 2 Take back with refurbishment

The panel with 1 steel sheet will be taken back and refurbished only on 1 side.

3. LCA: Results for 1m² of steel sheet for Ligna raised floor panel

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

| DECLARED, MNR = MODEL 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 | X | ND | ND | ND | ND | ND | ND | MNR | MNR | X | X | X | X | X |

| Core Indicator | Unit | A1-A3 | A4 | C1/1 | C1/2 | C2/1 | C2/2 | C3/1 | C3/2 | C4/1 | C4/2 | D1 | D2 |
|----------------|------------------------------------|----------|-----------|----------|----------|-----------|-----------|----------|----------|-----------|-----------|-----------|-----------|
| GWP-total | [kg CO ₂ -Eq.] | 7.82E+00 | 2.58E-02 | 0.00E+00 | 0.00E+00 | 2.32E-02 | 2.53E-03 | 3.62E+00 | 6.35E-01 | 1.47E-02 | 1.44E-02 | -1.22E+00 | -3.77E+00 |
| GWP-fossil | [kg CO ₂ -Eq.] | 7.81E+00 | 2.57E-02 | 0.00E+00 | 0.00E+00 | 2.32E-02 | 2.52E-03 | 1.37E+00 | 5.83E-01 | 1.48E-02 | 1.45E-02 | -1.21E+00 | -3.76E+00 |
| GWP-biogenic | [kg CO ₂ -Eq.] | 3.75E-03 | -1.16E-04 | 0.00E+00 | 0.00E+00 | -1.04E-04 | -1.14E-05 | 2.25E+00 | 5.27E-02 | -1.83E-04 | -1.80E-04 | -6.61E-03 | -1.18E-03 |
| GWP-luluc | [kg CO ₂ -Eq.] | 3.83E-03 | 1.55E-04 | 0.00E+00 | 0.00E+00 | 1.39E-04 | 1.52E-05 | 7.19E-05 | 9.31E-05 | 1.51E-05 | 1.48E-05 | -2.01E-04 | -1.42E-03 |
| ODP | [kg CFC11-Eq.] | 7.25E-12 | 6.38E-15 | 0.00E+00 | 0.00E+00 | 5.74E-15 | 6.26E-16 | 1.17E-12 | 1.07E-11 | 2.45E-14 | 2.40E-14 | -1.12E-11 | -2.88E-12 |
| AP | [mol H ⁺ -Eq.] | 1.70E-02 | 3.44E-05 | 0.00E+00 | 0.00E+00 | 3.10E-05 | 3.38E-06 | 2.02E-03 | 1.51E-03 | 4.75E-05 | 4.66E-05 | -1.64E-03 | -8.80E-03 |
| EP-freshwater | [kg P-Eq.] | 6.55E-06 | 6.10E-08 | 0.00E+00 | 0.00E+00 | 5.49E-08 | 5.98E-09 | 4.78E-07 | 2.40E-06 | 1.34E-08 | 1.32E-08 | -2.68E-06 | -2.96E-06 |
| EP-marine | [kg N-Eq.] | 4.44E-03 | 1.29E-05 | 0.00E+00 | 0.00E+00 | 1.16E-05 | 1.26E-06 | 7.75E-04 | 4.04E-04 | 1.19E-05 | 1.17E-05 | -5.16E-04 | -2.15E-03 |
| EP-terrestrial | [mol N-Eq.] | 4.78E-02 | 1.52E-04 | 0.00E+00 | 0.00E+00 | 1.37E-04 | 1.49E-05 | 9.20E-03 | 4.32E-03 | 1.31E-04 | 1.29E-04 | -5.51E-03 | -2.32E-02 |
| POCP | [kg NMVOC-Eq.] | 1.45E-02 | 3.06E-05 | 0.00E+00 | 0.00E+00 | 2.75E-05 | 3.00E-06 | 2.01E-03 | 1.52E-03 | 3.74E-05 | 3.67E-05 | -1.48E-03 | -7.36E-03 |
| ADPE | [kg Sb-Eq.] | 3.08E-07 | 1.87E-09 | 0.00E+00 | 0.00E+00 | 1.69E-09 | 1.84E-10 | 8.47E-09 | 1.05E-07 | 4.06E-10 | 3.98E-10 | -9.09E-08 | -1.51E-07 |
| ADPF | [MJ] | 7.65E+01 | 3.52E-01 | 0.00E+00 | 0.00E+00 | 3.17E-01 | 3.45E-02 | 1.75E+00 | 7.41E+00 | 2.21E-01 | 2.17E-01 | -1.67E+01 | -3.19E+01 |
| WDP | [m ³ world-Eq deprived] | 1.05E-01 | 1.36E-04 | 0.00E+00 | 0.00E+00 | 1.22E-04 | 1.33E-05 | 4.47E-01 | 1.35E-02 | -2.01E-04 | -1.97E-04 | -1.60E-02 | -5.03E-02 |

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2:

1m² of steel sheet for Ligna raised floor panel

| | |
|---------|--|
| 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; WDP = Water (user) deprivation potential |
|---------|--|

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2:

1m² of steel sheet for Ligna raised floor panel

| Indicator | Unit | A1-A3 | A4 | C1/1 | C1/2 | C2/1 | C2/2 | C3/1 | C3/2 | C4/1 | C4/2 | D1 | D2 |
|-----------|-------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|
| PERE | [MJ] | 4.79E+00 | 2.36E-02 | 0.00E+00 | 0.00E+00 | 2.12E-02 | 2.31E-03 | 5.75E-01 | 5.24E+00 | 1.99E-02 | 1.95E-02 | 5.52E+00 | -2.04E+00 |
| PERM | [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PERT | [MJ] | 4.79E+00 | 2.36E-02 | 0.00E+00 | 0.00E+00 | 2.12E-02 | 2.31E-03 | 5.75E-01 | 5.24E+00 | 1.99E-02 | 1.95E-02 | 5.52E+00 | -2.04E+00 |
| PENRE | [MJ] | 7.71E+01 | 3.52E-01 | 0.00E+00 | 0.00E+00 | 3.17E-01 | 3.46E-02 | 1.75E+00 | 7.41E+00 | 2.22E-01 | 2.17E-01 | 1.68E+01 | -3.22E+01 |
| PENRM | [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PENRT | [MJ] | 7.71E+01 | 3.52E-01 | 0.00E+00 | 0.00E+00 | 3.17E-01 | 3.46E-02 | 1.75E+00 | 7.41E+00 | 2.22E-01 | 2.17E-01 | 1.68E+01 | -3.22E+01 |
| SM | [kg] | 6.06E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.37E+00 | -4.3E-01 |
| RSF | [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NRSF | [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW | [m ³] | 5.44E-03 | 2.10E-05 | 0.00E+00 | 0.00E+00 | 1.89E-05 | 2.06E-06 | 1.06E-02 | 2.74E-03 | 2.50E-06 | 2.45E-06 | -2.31E-03 | -4.86E-03 |

| | |
|---------|---|
| 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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1m² of steel sheet for Ligna raised floor panel

| Indicator | Unit | A1-A3 | A4 | C1/1 | C1/2 | C2/1 | C2/2 | C3/1 | C3/2 | C4/1 | C4/2 | D1 | D2 |
|-----------|------|----------|----------|----------|----------|----------|----------|----------|-----------|----------|----------|-----------|-----------|
| HWD | [kg] | 1.37E-06 | 5.94E-13 | 0.00E+00 | 0.00E+00 | 5.35E-13 | 5.83E-14 | 1.73E-11 | -8.96E-10 | 1.83E-11 | 1.79E-11 | -7.91E-10 | 9.54E-10 |
| NHWD | [kg] | 9.32E-02 | 5.27E-05 | 0.00E+00 | 6.00E-02 | 4.75E-05 | 5.17E-06 | 2.15E-01 | -5.52E-02 | 3.17E-01 | 3.11E-01 | -1.15E-02 | -4.78E-02 |
| RWD | [kg] | 7.96E-04 | 4.64E-07 | 0.00E+00 | 0.00E+00 | 4.17E-07 | 4.55E-08 | 5.88E-05 | 5.47E-04 | 2.58E-06 | 2.53E-06 | -5.71E-04 | -2.05E-04 |
| CRU | [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.11E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MFR | [kg] | 1.63E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.8E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MER | [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EEE | [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.32E+00 | 6.98E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EET | [MJ] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.71E+00 | 1.62E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

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; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1m² of steel sheet for Ligna raised floor panel

| Indicator | Unit | A1-A3 | A4 | C1/1 | C1/2 | C2/1 | C2/2 | C3/1 | C3/2 | C4/1 | C4/2 | D1 | D2 |
|-----------|---------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|
| PM | [Disease Incidence] | 2.43E-07 | 2.82E-10 | 0.00E+00 | 0.00E+00 | 2.54E-10 | 2.77E-11 | 1.34E-08 | 2.11E-08 | 5.13E-10 | 5.03E-10 | -1.72E-08 | -1.28E-07 |
| IRP | [kBq U235-Eq.] | 7.14E-02 | 4.97E-05 | 0.00E+00 | 0.00E+00 | 4.47E-05 | 4.87E-06 | 6.22E-03 | 5.73E-02 | 3.81E-04 | 3.74E-04 | -6.01E-02 | -1.90E-02 |
| ETP-fw | [CTUe] | 1.51E+01 | 2.57E-01 | 0.00E+00 | 0.00E+00 | 2.31E-01 | 2.52E-02 | 6.71E-01 | 2.30E+00 | 6.58E-02 | 6.46E-02 | 2.71E+00 | -6.22E+00 |
| HTP-c | [CTUh] | 9.82E-09 | 5.12E-12 | 0.00E+00 | 0.00E+00 | 4.61E-12 | 5.02E-13 | 6.48E-11 | 2.39E-10 | 7.80E-12 | 7.65E-12 | -6.00E-10 | -5.16E-09 |
| HTP-nc | [CTUh] | 3.12E-08 | 2.15E-10 | 0.00E+00 | 0.00E+00 | 1.93E-10 | 2.11E-11 | 4.92E-09 | 1.47E-08 | 7.45E-10 | 7.31E-10 | -5.61E-09 | -1.22E-08 |
| SQP | [-] | 4.79E+00 | 1.25E-01 | 0.00E+00 | 0.00E+00 | 1.13E-01 | 1.23E-02 | 5.89E-01 | 3.81E+00 | 2.07E-02 | 2.03E-02 | 3.89E+00 | -2.11E+00 |

Caption PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

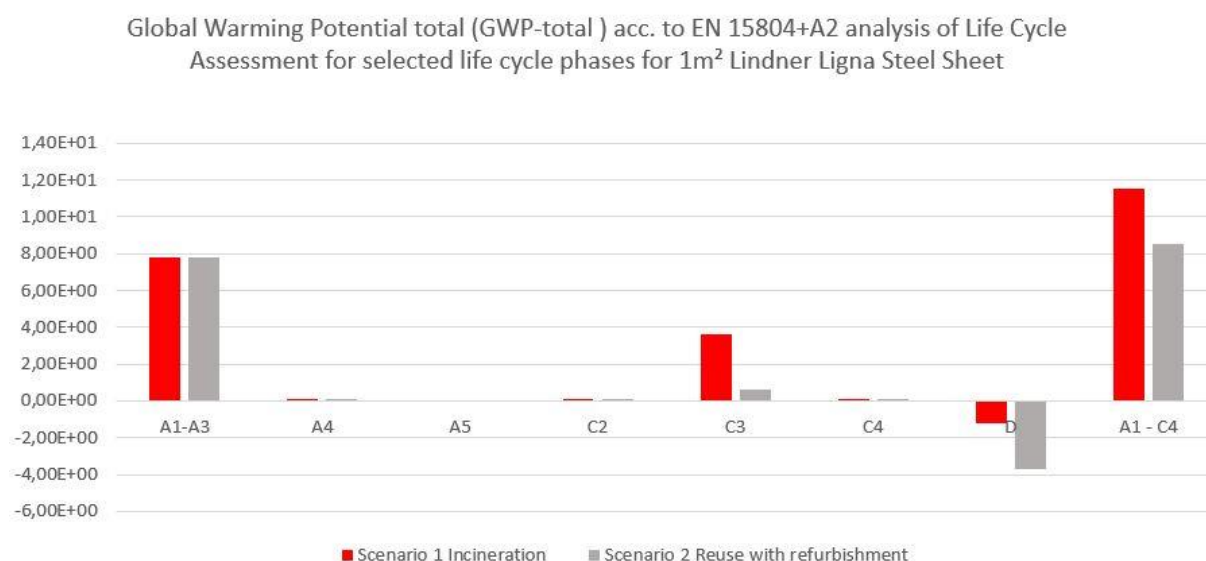


Figure 1: GWP Total for 1m² of Lindner Ligna steel sheet

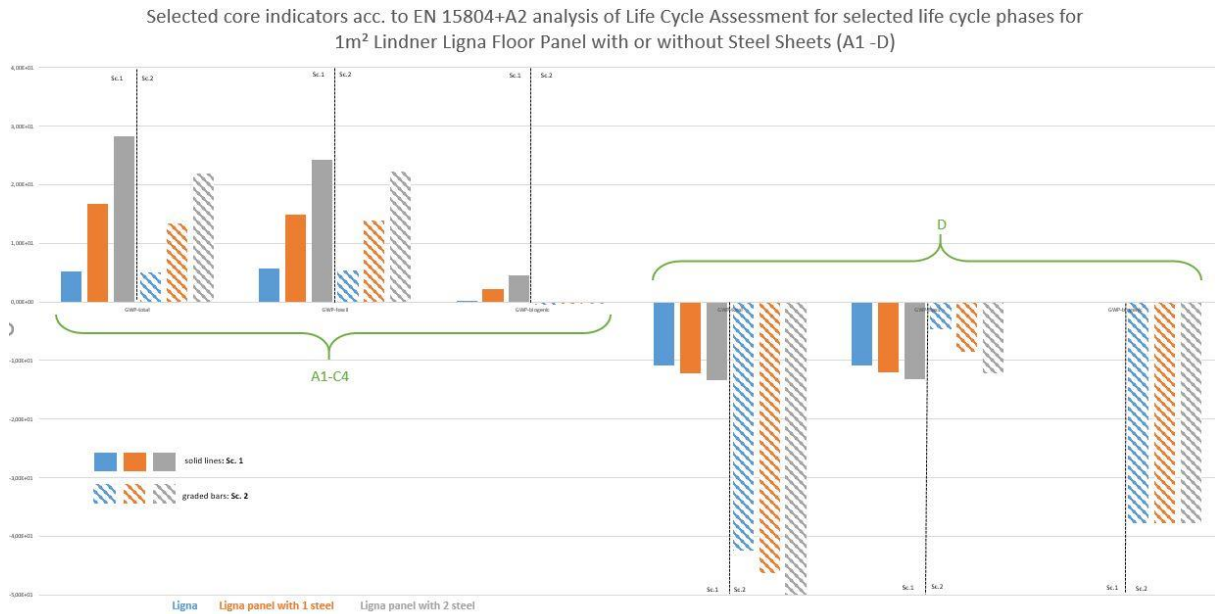


Figure 2: Selected core indicators for 1m² Ligna raised floor with or without steel sheet

For the different disposal paths all in all the environmental impact potential of Scenario 2 is significantly lower than that of Scenario 1. As more material is added, the environmental impact in terms of GWP total and fossil increases, with a linear proportional rise in the overall burden.

Scenario 2 consistently results in lower GHG emissions, emphasizing that not sending the panel to waste disposal but reusing it in a next use cycle is key to minimizing the carbon dioxide footprint of Ligna floor panels in the first use cycle.

In contrast to A1-C4, the D phase presents high potentials of material recovery and reuse for GWP values:

- Ligna-only panels maintain their environmental advantage, showing a moderate negative GWP due to the carbon sequestration potential of chipboard in the end-of-life phase.
- Panels containing steel (1 or 2 sheets) exhibit the most significant negative GWP values. As the steel is not demountable, but remains on the Ligna panel in a future system is demonstrating the strong climate benefits of steel reuse in the initial form.