# ENVIRONMENTAL PRODUCT DECLARATION

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

| | |
|---|---|
| Owner of the Declaration | Knauf AQUAPANEL GmbH & Co. KG |
| Publisher | Institut Bauen und Umwelt e.V. (IBU) |
| Programme holder | Institut Bauen und Umwelt e.V. (IBU) |
| Declaration number | EPD-USG-20210121-IBA2-EN |
| Issue date | 08/06/2021 |
| Valid to | 07/12/2026 |

## AQUAPANEL® Cement Board Rooftop 6 mm

## Knauf AQUAPANEL GmbH & Co. KG

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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# 1. General Information

## Knauf AQUAPANEL GmbH & Co. KG

**Programme holder**

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

**Declaration number**

EPD-USG-20210121-IBA2-EN

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

Fibre cement / Fibre concrete, 01/08/2021
(PCR checked and approved by the SVR)

**Issue date**

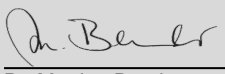
08/06/2021

**Valid to**

07/12/2026



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



Dr. Martina Bender
(Managing Director Institut Bauen und Umwelt e.V.)

## AQUAPANEL® Cement Board Rooftop 6 mm

**Owner of the declaration**

Knauf AQUAPANEL GmbH & Co. KG
Zur Helle 11
58638 Iserlohn
Germany

**Declared product / declared unit**

1 m² AQUAPANEL® Cement Board Rooftop with a thickness of 6 mm.

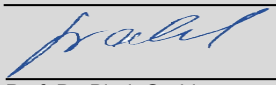
**Scope:**

This environmental product declaration refers to AQUAPANEL® Cement Board Rooftop produced in Iserlohn, 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*.

**Verification**

| |
|---|
| The standard EN 15804 serves as the core PCR |
| Independent verification of the declaration and data according to ISO 14025:2011 |
| ☐ internally ☒ externally |



Prof. Dr. Birgit Grahl,
(Independent verifier)

## 2. Product

### 2.1 Product description/Product definition

Cement-bonded, mineral building board with two-dimensional grid structures of glass layers arranged in longitudinal and transverse direction for use in flat roof construction.

The AQUAPANEL® Cement Board Rooftop is certified according to *EN 12467* and is therefore a product according to CPR with hEN. Regulation (EU) No. 305/2011 (CPR) applies to the placing of the product on the market in the EU/EFTA (with the exception of Switzerland).

The product requires a declaration of performance according to the CPR taking into account *DIN EN 12467:2018-12*, Fibre-cement boards - Product specification and test methods and the CE marking.

### 2.2 Application

AQUAPANEL® Cement Board Rooftop is a component of flat roof systems, especially commercial or industrial buildings. It improves the performance of the flat roof in several ways:

1. as a cover board between the insulation and the roof sealing:
- protects the underlying thermal insulation
- reduces the stress on the sealing membranes
- adds structural strength to the entire roof system
- provides a solid substrate for accessible roofs and roofs with ballast

2. as a support plate fixed directly to the profiled sheet, it serves as:
- support for the vapour barrier
- A work platform for the roofers

### 2.3 Technical Data

**Technical Data**

| Name | Value | Unit |
|---|---|---|
| Thermal conductivity nach ISO 10456 | 0.34 | W/(mK) |
| Water vapour diffusion resistance factor nach ISO 12572 | 48 | - |
| Swelling (air-dry to water-saturated) nach EN 318 | 0.38 | mm/m |
| Gross density nach EN 12467 | 1250 | $kg/m^3$ |
| Flexural strength nach EN 12467 | >7 | $N/mm^2$ |
| Coefficient of thermal expansion | 7 | $10^{-6}K^{-1}$ |
| pH-value | 12 | |

AQUAPANEL® Cement Board Rooftop (product according to CPR with hEN.

- Performance values of the product according to the declaration of performance *No KAGR_013* in relation to its essential characteristics in accordance with *DIN EN 12467:2018-12*, Fibre cement boards - Product specification and test methods.
- Voluntary information for the product: *Technical Data Sheet 04/19* (www.aquapanel.com).

### 2.4 Delivery status

The building panel is marketed in the dimensions 900 x 12000. The layer thickness is 6 mm.

### 2.5 Base materials/Ancillary materials

**AQUAPANEL® Cement Board Rooftop**

| Name | Value | Unit |
|---|---|---|
| Limestone | 45-50 | Mass-% |
| Cement | 35-40 | Mass-% |
| Perlite | 5-10 | Mass-% |
| Fibreglass scrim | <3 | Mass-% |
| Hydrophobic agent | <1 | Mass-% |

The product contains substances on the ECHA Candidate List of Substances of Very High Concern (SVHC) (date 04.05.2021) above 0.1% by mass: no.

The product contains other CMR substances of category 1A or 1B, which are not on the candidate list, above 0.1% by mass in at least one sub-product: no.

Biocidal products have been added to the present construction product or it has been treated with biocidal products (it is therefore a treated product in the sense of the Biocidal Products Regulation *(EU) No 528/2012*): no.

### 2.6 Manufacture

The aggregates and binders are stored in silos outside the production hall. The raw materials for the slab core are dosed according to the recipe via belt weighers and differential feeders and transported to the weighing container via a central conveyor. The binder for the production of the top layer is transported directly via a screw conveyor to the production unit of the "slurry" (cement mixture). The glass fabrics required for production are stored in the basement of the production hall. The dry mixture in the weighing container is emptied into the compulsory mixer below and water is added according to the recipe. The core mixture is mixed homogeneously and soil-moist and conveyed to the moulding station by belt conveyor. At the same time, the slurry for the top layer is homogeneously premixed and conveyed to the moulding station via screw pumps and hoses. In the moulding station, the 3-layer element is produced continuously by extrusion and cut to the appropriate length in the subsequent cutter. The cut boards are hardened in the shelf storage.

The production process is certified according to *ISO 9001.*

### 2.7 Environment and health during manufacturing

According to Regulation *(EC) No 1907/2006*, cement and cement-containing mixtures may not be used or placed on the market if the content of soluble chromium(VI) in the dry mass of the cement after hydration is more than 2 mg/kg (0.0002 %). Only low-chromate cements are used in the production process. Apart from the legal requirements, no further special measures are necessary.
Further environmental protection measures in the production process:
a) Minimization of waste: Both manufactured slabs that do not meet the requirements as well as any edge trimmings produced during the final processing of the slabs are returned to the manufacturing process as raw material.

b) Optimization of energy consumption: A high degree of automation in production enables optimal process parameters to be maintained, thus minimizing unnecessary energy consumption. This applies in particular to the expansion of the perlite raw material.

### 2.8 Product processing/Installation

Knauf Aquapanel GmbH & Co. KG provides technical data sheets for the cement-bonded building boards. This information is available in printed form as well as at www.aquapanel.com.

The boards can be mechanically fastened or glued. The processing can be carried out with commercially available tools.

### 2.9 Packaging

The cement-bonded building board with glass grid reinforcement is delivered on a returnable Euro pallet secured with metal strapping.

### 2.10 Condition of use

No changes in material composition occur during service life.

### 2.11 Environment and health during use

During the service life, there are no environmental and health effects. The results of the Volatile Organic Compound (VOC) analysis all remained below the respective detection limit (see chapter 7.3). There is no release of chromium (VI)-containing substances. There are no hazards to water, air or soil. In use, the ingredients of the products are firmly bound. Dust emissions are not possible.

### 2.12 Reference service life

From experience, a service life of approximately 50 years can be achieved when used as intended.

### 2.13 Extraordinary effects

**Fire**

Non-combustible building material of building material class A1 acc to *EN 13501-1/.*

**Fire protection**

| Name | Value |
|---|---|
| Building material class acc to EN 13501-1 | A1 |

**Water**

Chromium elution is to be expected in case of unforeseen effects of water in non-relevant quantities (see chapter 7.4). Further elutions of other heavy metals are not expected.

**Mechanical destruction**

No sharp break edges are created upon mechanical destruction.

### 2.14 Re-use phase

Once used, the products are practically un-reusable, but are suitable for recycling as filling material if fully separated.

### 2.15 Disposal

According to *AVV* AQUAPANEL® Cement Board Rooftop, the waste code 170904 mixed construction and demolition waste other than those falling under 170901, 170902 and 170903 is recommended.

### 2.16 Further information

For further information visit: www.aquapanel.com.

## 3. LCA: Calculation rules

### 3.1 Declared Unit

The declared unit of the study is 1 m² AQUAPANEL® Cement Board Rooftop with a thickness of 6 mm.

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared Unit | 1 | m² |
| Gross density EN 12467 | 1250 | kg/m$^3$ |
| Grammage | 9.5 | kg/m$^2$ |
| Conversion factor to 1 kg | 9,5 | kg/decl. unit |

* The density according to *EN 12467* is the density after complete drying. Therefore, the data in the above table on surface weight at delivery and the bulk density do not correlate,

### 3.2 System boundary

Within the scope of the conducted LCA, the production or provision and transport of the preliminary products/raw materials as well as the production of the final product (A1-A3) are taken into account. Furthermore, the end-of-life phase (C1-C4) is considered using technical scenarios.

The data of the cement board production was determined at the production site. The recipe and the raw materials used, the electrical energy used and all direct production waste were taken into account in the balancing. Within phase A2, all specific transport routes of the educts were stored.

### 3.3 Estimates and assumptions

With the exception of the technical scenarios (Chapter 4), no estimates or assumptions were made in the study.

### 3.4 Cut-off criteria

In the LCA, the cut-off criteria for a release agent was applied in the area of production. The material corresponds to <0.08 % of the mass input for the declared unit. The use of the wooden pallets used for storage and transport is also cut off within the consideration. Due to the frequent reuse, the proportion to be taken into account for a declared unit is very low and does not have a significant share in the result. Furthermore, the section of metal strapping occurs during pallet loading. In relation to a declared unit, the share is <0.1% of the total mass input.

An application of the cut-off criteria beyond the above-mentioned processes was not necessary.

### 3.5 Background data

The background data used was completely obtained from the *GaBi-ts* software or can be traced back to it. GaBi version 10.0.0.71 (Content Version 2020.2, Service Pack 40) was used to calculate the LCA.

### 3.6 Data quality

All background data records relevant for the calculation were provided by the declaration holder and processed with the database of the accounting software *GaBi ts.*
The manufacturer-specific data used is from 2019. All material and energy flows were recorded in full and were taken into account in the processes described in chapter 3.4.

### 3.7 Period under review

The review period for the data collection is 2019.

### 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: Germany

### 3.9 Allocation

During the production of cement-bound boards at the Iserlohn site, waste cuttings are produced, 100 % of which are returned to the production cycle. The offcuts are credited as a benefit to the system under consideration.

The data for A3 at the site was recorded in relation to the actual output of the product under consideration.

### 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. Die Hintergrunddaten wurden der *GaBi ts*-Software (Content Version 2020.2, Service Pack 40) entnommen.

## 4. LCA: Scenarios and additional technical information

**Characteristic product properties of biogenic carbon**

AQUAPANEL® Cement Board Rooftop is almost exclusively composed of inorganic materials. The proportion of biogenic carbon in the total mass of the product is less than 1 %.

**Scenario information**

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

**Module C1 - Deconstruction and demolition**

The deconstruction is carried out mechanically and unspecifically with an excavator (100 kW), related to the product under consideration. The scenario considers the impacts caused by the operation of the excavator (incl. diesel), depending on the mass to be moved (declared unit).

**Module C2 – Transport for waste management**

The transport of the deconstructed material is assumed to take place with one truck as a German fleet average to an inert material landfill as mixed construction waste. The transport distance is assumed to be 100 km.

**Module C3 - Waste management for reuse, recovery and/or recycling.**

The product under consideration can be used as bulk and fill material if separated by type. In practice, the deconstructed roof structure is not separated by type, so that a pure inert material landfill is assumed in this scenario.

**Module C4 - Disposal**

The product under consideration is disposed of as part of mixed construction waste in an inert landfill. No consideration is given to energy credits from possible landfill gas use, as the product consists almost exclusively of inorganic materials.

**Module D - Reuse, recovery and/or recycling potentials**

Due to the assumed landfilling of inert materials, a consideration of credits is not possible.

## 5. LCA: Results

The results of the life cycle assessment of the AQUAPANEL® Cement Board Rooftop for the life cycle phases considered (A1-A3) are presented below. The characterisation factors of EK-JRC specified by EN 15804 were used.

**Important notice:**

**EP-freshwater:**
This indicator was calculated as "kg P-eq." in accordance with the characterisation model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml)).

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

| Product stage | | | Construction process stage | | Use stage | | | | | | | End of life stage | | | | Benefits and loads beyond the system boundaries |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw material supply | Transport | Manufacturing | Transport from the gate to the site | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| X | X | X | MND | MND | 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 AQUAPANEL® Cement Board Rooftop 6 mm**

| Parameter | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| GWP-total | kg $CO_2$ eq | 3.09 | 0.03 | 0.29 | 0.01 | 0.06 | 0 | 0.13 | 0 |
| GWP-fossil | kg $CO_2$ eq | 3.06 | 0.03 | 0.28 | 0.01 | 0.06 | 0 | 0.14 | 0 |
| GWP-biogenic | kg $CO_2$ eq | 2.6E-02 | 1.17E-05 | 1.86E-03 | -2.57E-04 | 2.32E-05 | 0 | -1.14E-02 | 0 |
| GWP-luluc | kg $CO_2$ eq | 1.63E-04 | 1.22E-04 | 7.21E-04 | 2.43E-05 | 2.41E-04 | 0 | 4.15E-04 | 0 |
| ODP | kg CFC11 eq | 1.52E-14 | 7.13E-18 | 8.73E-15 | 1.41E-18 | 1.41E-17 | 0 | 5.34E-16 | 0 |
| AP | mol $H^+$ eq | 6.04E-03 | 1.68E-04 | 4.33E-04 | 2.86E-05 | 3.33E-04 | 0 | 1.03E-03 | 0 |
| EP-freshwater | kg P eq | 2.94E-06 | 6.33E-08 | 1.18E-06 | 1.26E-08 | 1.26E-07 | 0 | 2.47E-07 | 0 |
| EP-marine | kg N eq | 1.42E-03 | 8.23E-05 | 1.33E-04 | 1.35E-05 | 1.63E-04 | 0 | 2.66E-04 | 0 |
| EP-terrestrial | mol N eq | 1.55E-02 | 9.12E-04 | 1.39E-03 | 1.49E-04 | 1.81E-03 | 0 | 2.92E-03 | 0 |
| POCP | kg NMVOC eq | 4.41E-03 | 1.57E-04 | 3.33E-04 | 3.77E-05 | 3.12E-04 | 0 | 8.06E-04 | 0 |
| ADPE | kg Sb eq | 3.01E-07 | 2.41E-09 | 1.07E-07 | 4.82E-10 | 4.79E-09 | 0 | 1.29E-08 | 0 |
| ADPF | MJ | 27 | 0.39 | 3.54 | 0.08 | 0.77 | 0 | 1.89 | 0 |
| WDP | $m^3$ world eq deprived | 1.7E-01 | 1.25E-04 | 6.29E-03 | 2.5E-05 | 2.49E-04 | 0 | 1.51E-02 | 0 |

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 AQUAPANEL® Cement Board Rooftop 6 mm**

| Parameter | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ | 3.68 | 0.02 | 2.04 | 0.005 | 0.05 | 0 | 0.25 | 0 |
| PERM | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PERT | MJ | 3.68 | 0.02 | 2.04 | 0.005 | 0.05 | 0 | 0.25 | 0 |
| PENRE | MJ | 27.1 | 0.39 | 3.55 | 0.08 | 0.77 | 0 | 1.89 | 0 |
| PENRM | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PENRT | MJ | 27.1 | 0.39 | 3.55 | 0.08 | 0.77 | 0 | 1.89 | 0 |
| SM | kg | 0.03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| RSF | MJ | 1.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NRSF | MJ | 2.48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FW | $m^3$ | 2E-02 | 2.01E-05 | 1.1E-03 | 4.02E-06 | 4E-05 | 0 | 4.77E-04 | 0 |

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 AQUAPANEL® Cement Board Rooftop 6 mm**

| Parameter | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| HWD | kg | 3.87E-08 | 1.44E-08 | 2.38E-09 | 2.88E-09 | 2.86E-08 | 0 | 2.88E-08 | 0 |
| NHWD | kg | 6.52E-02 | 6.77E-05 | 2.73E-03 | 1.35E-05 | 1.35E-04 | 0 | 9.51E+00 | 0 |
| RWD | kg | 5.45E-04 | 4.06E-07 | 2.96E-04 | 8.11E-08 | 8.07E-07 | 0 | 2.15E-05 | 0 |
| CRU | kg | 0.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MFR | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MER | kg | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EEE | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| EET | MJ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 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 AQUAPANEL® Cement Board Rooftop 6 mm**

| Parameter | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| PM | Disease incidence | ND | ND | ND | ND | ND | ND | ND | ND |
| IR | kBq U235 eq | ND | ND | ND | ND | ND | ND | ND | ND |
| ETP-fw | CTUe | ND | ND | ND | ND | ND | ND | ND | ND |
| HTP-c | CTUh | ND | ND | ND | ND | ND | ND | ND | ND |
| HTP-nc | CTUh | ND | ND | ND | ND | ND | ND | ND | ND |
| SQP | SQP | ND | ND | ND | ND | ND | ND | ND | ND |

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

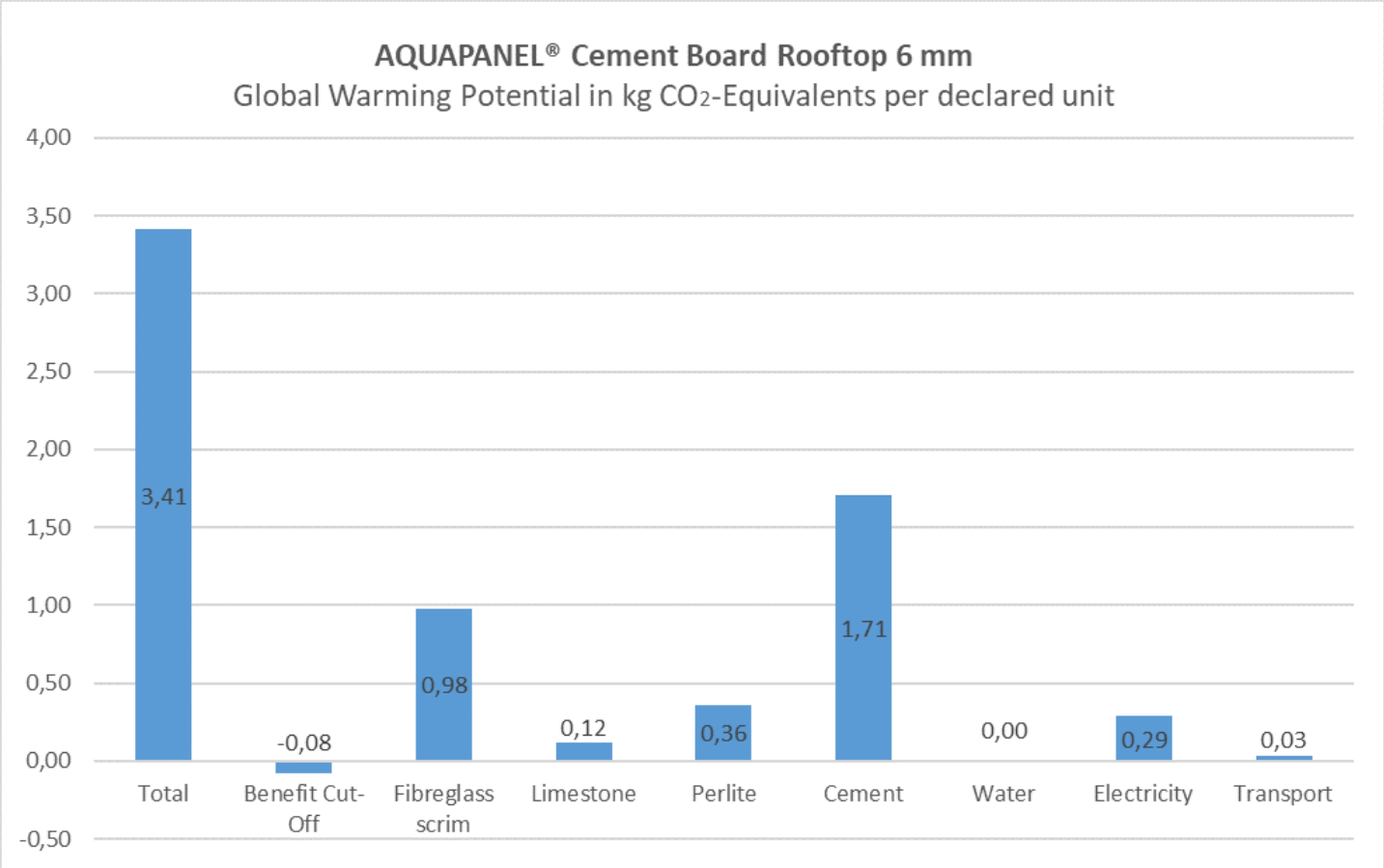
Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure 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

Based on the dominance analysis of the use of resources, it can be seen that the most climate-effective impact in the case of AQUAPANEL® cement panels is the raw material procurement/raw material processing (module A1). The mineral raw materials used for this are extracted as a non-regenerative resource and in some cases also thermally treated (glass melting, blowing process, cement burning). The CEM I cement used in the product contributes approx. 60% to the Global Warming Potential (GWP) due to the energy-intensive burning process, whereas the electrical energy of the production process only contributes approx. 5% to the GWP (see figure).

In the other impact categories considered, raw material procurement and raw material processing (A1), especially that of mineral raw materials, also stand out as relevant processes in the overall system, whereas the transport of raw materials and production at the Iserlohn plant have only minor impacts. The effects of the production process in the plant itself are rather subordinate in terms of life cycle assessment and are largely due to the electrical energy demand. The processes used here are largely mixing and moulding processes that have hardly any environmental impact. The drying process in the curing warehouse takes place without the use of additional thermal energy due to exothermic processes.




## 7. Requisite evidence

**7.1 Quality Management System DIN EN ISO 9001**
The location in Iserlohn is certified according to DIN EN *ISO 9001* (2018).

**7.2. Radioactivity**
The Activity Concentration Index (ACI) was determined to be 0.18. The tested product meets the official guideline value of ACI <1 as well as the test condition ACI <0.75 of the Institut für Baubiologie Rosenheim (IBR). Institute for Building Biology Rosenheim GmbH *Test Report No. 3018-1018* of August 2020.

**7.3. VOC emissions**
The analysis of emissions of volatile organic compounds (VOC) starting from the AQUAPANEL® Cement Board Rooftop was carried out in August 2020 by the Institut für Baubiologie Rosenheim (IBR) and the results were documented in *test report no. 3018-1018*.

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

| Name | Value | Unit |
|---|---|---|
| TVOC (C6 - C16) | 600 | µg/m$^3$ |
| Sum SVOC (C16 - C22) | <5 | µg/m$^3$ |
| R (dimensionless) | 0.1 | - |
| VOC without NIK | <5 | µg/m$^3$ |
| Carcinogenic Substances | <1 | µg/m$^3$ |

**AgBB result overview (3 days [µg/m³])**

| Name | Value | Unit |
|---|---|---|
| TVOC (C6 - C16) | 3100 | µg/m$^3$ |
| Sum SVOC (C16 - C22) | <5 | µg/m$^3$ |
| R (dimensionless) | 0.5 | - |
| VOC without NIK | 20 | µg/m$^3$ |
| Carcinogenic Substances | <1 | µg/m$^3$ |

Based on the measurement results and the comparison of the specifications of the AgBB scheme and the DIBt approval principles, no contamination of the tested product by emissions of volatile organic compounds and in particular by formaldehyde is to be expected; therefore, the use of the cement boards in interior rooms of buildings is harmless in terms of VOC emissions.

**7.4 Heavy metal concentrations**
A determination of the heavy metal concentration both in the original substance and in the eluate was carried out by the Institut für Baubiologie Rosenheim (IBR) in August 2020. The determination in the original substance was carried out according to *ISO 17294-2*, in the eluate according to *DIN 38414-4*.
Institut für Baubiologie Rosenheim GmbH *Test Report No. 3018-1018.*

**Heavy metal concentrations in the original substance**

| Name | Value | Unit |
|---|---|---|
| Arsenic | 1,6 | mg/kg |
| Lead | 6,0 | mg/kg |
| Cadmium | <0.3 | mg/kg |
| Chrome | 22,1 | mg/kg |
| Copper | 35.1 | mg/kg |
| Nickel | 9,61 | mg/kg |
| Mercury | <0,05 | mg/kg |
| Zinc | <30 | mg/kg |

**Heavy metal concentration in the eluate**

| Name | Value | Unit |
|---|---|---|
| Arsenic | <0,01 | mg/l |
| Lead | <0,005 | mg/l |
| Cadmium | <0,0005 | mg/l |
| Chrome | 0,0231 | mg/l |
| Copper | <0,005 | mg/l |
| Nickel | <0,005 | mg/l |
| Mercury | <0,0001 | mg/l |
| Zinc | 0,072 | mg/l |

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