# ENVIRONMENTAL PRODUCT DECLARATION

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

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|---|---|
| Owner of the Declaration | TAIM e.V. |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
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| Valid to | 06.10.2030 |

## Fire Protection Ceilings

## TAIM e.V. - Verband Industrieller Metalldeckenhersteller

Institut Bauen und Umwelt e.V.

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# 1. General Information

## TAIM e.V. - Verband Industrieller Metalldeckenhersteller

**Programme holder**

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

**Declaration number**

EPD-TAI-20250171-IBC1-EN

**This declaration is based on the product category rules:**

Metal ceilings, 01.08.2021
(PCR checked and approved by the SVR)

**Issue date**

07.10.2025

**Valid to**

06.10.2030

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

## Fire Protection Ceilings

**Owner of the declaration**

TAIM e.V.
Osloer Str. 100
13359 Berlin
Germany

**Declared product / declared unit**

The declared unit is 1 t fire protection metal ceiling. The average weight per unit area is 27.95 kg/m².

**Scope:**

This declaration applies to all production manufacturers of the following TAIM e.V. members. The data of this Life Cycle Assessment is based on annual data from 2022, which were collected at the factory.

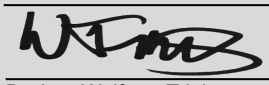
- durlum Group GmbH: www.durlum.com
- Fural Systeme in Metall GmbH: www.fural.com
- Geipel® GENEX- Vertrieb Ltd. & Co. KG: www.geipel-genex.de
- Lindner SE: www.Lindner-Group.com

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 14025:2011 | | | |
| ☐ | internally | ☒ | externally |



Dr.-Ing. Wolfram Trinius,
(Independent verifier)

TAIM

## 2. Product

### 2.1 Product description/Product definition

Fire protection metal ceiling systems are manufactured from folded and partially punched steel as complete kits or as individual components. The kit consists
of the top layer as a linear panel and the substructure for fastening the metal ceiling. The ceiling panel is a combination of steel and fire protection panels (e.g. plasterboard fire protection panels (GKF), vermiculite panels) and optionally mineral wool. The

The substructure is also made of steel and fire protection boards, can be fastened directly to the bare ceiling/wall or have different suspension heights and is designed according to the shape of its functional requirements and the weight of the ceiling layers.The production of the ceiling types has been standardized for many years and the processes and production steps of the companies for the individual ceiling systems are highly coordinated and comparable. The variance in the min/max surface weight is solely due to the different requirements for strength and support; all product variants are manufactured and offered equally by all companies within the individual products.

Regulation (EU) No. /305/2011/ (CPR Construction Products Regulation) applies to the placing on the market in the European Union and EFTA (with the exception of Switzerland). The products require a declaration of performance taking into account the harmonised *EN 13964*, suspended ceilings - requirements and test methods and the CE marking. The European classification of the fire resistance of building components is regulated in *EN 13501-2*. Metal ceiling systems must be tested as a component (i.e. kit as defined in EN 13964) for fire resistance, which is representative of the complete ceiling system (suspension, substructure, top layer, etc.). The result is documented in a classification report (European certificate of usability). National certificates of usability for fire resistance must be taken into account. Metal ceilings in accordance with the technical regulations of TAIM e.V. are connected to the ceiling above or to the adjacent wall by means of hangers or a substructure attached directly to the load-bearing component at a distance.

### 2.2 Application

The fire protection metal ceiling systems are used for indoor purposes as a rectangular panel (also as special shape) for ceiling cladding. The product is manufactured in accordance with the respective customer's requirements.

### 2.3 Technical Data

The following technical data apply to fire protection metal ceiling systems. The standard *EN 13964* applies.The test standards are *EN 13501-2* and/or *DIN 4102-2*.

**Constructional data**

| Name | Value | Unit |
|---|---|---|
| average Grammage | | kg/m² |
| Durability class (EN 13964) | A | - |
| Cooling output (EN 14240) | not relevant | W/m² |
| Heating output (EN ISO 14037) | not relevant | W/m² |
| Sound absorption (EN ISO 354, EN ISO 11654) | not relevant | % |
| Airborne sound reduction (EN 20140-9, ISO 140-3) | not relevant | dB |

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 13964:2014-08* Suspended ceilings - Requirements and test methods.
National standards and specifications apply to the application of fire protection metal ceiling systems.

### 2.4 Delivery status

The fire protection metal ceiling systems, kits and components are produced in individual sizes. Packaging is usually palletized and/or in cardboard boxes with polystyrene and PP straps.

### 2.5 Base materials/Ancillary materials

The base material of fire protection metal ceiling systems are:

| Name | Value | Unit |
|---|---|---|
| Steel | 42 | % |
| gypsum plasterboard | 49 | % |
| acoustic tile | < 1 | % |
| sealing strip | < 1 | % |
| Minerl wool | < 1 | % |

A heavier panel is also associated with a more solid substructure. The relationship between the material used and the static requirements or strength of the panels and substructure is proportional and comparable regardless of the ceiling type.

This product/ at least one partial article contains substances listed in the ECHA candidate list (23.01.2024) exceeding 0.1 percentage by mass: no.

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

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

The fire protection metal ceiling systems are manufactured in a continuous manufacturing process. The steel sheets are mainly uncoiled, perforated (optional), stamped (optionally aligned), clipped and folded. If not made of precoated material, the top layers are usually provided after the cleaning process with a powder or wet coating. Subsequently, an acoustic fleece insert can be applied to the back by means of heat in a continuous process. By adding heat, a hot-melt adhesive applied to the fleece is activated, which creates the adhesion of the fleece to the back of the metalsheet. This is followed by fitting with fire protection boards and, if necessary, small parts and mineral wool to create the functionality required for fire resistance. Stamped and perforated waste is gathered, collected by local

disposal companies and sent to the recycling loop. All production steps are carried out in compliance with the requirements and test specifications according to *EN 13964* and the technical regulations of the TAIM e.V. *THM*.
For all ceiling types and manufacturers, the production-specific processes do not change, regardless of whether the weight per unit area is lower or higher.
Panels and substructure each result in the end product for which the FU of 1 t is declared. All companies confirm that the higher the weight per unit area, the more resources and energy are required for the panels and substructure, and vice versa. Material use, distribution and energy use are proportional to the weight per unit area.
The influence of perforation is very small and not a significant factor in averaging. The energy input (current) remains the same regardless of which profile is roll formed.
Whether the basis weights of the respective products or manufacturers are at the minimum or maximum limit depends on which ceiling construction is selected and which functional properties the ceiling panels are to fulfill. A heavier panel is also associated with a more solid substructure. The relationship between the material used and the static requirements or strength of the panels and substructure is proportional and comparable regardless of the ceiling type.

### 2.7 Environment and health during manufacturing

Manufacturing conditions do not require any special health and safety protection measures other than those provided by the authorities for the specific work area, e.g. safety vest, safety shoes, dust mask. The DFG Commission for the investigation of Chemical Compounds in the Work Area – better known as MAK values (national regulations) are not exceeded at any point of the production process. Noise-intensive installations, such as punching and straightening systems are correspondingly insulated by structural measures.

The statutory health and safety regulations for metal and dry construction trades as well as the respective provisions of the construction industry, apply. The production-related exhaust air is cleaned in accordance with legal regulations.

**Water/Ground**: No contamination of water or soil occurs. All values determined inside and outside the production facilities are below the applicable national requirements for noise protection. *EN ISO 14001* certificates and other manufacturer-specific documents on environmental and health protection can be requested from the manufacturer.

### 2.8 Product processing/Installation

The membrane of the fire protection metal ceiling system is attached to a substructure. The installation is to be carried out by trained personnel and the national certificate of usability. The manufacturer's instructions must be observed.

### 2.9 Packaging

The fire protection ceilings are palletized and/or packed in cardboard, protected with polystyrene and stabilized with PP straps. The packaging was recorded and is part of the balance sheet; delivery and assembly are not part of the balance sheet, whereby the disposal of the packaging takes place in module A5. The packaging of the preliminary products could not be collected and is therefore not part of the balance sheet.

### 2.10 Condition of use

The smooth surface of the metal ceilings is easy to clean and does not require much maintenance. No general cleaning and maintenance recommendations can be given due to the different designs of the fire protection ceilings and the areas of application. The prerequisite for a long service life is regular maintenance, care and servicing of the product. The solid composition does not change over the period of use. There is no inherent dust or flying fibers.
Documents can be requested from the respective metal ceiling system manufacturer.

### 2.11 Environment and health during use

There are no known interactions between the product, the environment and health. Volatile organic compounds (VOC) are below the valuation limit according to health-related Evaluation of Emissions of Volatile Organic Compounds from Building PRoducts (AgBB) *AgBB evaluation scheme*.

### 2.12 Reference service life

Based on the useful lives of building components according to the Sustainable Building Assessment System *BBSR-Table 2017*, Service Lives of components for life cycle assessment according to Assessment System for Sustainable Building (BNB), the reference service life of fire protection metal ceilings exceeds 50 years. The product is not subject to any physical ageing during its service life. If used as intended, no abrasion will occur during its service life or during maintenance work.

### 2.13 Extraordinary effects

**Fire**

The fire protection metal ceiling systems declared here correspond to the class A2 - s1, d0 of building products regarding their reaction to fire, according to *EN 13501-1*. The class of flaming droplets is d0 and the class for smoke density is pre-defined as s1.
The fire protection boards used in accordance with *EN 520* or *EN 15501* correspond to building material class A2 - s1, d0 in accordance with *EN 13501-1*. The fire behaviour is 'non-combustible', there is 'no smoke' and 'no burning droplets/dripping'.

**Reaction to fire metal ceilings and fire protection boards**

| Name | Value |
|---|---|
| Building material class | A2 |
| Smoke gas development | s1 |
| Burning droplets | d0 |

**Water**

There are no known effects on the environment in the event of unforeseen ingress of water.

**Mechanical destruction**

Mechanical destruction will damage the installed fire protection boards. Broken parts can be vacuumed up and swept up. Mineral wool residues are packed dust-tight and residual dust is picked up with a hoover. It can be assumed that with coated ceilings, possible paint chips occur in such small quantities that there are no negative effects on the environment.

### 2.14 Re-use phase

The fire protection metal ceiling systems can be removed and re-used without damaging the product. If necessary, damaged fire protection boards can be replaced, taking into account the national usability certificates.

### 2.15 Disposal

The metal ceiling can be sent for high-quality material recycling. Residual materials from the ceiling systems are disposed of and thermally recycled. Due to the large amount of recyclable metal scrap, the amount of raw material required for new production in the downstream system is reduced. Offcuts from production are returned directly to production in a closed loop and reused.
GKF board waste (demolition) in accordance with *EN 520* can be recycled if pure gypsum fractions are produced through processing. This is currently not (yet) economically feasible.

Therefore, GKF boards are disposed of in landfills for bulk waste.
Fire protection board waste (demolition) in accordance with *EN 15501* can be disposed of in landfills for bulk waste. Mineral wool waste must be packed separately from other waste in dust-tight fabric bags or big bags approved for this purpose.
In accordance with the Waste Classification Ordinance (*AVV*) and the European Waste List (*EWL*), the waste code for steel is:
17 04 05 – Iron and steel
17 08 02 - Gypsum-based building materials other than those mentioned in 17 08 01
17 09 04 - Mixed construction and demolition waste other than those mentioned in 17 09 01, 17 09 02 and 17 09 03
17 06 04 - Insulating materials other than those mentioned in 17 06 01 and 17 06 03

### 2.16 Further information

- durlum GmbH: www.durlum.de
- Fural Systeme in Metall GmbH: www.fural.com
- Geipel® Genex-Vertrieb Ltd. & Co. KG: www.geipel-genex.de
- Lindner SE: www.Lindner-Group.com

## 3. LCA: Calculation rules

### 3.1 Declared Unit

The declared unit is 1 t of fire protection blanket; the basis weight was determined by the members of the TAIM association on a product-specific basis; in the course of data collection, the participating companies determined and specified their minimum, maximum and average basis weights for the appropriate EPD. The data is based on the companies' own surveys and was used as the basis for calculating the average.

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Grammage | 27.95 | kg/m$^2$ |
| Gross density | 7850 | kg/m³ |
| Declared unit | 1 | t |
| Conversion factor to 1m² | 0,02795 | t/m² |

The production of ceiling types has been standardized for many years and the processes and production steps of the companies for individual ceiling systems are highly coordinated and comparable. The variance in the min/max surface weight is solely due to the different demands on strength and support; all product variants are manufactured and offered by all companies within the individual products in the same way. Perforation, edge cutting and shaping of the system ceilings are proportional to the basis weight in terms of energy, resources and expenditure and contribute a very small proportion of the energy expenditure overall. The main driver is the production and processing of the main material, steel.

A weighted weight per unit area was calculated for all participating companies per EPD; the LCA results can be scaled accordingly using a conversion factor of 1 t to 1 m².

The fluctuation range for the fire protection ceilings is 0.90 - 1.36. The effect on the results for 1 t fire protection ceiling is described in more detail in the Interpretation chapter.

### 3.2 System boundary

The Life Cycle Assessment considers the system boundaries "cradle to grave" and follows the modular construction system described by *EN 15804*. The LCA takes into account the following
modules:

- A1: Raw material extraction and processing, processing procedures and preparation of secondary materials: Coils/blanks and other preliminary products are transported to the factory
- A2: Transport to the manufacturer: Transport of all raw materials and preliminary products to the manufacturing plant
- A3: Manufacturing processes and expenses in the factory: Ceiling systems are produced according to the manufacturing description in section 2.6, metal offcuts are reused directly in the closed-loop in the production plant, offcuts of residual materials are disposed of and the products are prepared for shipment to the customer.
- A5: Transportation to the installation site and installation are not part of this balance; however, the disposal of packaging quantities is modeled in A5.
- C1: Dismantling of the ceiling systems after the use phase: no plausible and consistent data could be provided by the company for this; due to the numerous examples of use and the type of dismantling (demolition, dismantling, replacement), many scenarios are conceivable; a cross-association assumption was not made here in C1.
- C2: Transport for waste management: The materials of the ceiling systems are separated into their individual components on the construction site or during the disposal phase; scrap metal is sent for high-quality material recycling; other residual materials are sent to the waste incineration plant for thermal disposal.
- C3: Waste management for reuse, recovery and/or recycling: All secondary materials are listed here as no-burden processes with zero emissions and the primary scrap is recycled accordingly. Due to the cut-off calculation method, the processing emissions of steel scrap are not included in this balance and therefore no emissions are attributable to C3.
- C4: Disposal: A processing loss of 5% is assumed (according to Worldsteel Method 2017); residual scrap and residual materials are collected and sent for disposal.
- D: Reuse, recovery or recycling potential as net flows and credits or Loads: Thermal credits are given through the incineration of the residual materials in the waste incineration plant with the corresponding LHV stored in the ecoinvent data set, as well as material credits for the primary steel scrap, which can substitute primary material in the next product system.

### 3.3 Estimates and assumptions

All plant- and process-specific data was made available to the life cycle assessor by the members of *TAIM e.V.*. Missing data was supplemented by estimates based on comparable substitutes or on data from the
secondary literature and the *ecoinvent 3.10* database. Data records missing from the database were modeled by the balancer.

### 3.4 Cut-off criteria

All relevant data, i.e. all raw materials used in production as well as the energy and resources used in production, were taken from a data collection sheet following a previous comprehensive survey of the companies' operating data for the life cycle inventory analysis. For the inputs and outputs taken into account, the actual transport distances were used or

estimated with the help of documented rules, and material and energy flows with a share of < 1 % were included. The sum of the neglected processes is less than 5% of the impact categories. The expenses for the provision of infrastructure (machinery, buildings, etc.) for the entire foreground system were not taken into account.

### 3.5 Background data

The life cycle assessment is based upon plant-specific data collection including all energy sources and operating resources for one year (observation period January to December 2022). Background data for modelling and missing inventories of primary products are based on the LCIA database inventory *ecoinvent 3.10.* Modelling and impact assessment are carried out using *SimaPro* software (*version 9.6.0.1*).

### 3.6 Data quality

The foreground data relates to the financial year from January until December 2022.
The data collected was checked for representativeness in relation to previous years. Data sets for background data are based on the *ecoinvent 3.10* database. Missing specific data for preliminary products (such as external iron scrap) were modelled on the basis of generic data sets from *ecoinvent 3.10*, taking into account country-specific conditions. The data quality of all emission factors used in relation to DQ Geo, Tech and Time can be classified as good. Where data sets were not 100% suitable, the maximum approximation to the real process was used; the most up-to-date data sets from the ecoinvent database were always used. The impact on emissions in relation to approximated data sets can be considered low and has no significant effect on the results of the overall EPD.

### 3.7 Period under review

The quantities of raw materials, energy and waste used are based on the year 2022.
They correspond to the current state of the art and are therefore representative for the period under consideration.

### 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: Europe

### 3.9 Allocation

Co-product allocation does not exist in the manufacturing process. All energy consumption and material flows for the product could be allocated on the basis of measured production data or based on mass. The companies' operating data was allocated. The end-of-life calculation was based on the cut-off approach, whereby no credits are awarded for the proportion of secondary materials used in production (inputs) for avoided loads in other product systems (system space expansion) at the end of life.In Module D, additional loads are awarded for the compensation of lost secondary material in the EoL (5 %) in the previous product system.

### 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. A comparison or evaluation of EPD data is only possible of EPD data is only possible if all data sets to be compared have been created in accordance with *EN 15804* and the building context or the product-specific performance characteristics are taken into account. The background database *ecoinvent 3.10* was used.
The following evaluation methods are used: - EF3.1 (adapted) V1.01 / EF 3.1 normalization and weighting set
- Cumulative energy demand (LHV) V1.01 / Cumulative energy demand
- EDIP 2003 V1.07 / Standard
- Selected LCI results, additionally V1.06

## 4. LCA: Scenarios and additional technical information

**Characteristic product properties of biogenic carbon**

The product contains less than 5% of the total mass less than 5 % biogenic carbon, which is why this information is not included in this EPD.
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of $CO_2$.

The reference service life according to ISO 15686-1 could not have been determined. The declaration of the reference service life underlies the assessment system of the Federal Institute for Research on Building, Urban Affairs and Spatial Development BBSR.

**Reference service life**

| Name | Value | Unit |
|---|---|---|
| Life Span (according to BBSR) | ≥ 50 | a |

**End of life (C1-C4)**

| Name | Value | Unit |
|---|---|---|
| Collected separately waste type | 412 | kg |
| Scrap for Recycling (95%) | 391 | kg |
| Scrap for Landfilling | 21 | kg |
| Other residual materials (e.g. plasterboard, acoustic fleece) | 580 | kg |

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

| Name | Value | Unit |
|---|---|---|
| Net scrap steel | -220 | kg |

A recycling rate of 95% is assumed.

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## 5. LCA: Results

The following table summarises the LCA results. The impact assessment results do not allow any conclusion as to the endpoints of the effect categories, exceedance of threshold values, safety margins, or risks. Long- erm emissions (> 100 years) are not included in the impact assessment. The impact assessment uses the evaluation method according to EF3.1.

**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 | MND | 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 t fire protection ceiling**

| Parameter | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| GWP-total | kg $CO_2$ eq | 1.34E+03 | 1.08E+00 | 0 | 7.46E+00 | 0 | 3.12E+02 | -1.43E+03 |
| GWP-fossil | kg $CO_2$ eq | 1.34E+03 | 1.07E+00 | 0 | 7.45E+00 | 0 | 3.12E+02 | -1.42E+03 |
| GWP-biogenic | kg $CO_2$ eq | 5.91E+00 | 1.83E-04 | 0 | 1.23E-03 | 0 | 1.15E-02 | -5.69E-01 |
| GWP-luluc | kg $CO_2$ eq | 2.37E+00 | 3.81E-04 | 0 | 2.55E-03 | 0 | 5.36E-03 | -5.16E-01 |
| ODP | kg CFC11 eq | 6.72E-05 | 2.24E-08 | 0 | 1.5E-07 | 0 | 3.88E-07 | -2.7E-05 |
| AP | mol $H^+$ eq | 8.12E+00 | 2.54E-03 | 0 | 2.41E-02 | 0 | 1.75E-01 | -4.14E+00 |
| EP-freshwater | kg P eq | 5.39E-01 | 7.57E-05 | 0 | 5.07E-04 | 0 | 2.67E-02 | -3.81E-01 |
| EP-marine | kg N eq | 1.58E+00 | 6.66E-04 | 0 | 8.18E-03 | 0 | 9.63E-02 | -9.94E-01 |
| EP-terrestrial | mol N eq | 2.16E+01 | 7.2E-03 | 0 | 8.89E-02 | 0 | 8.26E-01 | -1.03E+01 |
| POCP | kg NMVOC eq | 6.55E+00 | 4.41E-03 | 0 | 3.92E-02 | 0 | 2.18E-01 | -4.07E+00 |
| ADPE | kg Sb eq | 1.36E-02 | 3E-06 | 0 | 2.01E-05 | 0 | 4.21E-05 | -5.86E-03 |
| ADPF | MJ | 2.23E+04 | 1.61E+01 | 0 | 1.08E+02 | 0 | 2.13E+02 | -1.79E+04 |
| WDP | $m^3$ world eq deprived | 6.54E+02 | 7.69E-02 | 0 | 5.15E-01 | 0 | 4.14E+00 | -3.07E+02 |

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 t fire protection ceiling**

| Parameter | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| PERE | MJ | 1.52E+03 | 2.04E-01 | 0 | 1.36E+00 | 0 | 5.53E+00 | 0 |
| PERM | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERT | MJ | 1.52E+03 | 2.04E-01 | 0 | 1.36E+00 | 0 | 5.53E+00 | 0 |
| PENRE | MJ | 4.27E+04 | 1.62E+01 | 0 | 1.08E+02 | 0 | 2.15E+02 | 0 |
| PENRM | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PENRT | MJ | 4.27E+04 | 1.62E+01 | 0 | 1.08E+02 | 0 | 2.15E+02 | 0 |
| SM | kg | 6.13E+02 | 0 | 0 | 0 | 0 | 0 | -2.2E+02 |
| RSF | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NRSF | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FW | $m^3$ | 2.09E+01 | 2.42E-03 | 0 | 1.62E-02 | 0 | 6.57E-01 | -9.75E+00 |

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 t fire protection ceiling**

| Parameter | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| HWD | kg | 1.33E-01 | 1.06E-04 | 0 | 7.09E-04 | 0 | 2.13E-03 | -1.05E-01 |
| NHWD | kg | 3.01E+02 | 1.38E+00 | 0 | 9.23E+00 | 0 | 1.64E+02 | 0 |
| RWD | kg | 5.49E-02 | 4.85E-06 | 0 | 3.25E-05 | 0 | 1.27E-04 | -1.03E-02 |
| CRU | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MFR | kg | 0 | 0 | 0 | 0 | 3.91E+02 | 0 | 0 |
| MER | kg | 0 | 0 | 0 | 0 | 0 | 6.01E+02 | 0 |
| EEE | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EET | MJ | 0 | 0 | 0 | 0 | 0 | 9.15E+03 | 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 t fire protection ceiling**

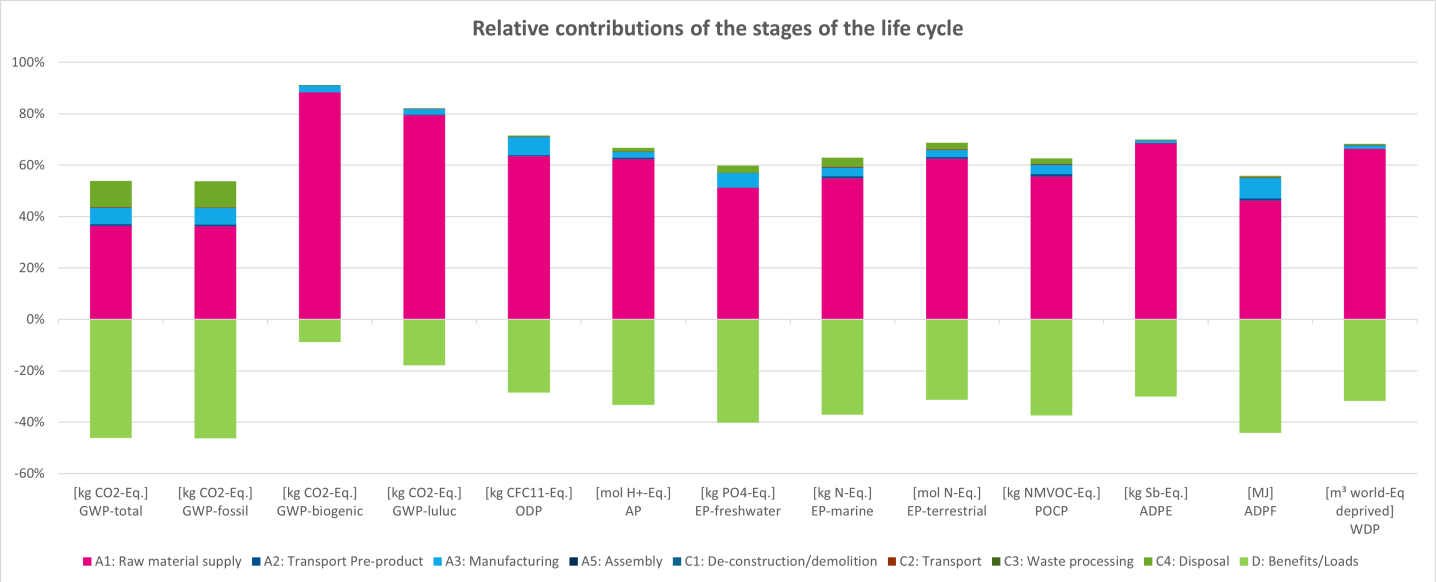
| Parameter | Unit | A1-A3 | A5 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| PM | Disease incidence | 1.29E-04 | 1.05E-07 | 0 | 7.41E-07 | 0 | 1.63E-06 | -8.35E-05 |
| IR | kBq U235 eq | 1.87E+02 | 1.96E-02 | 0 | 1.31E-01 | 0 | 4.93E-01 | -4.09E+01 |
| ETP-fw | CTUe | 9.52E+03 | 0 | 3.82E+00 | 0 | 2.56E+01 | 0 | 1.13E+03 |
| HTP-c | CTUh | 1.39E-05 | 6.88E-09 | 0 | 4.61E-08 | 0 | 3.02E-07 | -8.94E-05 |
| HTP-nc | CTUh | 2.01E-04 | 1.04E-08 | 0 | 6.96E-08 | 0 | 3.46E-06 | -1.67E-05 |
| SQP | SQP | 1.34E+05 | 1.62E+01 | 0 | 1.09E+02 | 0 | 1.16E+02 | -3.08E+03 |

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

*MND: Module not declared
**MDR: Module not relevant
Qualifier 1 –applies to the indicator 'potential effect through human exposition to U235'. This effect category mainly covers the potential impact of low-dosage ionising radiation on human health in the nuclear fuel cycle. It does not account for effects caused by possible nuclear accidents and occupational exposure nor for the disposal of radioactive waste in subterranean installations. This indicator also does not cover the potential ionising radiation emitted by the ground, radon, andcertain construction materials.
Qualifier 2 – applies to the indicators: 'abiotic resource depletion potential – non-fossil resources', 'abiotic resource depletion potential – fossil fuels', 'water deprivation potential (user)', 'potential toxicity reference unit for ecosystems', 'potential toxicity reference unit forhumans – carcinogenic effect', 'potential toxicity reference unit for humans – non-carcinogenic effect', and 'potential soil quality index'. Diligence must be applied when using the results of the environmental impact indicator because they are fraught with highuncertainties or experience with the indicator is limited.

## 6. LCA: Interpretation

The following figure shows the relative contributions of different Life Cycle processes and the primary energy demand in the form of a dominance analysis.




The environmental impacts within Modules A1-A3 are dominated by raw materials by at least 84%, regardless of the impact category
; production plays a further role in the supply of raw materials. Transportation plays a negligible role (< 2 %). The credits in Module D are explained by the avoided environmental impacts in other product systems and arise from the recycling of metal scrap.

The total primary energy requirement within production (A1-3) is divided between approx. 97
% from non-renewable energy sources and approx. 3 % from renewable energies. 92
% of the total non-renewable primary energy requirement (PENRT) is contributed by the raw materials; 8 % is contributed by the manufacturing phase. The contributions from transportation are negligible.

When considering the total renewable primary energy requirement (PERT), 70 %
of PE is caused by the provision of raw materials within modules A1-A3; 30 % by production.
As part of the LCA study, different product variants and company data were averaged as part of the TAIM-EPD.

Although the products under consideration are very similar in terms of production and material composition and the production steps are identical, there may be fluctuations in the results due to different variants in the impact assessment. In order to determine the possible fluctuation ranges, the extremes were therefore calculated on the basis of a minimum and maximum product configuration in addition to the average annual production.
Overall, the fluctuation ranges within the EPD are within a plausible and normal range. As the average is a weighted average based on the net production data of the individual companies, the participation in the EPD and the annual production in 2022 play a significant role and influence the average. If the companies that are more significant as a result have indicated a greater fluctuation in their min/max values, this also results in a greater fluctuation range for the overall average. In principle, however, the same products are manufactured using the same production processes; the basis weights depend on the strength and stability requirements of the ceiling system, which can vary depending on the company-specific view.
The companies can independently classify where they lie and to what extent the LCA results apply to their specific product according to their known basis weight and the assumed average in the EPD.
As an approximation, deviating basis weights can be allocated proportionally to the GWP result.

Based on the reference product, there are calculated fluctuations in the environmental impact results of 0.9 - 1.36 in the individual impact categories.
Overall, the significance of the results of the average product is of limited representativeness for individual products, as they sometimes exhibit larger fluctuation ranges.

## 7. Requisite evidence

**VOC emissions**
For the declared product the test procedure according to /AgBB-scheme/ was carried out by the measuring agency eco-INSTITUT GmbH on 05.12.2013. The results of the laboratory report (test No. 4244-001 (II) were provided by the member company durlum GmbH as a reference for the TAIM e.V.

The test report is based on the "Assessment basis for the health assessment of VOC and SVOC of construction products (as of 2010) of the Committee for the Health Assessment of Construction Products AgBB". The summary assessment of the test procedure yields the result that the product meets the emission requirements of the /AgBB evaluation scheme/.

| | Testing after 3 days [µg/m³] | | Testing after 7 days [µg/m³] | |
|---|---|---|---|---|
| | Results | Requirement | Results | Requirement |
| Sum VOC (C6C16) | 16 | ≤ 10000 | 12 | ≤ 1000 |
| Sum SVOC (C16-C22) | < 1 | - | < 1 | 100 |
| R (dimensionsless) | 0,01 | - | 0 | ≤ 1 |
| Sum VOC o. LCI | 9 | - | 8 | ≤ 100 |
| Sum carcinogenic substances (EU- Kat 1 und 2) | < 1 | ≤ 10 | < 1 | ≤ 1 |

7.1 VOC emissions
For products used in indoor applications.
Test method in accordance with the AgBB scheme indicating the measuring agency, date and results as a range of values. At least the following must be declared:

## 8. References


**Standards**

**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.

**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

**Committee for Healt-related Evaluation of Building Products (AgBB)**
Evaluation procedure for VOC emissions from building products, 2015.

**eco-INSTITUT**
GmbH: Prüfbericht Nr. 42344-001 (II), 2013.

**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.

**ecoinvent**
Ecoinventory database version 3.10 of the Swiss Centre for Life Cycle Inventories, Dübendorf.www.ecoinvent.ch

**Institute Construction and Environment e.V. (ed.)**: Product category rules for building-related products and service. Part A:

Calculation rules for Life Cycle Assessment and requirements on the project report, version 1.7, 2018.

**Institute Construction and Environment e.V. (ed.):** PCR Guidance-Texts for Building-Related Products and Services. Part B: Requirements on the EPD for www.ibu-epd.com Metal ceilings, version 1.6, 2017.

**Technisches Handbuch Metalldecken (THM)**: TAIM e.V. (Hrsg.), Oktober 2018.

**Waste Classification Ordinance (AVV)/ European Waste List (EWL):** Waste Classification. Disposal Code 17 04 05 iron and steel, 2002.

**ECHA candidate list**
Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency (ECHA), European Union Regulation No 1907/2006, January 2020.

**DIN EN 520:**
DIN EN 520: Gypsum plasterboards - Definitions, requirements and test methods; German version EN 520:2004+A1:2009.

**DIN 4102-2**
DIN 4102-2: Fire Behaviour of Building Materials and Building Components; Building Components; Definitions, Requirements and Tests.

**DIN EN 14240**
DIN EN 14240: Ventilation for buildings - Chilled ceilings - Testing and rating; German version EN 14240:2004.

**DIN EN 14037-1**
DIN EN 14037-1: Free hanging heating and cooling surfaces for water with a temperature below 120 °C - Part 1: Pre-fabricated ceiling mounted radiant panels for space heating - Technical specifications and requirements; German version EN 14037-1:2016.

**EN 13501-1**
EN 13501-1: 2010: Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests; German version EN 13501-1:2007+A1:2009.

**DIN EN 15501**
DIN EN 15501: Thermal insulation products for building equipment and industrial installations - Factory made expanded perlite (EP) and exfoliated vermiculite (EV) products - Specification; German version EN 15501:2015

**DIN EN 13501-2**
DIN EN 13501-2: Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance and/or smoke control tests, excluding ventilation services; German version EN 13501-2:2023

**EN 13964**
EN 13964: 2014: Suspended ceilings - Requirements and test methods; German version EN 13964:2014.

**ISO 15686-1**
ISO 15686-1**:** 2015: Buildings and constructed assets - Service life planning - Part 1: General principles and framework.

**DIN EN ISO 14001**
DIN EN ISO 14001: Environmental management systems - Requirements with guidance for use (ISO 14001:2015); German and English version EN ISO 14001:2015.

**DIN EN ISO 14025**
DIN EN ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006); German and English version EN ISO 14025:2011.

**DIN EN ISO 14040**
DIN EN ISO 14040: Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006 + Amd 1:2020); German version EN ISO 14040:2006 + A1:2020.

**DIN EN ISO 14044**
DIN EN ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006 + Amd 1:2017 + Amd 2:2020); German version EN ISO 14044:2006 + A1:2018 + A2:2020Environmental management - Life cycle assessment - Requirements and guidelines (ISO 14044:2006 + Amd 1:2017 + Amd 2:2020); German version EN ISO 14044:2006 + A1:2018 + A2:2020.

**DIN EN 15501**
DIN EN 15501:Thermal insulation products for building equipment and industrial installations - Factory made expanded perlite (EP) and exfoliated vermiculite (EV) products - Specification; German version EN 15501:2015.

**DIN EN ISO 50001**
DIN EN ISO 50001: Energy management systems - Requirements with guidance for use (ISO 50001:2018); German version EN ISO 50001:2018.

**Construction Procut Regulation (CPR):** Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (Text with EEA relevance), in: Official Journal of the European Union, 2011.

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