# Alpha 2000 and Nivello Quattro

Calcium-Sulphate Self-Levelling Screeds
by BAUMIT Bulgaria EOOD

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**EPD Program operator:**
Instytut Techniki Budowlanej (ITB)
1 Filtrowa Str.
00-611 Warsaw, Poland
www.itb.pl

**Manufacturer:**
BAUMIT Bulgaria EOOD
38 Bulgaria Str.,
Elin Pelin 2100, BULGARIA
www.baumit.bg

## 1. General Information

**EPD owner:** **BAUMIT Bulgaria EOOD**
Address: 38 Bulgaria Str., Elin Pelin 2100, BULGARIA
Website and e-mail: www.baumit.bg; office@baumit.bg
Telephone: + 359 2 9266 911

**LCA and EPD prepared by:** **Green ReStart OOD**
Address: 65 Shipchenski prohod Blvd., 1574 Sofia, Bulgaria
Contact person: Dr. Eng. Roumiana Zaharieva (roumiana.zaharieva@gmail.com)
Dr. Eng. Yana Kancheva (kancheva@greenrestart.com )

This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025. It contains information about the impact of declared construction materials on environment and their aspects verified by the independent Advisory Board according to ISO 14025.

Basically, a comparison, or evaluation of EPD data is possible only if all the compared data were created according to EN 15804.

**Life Cycle analysis (LCA):** Modules A1-A3, C1-C4 and Module D in accordance with EN 15804 (Cradle to Gate with options)

**Declared durability:** 50 years under normal conditions of use

**Product standard**: BDS EN 13813

**PCR**: ITB-EPD General PCR v1.4/2014

**Representativeness:** BG, RER, GLO

**Declared unit:** 1 ton of dry mix for calcium-sulphate self-levelling floating screeds

**LCA scope:** Product stage (modules A1-A3), end-of-life stage (C1-C4) and Benefits and loads beyond the system boundary (module D)

**Year of preparing the characteristic:** 2021

## 2. Product Description

### BAUMIT ALPHA 2000

BAUMIT Alpha 2000 is a a factory-made, ready-mixed, calcium sulphate screed (class CA-C20-F5, acc. to EN 13813) for use as a floating, sliding and composite screed for machine application and increased area coverage. Alpha 2000 is suitable for underfloor heating without the use of additives. It consists of calcium sulphate, limestone crushed stone, Portland cement and additives. Alpha 2000 covers the requirements of the European standard EN 13813 and the Austrian standard ÖNORM B 2232. Alpha 2000 is packed in bags with unit mass 40 kg.

## BAUMIT NIVELLO QUATTRO

BAUMIT Nivello Quattro is a factory-made, ready-mixed, self-levelling powder-form calcium sulphate screed (class CA-C20-F6, acc. to EN 13813), used as a floating screed, for smoothing and filling putty for indoor use, for levelling and smoothing of calcium sulphate, cement, asphalt, magnesium and quick-drying screeds, as well as for tiled surfaces in old and new buildings, in coat thicknesses from 1 to 20 mm, prior to the laying of floor coverings of any kind. It consists of calcium sulphate, limestone crushed stone, Portland cement and additives. Nivello Quattro is packed in bags with unit mass 25 kg.

Figure 1 and Figure 2 show pictures of packed Alpha 2000 and Nivello Quattro.


Figure 1: Packed Alpha 2000 calcium-sulphate screed dry mix


Figure 2: Packed Nivello Quattro calcium sulphate screed dry mix

Table 1 lists the essential characteristics of Alpha 2000 and Nivello Quattro as per the Product technical specifications.

Table 1: Technical characteristics of Alpha 2000 and Nivello Quattro

| Characteristics | Value/Class | | Units | Technical specification |
|---|---|---|---|---|
| | Alpha 2000 | Nivello Quattro | | |
| Dry density | ≈ 1950 | ≈ 1280 | kg/m$^3$ | BDS EN 13813 |
| Maximum grain size | < 4.0 | 0.3 | mm | BDS EN 13813 |
| Compressive strength class | C 20 | C 20 | class | BDS EN 13813 |
| Bending tensile strength class | F 5 | F 6 | class | BDS EN 13813 |
| Strength class | CA–C20–F5 | CA–C20–F6 | class | BDS EN 13813 |
| Consumption rate | ≈ 1.9 | ≈ 1.5 | kg/m$^2$ for 1 mm thickness | |
| Water demand | ≈ 16% | ≈ 24% | 6.4 litres/40 kg bag for Alpha 2000<br>6.0 litres per 1 bag of 25 kg for Nivello Quattro | |

## 3. LCA Information

| | |
|---|---|
| **FUNCTIONAL UNIT** | 1 ton calcium-sulphate screed |
| **SYSTEM BOUNDARIES** | Cradle to Gate + options: Modules A1-A3, C1-C4 and Module D |
| **DECLARED DURABILITY** | 50 years for indoor applications under normal conditions of use |
| **CUT-OFF CRITERIA** | As per EN 15804, in the case that there is not enough information, the process energy and materials representing less than 1% of the energy and mass used per module can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded is less than 5% of the whole mass and energy used, as well of the emissions to environment occurred.<br>Flows related to human activities such as employee transport are excluded. In accordance with EN 15804 the construction of plants, production of machines and transportation systems are excluded.<br>Environmental burden of the administrative building is partly considered.<br>Some additives in very small amounts are excluded due to lack of enough data and negligible potential environmental impacts.<br>The total sum of omitted processes does not exceed 1% of the whole mass of inputs and outputs. |
| **ASSUMPTIONS AND LIMITATIONS** | Generic data from ecoinvent v.3.6 database is used to model the components of calcium-sulphate screeds that are delivered by external suppliers and the manufacturer does not have influence on their production processes.<br>Packaging materials and packaging waste are considered in the assessment of all components of Alpha 2000 and Nivello Quattro. |
| **GEOGRAPHICAL COVERAGE AND TIME PERIOD** | All data related to the calcium-sulphate screeds is collected from BAUMIT Bulgaria EOOD and represents the manufacturing process in 2018.<br>Assessment of transport of all components covers all used transport types, external and internal transport activities. |
| **DATA QUALITY** | The information on the production process of the screeds is collected from BAUMIT Bulgaria EOOD.<br>Information on the transport and composition of components is provided by BAUMIT Bulgaria EOOD.<br>Information on the production process of additives is accounted as presented in ecoinvent v.3.6 database. |
| **ALLOCATION** | The factory of BAUMIT Bulgaria EOOD in Elin Pelin produces various construction products for external and internal finishing layers of buildings. The manufacturing processes for both calcium-sulphate screeds are equivalent with slight variance in terms of working regime of drying and mixing stations. Even though, allocation is done regarding energy and fuel use, and generated waste. Environmental impacts, resource use and waste generation are calculated based on yearly data about the inputs/outputs and the yearly production of calcium-sulphate screeds for 2018. |

## 4. Manufacturing process

The received fraction of crushed stone is 20/60 mm and it is dried in an oven, if necessary. This fraction is then crushed in a coarse crusher and subsequently sieved into seven smaller fractions. The smaller fractions are fed into pipelines and then carried to silos.

The other ingredients – calcium sulphate, cement CEM I 52.5 N and additives (polymeric, cellulose, etc.), are delivered as dry substances. Calcium sulphate and cement are delivered in mobile (transportable silos) and are discharged into the factory silos (in the factory tower) through pneumatic compressed air pipe system. The additives are delivered in paper bags or big bags and are also discharged into smaller silos in the factory tower.

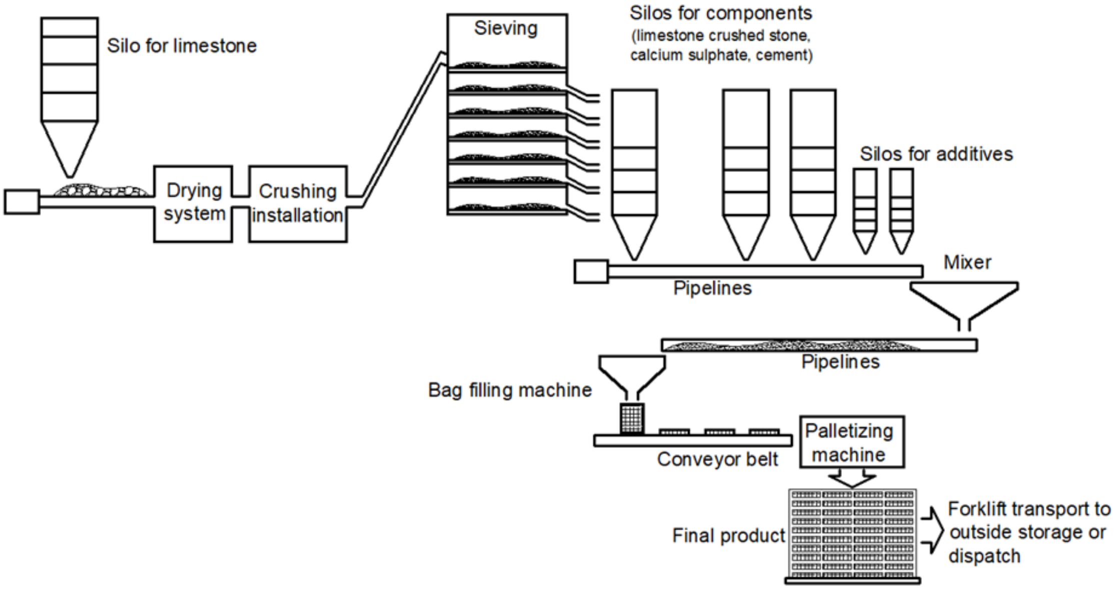


Figure 3: Production process of Alpha 2000 and Nivello Quattro

After the predefined quantity of each material is set, the materials are dosed and released on gravity pipelines that take them to a mixing facility. The ready mix is then transported to a machine for bag-filling. All products are packed in paper bags with mass 40 kg or 25 kg. The sealed bags are transported to the palletizing station through conveying belt. The bags are arranged on the pallets and covered by elastic polyethylene film. The pallets are transported by forklifts to an outside storage space.

## 5. System boundaries

**Module A1:** Raw materials supply and transport
The production processes of the calcium sulphate, limestone crushed stone, Portland cement and additives are considered using referent data for the ecoinvent database. Production of packaging materials is also considered using referent data from the ecoinvent database.

**Module A2:** Transport of raw materials to the production site
The transport to the factory of the calcium sulphate, limestone crushed stone, Portland cement, additives and packaging materials is considered using real data from the manufacturer.

**Module A3:** Manufacturing

This module considers the actual production process: This includes the process of crushing, drying, sieving, dosing, packaging and palletizing. Energy, water and fuel consumption are considered in full based on 1-year consumption data provided by the manufacturer.

**Module C1:** Deconstruction/Demolition of the building

Module C1 describes the processing of screeds during the deconstruction/demolition as part of the deconstruction/demolition process of the entire building. Data is assembled based on developed scenario.

BAUMIT Bulgaria manufactures and offers construction products since 1995, i.e. for 25 years. So, at present practically no concrete data for the end of life of the considered products – calcium sulphate screeds, is available. The following scenario is developed, based on existing practices in Bulgaria in regards with the construction and demolition waste (C&DW) management and the requirements of the national legislation (WMA, 2012 and Ordinance on C&DW management, 2012 and 2017).

The deconstruction/demolition of the calcium sulphate screeds is considered as a part of the entire demolition process of the whole building. There are no specific selective demolition methods for screeds removal, applied in Bulgaria. However, the calcium sulphate screeds are to be collected separately, because, although the national legislation does not impose a material recovery degree for that C&DW, there is a prohibition for disposal of gypsum containing waste at the ordinary regional landfills for municipal waste. During the demolition process the floating screeds are practically self-detached. A significant amount (at least 80%) of the screeds, initially adhered to the substrate, is self-detached, too, because of the friability of the screeds and breaking of bonding with the substrate. So, at least 80% of the screed waste is collected separately as C&DW of code 17 08 02 (as per the European Waste Catalogue EWC, gypsum-based construction materials other than those mentioned in 17 08 01*). The screed waste is transferred to a dedicated container by the existing means at the construction site (lifts/winders, chutes, etc.). The remains of adhered screeds (not more than 20%) contribute to the C&DW, coming from of the substrate material, i.e. to C&DW of code 17 01 01 (concrete) and it is transported to a treatment plant for recovery operations. Therefore, the contribution of calcium sulphate screeds to the demolition of the entire building can be neglected and the impact of this module is assumed as zero.

**Module C2:** Transport to waste treatment facility

Module C2 refers to the transport of the screed C&D waste (C&DW) to a facility for waste treatment. Data is assembled based on a developed scenario.

The following assumptions are made to calculate the impacts of this module:

- 80 % of the screed waste from demolition activities is collected as C&DW of code 17 08 02. The loading of waste is done by a loader with bucket capacity 3,6 $m^3$, Euro IV emissions class. The waste is transported to a special facility – a dedicated landfill, where the gypsum containing waste can be disposed separately or to a C&DW storage site. The average distance of transportation is 25 km. The transport of waste is done by a lorry of the size class 7.5-16 tons, Euro IV emissions class.
- 20% of the screed waste from demolition activities is collected as C&DW code 17 01 01. The loading of waste is done by a loader with bucket capacity 3,6 m3, Euro IV emissions class. The average distance of transportation is 25 km. The transport of waste is done by a lorry of the size class 7.5-16 tons, Euro IV emissions class.

**Module C3: Waste processing**

Module C3 accounts for the environmental impacts during the processing of C&DW containing calcium-sulphate screed at the waste recovery facility. Data is assembled based on a developed scenario.

Module C3 shall account the environmental impacts during the processing of screed C&DW at the waste recovery facility. In Bulgaria there is no recycling of calcium sulphate screeds from demolition/repair works. Concrete waste of code 17 01 01 is recycled by crushing and screening only into coarse aggregate. During the crushing and screening the more friable screed is broken and detached and collected as unsuitable fraction, forming a secondary waste from the recycling plant.

No recovery or further treatment of that waste is foreseen. Since it is gypsum containing waste, it is stored or landfilled at a dedicated place within the treatment facility.

Taking into consideration the small amount of screed waste among the concrete waste (20% on flooring slabs and no screed on other demolished concrete elements – columns, beams, shear walls, foundations, roof slab), the contribution of calcium sulphate screeds to the recycling process of the building's concrete waste can be neglected and the impact of this module is assumed as zero.

**C4: Disposal**

Module C4 considers the effects from calcium-sulphate containing C&DW that is disposed. Data is assembled based on developed scenario.

At the landfill, the waste is unloaded from the lorry at a dedicated place. No additional treatment is required.

**Module D:** Benefits and loads beyond the system boundary

Module D regards the effects and impact of the secondary material derived from recycling of calcium sulphate containing C&DW. Since at the present moment in Bulgaria there are no practices for calcium sulphate waste recovery at all, at the end of the service life the screeds cannot be linked to other systems using calcium sulphate. This is why, the impacts for module D are assumed to be zero.

## 6. LCA Results

**Declared unit**

The declaration refers to 1 ton of calcium-sulphate screed dry mix.

Table 2: Description of the system boundary

| Environmental assessment information (☒ – Included in LCA, MNA – Module not assessed) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Product stage | | | Construction process | | Use stage | | | | | | | End of life | | | | Benefits and loads beyond the system boundary |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Raw material supply | Transport | Manufacturing | Transport to construction site | Construction – assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction/ demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling potential |
| ☒ | ☒ | ☒ | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | MNA | ☒ | ☒ | ☒ | ☒ | ☒ |

The following tables provide the LCA results on the evaluated environmental categories. A list of the used abbreviations is given below:

| | |
|---|---|
| GWP-total | Global warming potential total (sum of GWP-fossil, GWP-biogenic and GWP-luluc) |
| GWP-fossil | Global warming potential fossil fuels |
| GWP-biogenic | Global warming potential biogenic |
| GWP-luluc | Global warming potential land use and land use change |
| ODP | Ozone depletion potential |
| AP | Acidification potential |
| EP-freshwater | Eutrophication potential, fraction of nutrients reaching freshwater end compartment |
| EP-marine | Eutrophication potential, fraction of nutrients reaching marine end compartment |
| EP-terrestrial | Eutrophication potential, Accumulated Exceedance |
| POCP | Photochemical ozone creation potential |
| ADP-minerals & metals | Abiotic depletion potential for non-fossil resources |
| ADP-fossil fuels | Abiotic depletion potential of fossil resources |
| RPER | Renewable primary energy resources |
| NRPER | Non-renewable primary energy resources |
| ETP-fw | Eco-toxilcity freshwater (Potential Comparative Toxic Unit for ecosystems) |
| HTP-c | Human toxicity, cancer effects (Potential Comparative Toxic Unit for humans) |
| HTP-nc | Human toxicity, non-cancer effects (Potential Comparative Toxic Unit for humans) |
| IRP | Ionizing radiation, human health (Potential Human exposure efficiency relative to U-235) |
| SQP | Land use related impacts/ Soil quality (Potential soil quality index) |
| PM | Particulate Matter emissions (Potential incidence of disease due to PM emissions) |

Table 3: Environmental information about 1 ton Alpha 2000 calcium-sulphate screed dry mix

| Environmental impacts for 1 ton Alpha 2000 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| GWP-total | kg $CO_2$–eq. | 4.09E+01 | 4.78E+01 | 2.00E+01 | 0.00E+00 | 7.81E+00 | 0.00E+00 | 1.11E+00 | 0.00E+00 |
| GWP-fossil | kg $CO_2$–eq. | 4.06E+01 | 4.78E+01 | 2.00E+01 | 0.00E+00 | 7.81E+00 | 0.00E+00 | 1.11E+00 | 0.00E+00 |
| GWP-biogenic | kg $CO_2$–eq. | 2.80E-01 | 0.00E+00 | 1.51E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.52E-05 | 0.00E+00 |
| GWP-luluc | kg $CO_2$–eq. | 2.52E-03 | 4.00E-04 | 1.53E-05 | 0.00E+00 | 5.73E-05 | 0.00E+00 | 2.59E-06 | 0.00E+00 |
| ODP | kg CFC 11–eq. | 3.64E-06 | 1.10E-05 | 9.50E-07 | 0.00E+00 | 1.72E-06 | 0.00E+00 | 2.38E-07 | 0.00E+00 |
| AP | mol $H^+$–eq. | 1.99E-01 | 1.11E-01 | 1.42E-01 | 0.00E+00 | 1.69E-02 | 0.00E+00 | 1.89E-03 | 0.00E+00 |
| EP-freshwater | kg $PO_4$–eq. | 8.73E-03 | 3.54E-03 | 4.50E-02 | 0.00E+00 | 5.50E-04 | 0.00E+00 | 4.01E-05 | 0.00E+00 |
| EP-marine | kg N–eq. | 4.07E-02 | 1.53E-02 | 2.09E-02 | 0.00E+00 | 2.31E-03 | 0.00E+00 | 2.50E-04 | 0.00E+00 |
| EP-terrestrial | mol N–eq. | 4.67E-01 | 1.62E-01 | 1.25E-01 | 0.00E+00 | 2.45E-02 | 0.00E+00 | 2.72E-03 | 0.00E+00 |
| POCP | kg NMVOC–eq. | 1.26E-01 | 8.15E-02 | 3.70E-02 | 0.00E+00 | 1.23E-02 | 0.00E+00 | 1.51E-03 | 0.00E+00 |
| ADP-minerals&metals | kg Sb–eq. | 1.33E-02 | 1.26E-03 | 5.47E-05 | 0.00E+00 | 2.00E-04 | 0.00E+00 | 1.69E-06 | 0.00E+00 |
| ADP-fossil | MJ | 6.05E+02 | 7.19E+02 | 3.14E+02 | 0.00E+00 | 1.12E+02 | 0.00E+00 | 1.50E+01 | 0.00E+00 |
| WDP | $m^3$ | 6.42E+02 | 6.83E+02 | 4.40E+03 | 0.00E+00 | 1.03E+02 | 0.00E+00 | 3.22E+00 | 0.00E+00 |

| Additional environmental impacts for 1 ton Alpha 2000 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| ETP-fw | CTUe | 1.25E+01 | 2.45E+01 | 1.03E+00 | 0.00E+00 | 2.47E+00 | 0.00E+00 | 8.99E-02 | 0.00E+00 |
| HTP-c | CTUh | 1.15E-08 | 1.48E-08 | 6.16E-09 | 0.00E+00 | 3.47E-09 | 0.00E+00 | 7.02E-10 | 0.00E+00 |
| HTP-nc | CTUh | 8.19E-07 | 9.23E-07 | 1.18E-06 | 0.00E+00 | 1.29E-07 | 0.00E+00 | 6.82E-09 | 0.00E+00 |
| IRP | kBq U-235-eq. | 2.14E+00 | 3.75E+00 | 9.78E+00 | 0.00E+00 | 5.78E-01 | 0.00E+00 | 6.90E-02 | 0.00E+00 |
| SQP | - | 7.08E+02 | 7.73E+02 | 2.02E+01 | 0.00E+00 | 6.94E+01 | 0.00E+00 | 7.76E-01 | 0.00E+00 |
| PM | Disease incidence | 2.69E-06 | 3.24E-06 | 2.26E-07 | 0.00E+00 | 4.25E-07 | 0.00E+00 | 5.26E-08 | 0.00E+00 |

| Resource use for 1 ton Alpha 2000 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| RPER excluding RPER used as raw materials | MJ | 2.72E+01 | 1.02E+01 | 2.41E+01 | 0.00E+00 | 1.54E+00 | 0.00E+00 | 8.22E-02 | 0.00E+00 |
| RPER used as raw materials | MJ | 2.54E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PERT | MJ | 5.26E+01 | 1.02E+01 | 2.41E+01 | 0.00E+00 | 1.54E+00 | 0.00E+00 | 8.22E-02 | 0.00E+00 |
| NRPER excluding NRPER used as raw materials | MJ | 6.33E+02 | 7.33E+02 | 4.83E+02 | 0.00E+00 | 1.15E+02 | 0.00E+00 | 1.51E+01 | 0.00E+00 |
| NRPER used as raw materials | MJ | 0.00E+00 | 1.00E+00 | 2.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PENRT | MJ | 6.33E+02 | 7.34E+02 | 4.85E+02 | 0.00E+00 | 1.15E+02 | 0.00E+00 | 1.51E+01 | 0.00E+00 |
| Use of secondary material | kg | 2.64E+00 | 2.90E-01 | 3.38E-02 | 0.00E+00 | 5.59E-02 | 0.00E+00 | 7.46E-03 | 0.00E+00 |
| Use of renewable secondary fuels | MJ | 5.69E-01 | 3.64E-01 | 9.81E-01 | 0.00E+00 | 5.36E-02 | 0.00E+00 | 2.02E-03 | 0.00E+00 |
| Use of non-renewable secondary fuels | MJ | 1.80E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Net use of fresh water | $m^3$ | 1.27E-01 | 5.25E-02 | 1.39E-01 | 0.00E+00 | 7.75E-03 | 0.00E+00 | 4.20E-04 | 0.00E+00 |

| Output flows and waste categories for 1 ton Alpha 2000 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| Hazardous waste disposed | kg | 1.46E+00 | 7.37E-01 | 2.57E-01 | 0.00E+00 | 1.31E-01 | 0.00E+00 | 1.64E-02 | 0.00E+00 |
| Non-hazardous waste disposed | kg | 4.17E+01 | 5.31E+01 | 0.00E+00 | 0.00E+00 | 5.62E+00 | 0.00E+00 | 1.75E-01 | 0.00E+00 |
| Radioactive waste disposed | kg | 1.15E-03 | 5.01E-03 | 2.43E-03 | 0.00E+00 | 7.80E-04 | 0.00E+00 | 1.10E-04 | 0.00E+00 |
| Components for re-use | 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 |
| Materials for recycling | kg | 2.17E+00 | 2.41E-01 | 1.84E+01 | 0.00E+00 | 4.83E-02 | 0.00E+00 | 7.33E-03 | 0.00E+00 |
| Materials for energy recovery | kg | 1.11E-02 | 4.03E-03 | 9.65E-03 | 0.00E+00 | 6.00E-04 | 0.00E+00 | 2.27E-05 | 0.00E+00 |
| Exported energy | 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 |

| **Biogenic carbon content** | **Unit** | |
|---|---|---|
| Biogenic carbon content in product | kg C | 0.00E+00 |
| Biogenic carbon content in accompanying packaging | kg C | 2.6E+01 |

Table 4: Environmental information about 1 ton Nivello Quattro calcium-sulphate screed dry mix

| Environmental impacts for 1 ton Nivello Quattro | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| GWP-total | kg $CO_2$–eq. | 1.23E+02 | 6.75E+01 | 2.24E+01 | 0.00E+00 | 7.81E+00 | 0.00E+00 | 1.11E+00 | 0.00E+00 |
| GWP-fossil | kg $CO_2$–eq. | 1.23E+02 | 6.75E+01 | 2.23E+01 | 0.00E+00 | 7.81E+00 | 0.00E+00 | 1.11E+00 | 0.00E+00 |
| GWP-biogenic | kg $CO_2$–eq. | 6.00E-01 | 0.00E+00 | 1.69E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.52E-05 | 0.00E+00 |
| GWP-luluc | kg $CO_2$–eq. | 3.59E-03 | 5.30E-04 | 1.71E-05 | 0.00E+00 | 5.73E-05 | 0.00E+00 | 2.59E-06 | 0.00E+00 |
| ODP | kg CFC 11–eq. | 8.17E-06 | 1.48E-05 | 1.06E-06 | 0.00E+00 | 1.72E-06 | 0.00E+00 | 2.38E-07 | 0.00E+00 |
| AP | mol $H^+$–eq. | 4.82E-01 | 3.14E-01 | 1.58E-01 | 0.00E+00 | 1.69E-02 | 0.00E+00 | 1.89E-03 | 0.00E+00 |
| EP-freshwater | kg $PO_4$–eq. | 2.35E-02 | 5.70E-03 | 5.02E-02 | 0.00E+00 | 5.50E-04 | 0.00E+00 | 4.01E-05 | 0.00E+00 |
| EP-marine | kg N–eq. | 9.62E-02 | 1.03E-01 | 2.33E-02 | 0.00E+00 | 2.31E-03 | 0.00E+00 | 2.50E-04 | 0.00E+00 |
| EP-terrestrial | mol N–eq. | 1.05E+00 | 1.12E+00 | 1.40E-01 | 0.00E+00 | 2.45E-02 | 0.00E+00 | 2.72E-03 | 0.00E+00 |
| POCP | kg NMVOC–eq. | 3.43E-01 | 3.21E-01 | 4.13E-02 | 0.00E+00 | 1.23E-02 | 0.00E+00 | 1.51E-03 | 0.00E+00 |
| ADP-minerals&metals | kg Sb–eq. | 1.72E-02 | 1.76E-03 | 6.10E-05 | 0.00E+00 | 2.00E-04 | 0.00E+00 | 1.69E-06 | 0.00E+00 |
| ADP-fossil | MJ | 2.59E+03 | 1.01E+03 | 3.50E+02 | 0.00E+00 | 1.12E+02 | 0.00E+00 | 1.50E+01 | 0.00E+00 |
| WDP | $m^3$ | 2.96E+03 | 3.48E+02 | 4.91E+03 | 0.00E+00 | 1.03E+02 | 0.00E+00 | 3.22E+00 | 0.00E+00 |

| Additional environmental impacts for 1 ton Nivello Quattro | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| ETP-fw | CTUe | 2.90E+01 | 3.31E+01 | 1.15E+00 | 0.00E+00 | 2.47E+00 | 0.00E+00 | 8.99E-02 | 0.00E+00 |
| HTP-c | CTUh | 2.79E-08 | 2.06E-08 | 6.88E-09 | 0.00E+00 | 3.47E-09 | 0.00E+00 | 7.02E-10 | 0.00E+00 |
| HTP-nc | CTUh | 2.42E-06 | 1.41E-06 | 1.32E-06 | 0.00E+00 | 1.29E-07 | 0.00E+00 | 6.82E-09 | 0.00E+00 |
| IRP | kBq U-235-eq. | 7.27E+00 | 4.70E+00 | 1.09E+01 | 0.00E+00 | 5.78E-01 | 0.00E+00 | 6.90E-02 | 0.00E+00 |
| SQP | - | 1.41E+03 | 1.02E+03 | 2.25E+01 | 0.00E+00 | 6.94E+01 | 0.00E+00 | 7.76E-01 | 0.00E+00 |
| PM | Disease incidence | 5.04E-06 | 4.81E-06 | 2.53E-07 | 0.00E+00 | 4.25E-07 | 0.00E+00 | 5.26E-08 | 0.00E+00 |

| Resource use for 1 ton Nivello Quattro | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| RPER excluding RPER used as raw materials | MJ | 9.60E+01 | 1.13E+01 | 2.69E+01 | 0.00E+00 | 1.54E+00 | 0.00E+00 | 8.22E-02 | 0.00E+00 |
| RPER used as raw materials | MJ | 3.37E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PERT | MJ | 1.30E+02 | 1.13E+01 | 2.69E+01 | 0.00E+00 | 1.54E+00 | 0.00E+00 | 8.22E-02 | 0.00E+00 |
| NRPER excluding NRPER used as raw materials | MJ | 2.73E+03 | 1.03E+03 | 5.41E+02 | 0.00E+00 | 1.15E+02 | 0.00E+00 | 1.51E+01 | 0.00E+00 |
| NRPER used as raw materials | 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 |
| PENRT | MJ | 2.73E+03 | 1.03E+03 | 5.41E+02 | 0.00E+00 | 1.15E+02 | 0.00E+00 | 1.51E+01 | 0.00E+00 |
| Use of secondary material | kg | 3.74E+00 | 3.92E-01 | 3.77E-02 | 0.00E+00 | 5.59E-02 | 0.00E+00 | 7.46E-03 | 0.00E+00 |
| Use of renewable secondary fuels | MJ | 2.79E+00 | 2.32E-01 | 1.10E+00 | 0.00E+00 | 5.36E-02 | 0.00E+00 | 2.02E-03 | 0.00E+00 |
| Use of non-renewable secondary fuels | MJ | 7.15E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Net use of fresh water | $m^3$ | 1.10E+00 | 5.05E-02 | 1.55E-01 | 0.00E+00 | 7.75E-03 | 0.00E+00 | 4.20E-04 | 0.00E+00 |

| Output flows and waste categories for 1 ton Nivello Quattro | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Indicator | Unit | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D |
| Hazardous waste disposed | kg | 3.68E+00 | 1.30E+00 | 2.87E-01 | 0.00E+00 | 1.31E-01 | 0.00E+00 | 1.64E-02 | 0.00E+00 |
| Non-hazardous waste disposed | kg | 1.13E+02 | 7.51E+01 | 0.00E+00 | 0.00E+00 | 5.62E+00 | 0.00E+00 | 1.75E-01 | 0.00E+00 |
| Radioactive waste disposed | kg | 3.34E-03 | 6.68E-03 | 2.71E-03 | 0.00E+00 | 7.80E-04 | 0.00E+00 | 1.10E-04 | 0.00E+00 |
| Components for re-use | 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 |
| Materials for recycling | kg | 3.00E+00 | 3.29E-01 | 1.84E+01 | 0.00E+00 | 4.83E-02 | 0.00E+00 | 7.33E-03 | 0.00E+00 |
| Materials for energy recovery | kg | 4.16E-02 | 2.97E-03 | 1.08E-02 | 0.00E+00 | 6.00E-04 | 0.00E+00 | 2.27E-05 | 0.00E+00 |
| Exported energy | 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 |

| **Biogenic carbon content** | **Unit** | |
|---|---|---|
| Biogenic carbon content in product | kg C | 0.47E+00 |
| Biogenic carbon content in accompanying packaging | kg C | 3.05E+01 |

## 7. Interpretation

Figure 4 illustrates the shares of product stage modules A1, A2, A3 and end-of-life stage (modules C1-C4) in some environmental impacts of Alpha 2000 and Nivello Quattro. No uniform trend can be outlined from the data, but it can be concluded that the primary share on most indicators is formed by the acquisition of raw materials and pre-products (module A1) and their transport to manufacturer's site (module A2). The production process (module A3) and related use of machines powered by electricity and fuels shows distinct impact contributions on indicators related to production of energy and fuels (PENRT, PERT, GWP, EP-freshwater).

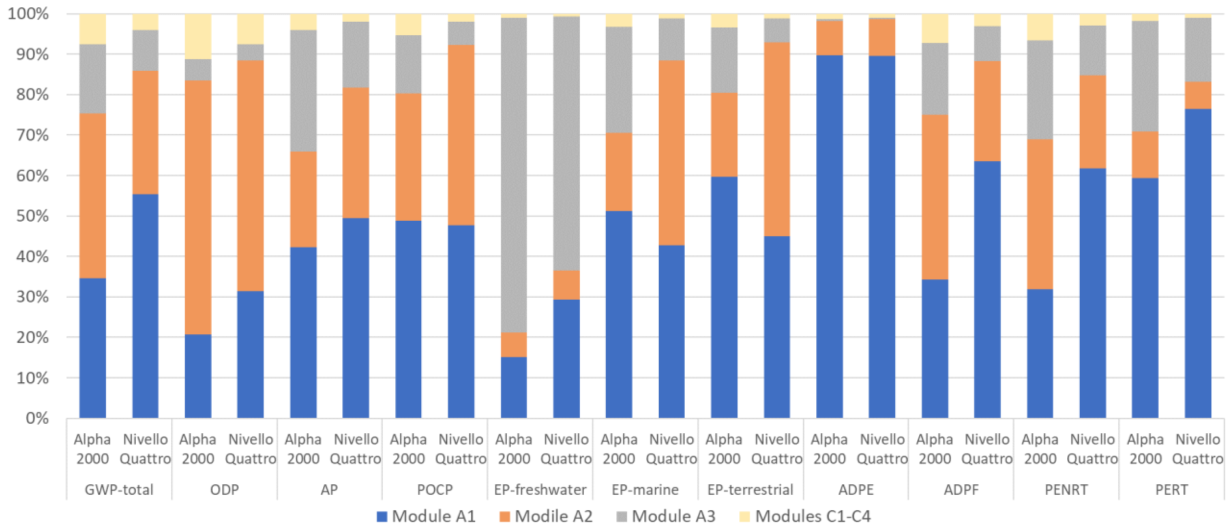


Figure 4: Shares of product stage modules A1, A2, A3 and end-of-life stage (modules C1-C4) in some environmental impacts of Alpha 2000 and Nivello Quattro

The environmental impacts for the end of life stage (modules C1-C4) arise from the operation of machines necessary for the processing of screed waste. These operations include collecting and loading of waste, transport to treatment facility, etc. Since the impacts from machines operation arise mainly from the use of fuels, the indicators of importance are the abiotic depletion potential for fossil resources (ADPF) and the use of non-renewable resources (PENRT), the carbon footprint (GWP) and ozone depletion potential (ODP) and these impacts are mostly released during modules C2 and C4 when machine processing is done.

## 8. EPD verification

The process of verification of an EPD is in accordance with ISO 14025, clause 8.1.3 and ISO 21930, clause 9. After verification, this EPD is valid for a 5 years period. EPD does not have to be recalculated after 5 years if the underlying data has not changed significantly.

| |
|---|
| CEN standard EN 15804 serves as the core PCR along with ITB PCR A |
| Independent verification corresponding to ISO 14025 (subclause 8.1.3)<br><br>☒ external ☐ internal |
| Verification of EPD: PhD Eng. Halina Prejzner, PhD Eng. Justyna Tomaszewska<br>LCI audit and input data verification: PhD Eng. Roumiana Zaharieva, PhD Eng. Yana Kancheva, PhD Eng. Justyna Tomaszewska<br>LCA auditor: PhD Eng. Roumiana Zaharieva, PhD Eng. Yana Kancheva<br>Verification of procedures and declaration: PhD Eng. Justyna Tomaszewska |

## Literature


[1] ITB PCR A- General Product Category Rules for Construction Products

[2] BDS EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

[3] BDS ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures

[4] BDS ISO 14040:2006, Environmental management -- Life cycle assessment -- Principles and framework

[5] BDS ISO 14044:2006, Environmental management – Life cycle assessment – Requirements and guidelines

[6] BDS EN 15942:2011, Sustainability of construction works – Environmental product declarations. Communication format business-to-business

[7] BDS EN 13813:2003 Screed material and floor screeds - Screed material - Properties and requirements

[8] 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

[9] Product technical specification for Alpha 2000, February 2019

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[11] Data safety sheet Nivello Quattro v.2 – 12.09.2018

[12] Data safety sheet Alpha 2000 v.2 – 12.09.2018

[13] International Energy Agency, www.iea.org (last visited March 21, 2019)

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[15] Candidate List of substances of very high concern for Authorisation, editor: European Chemicals Agency (ECHA), Helsinki (FI), last update 25/02/2019, https://echa.europa.eu/candidate-list-table

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[17] Bulgarian Waste Management Act, State Gazette No 53 dated 13.07.2012 and further amendments (Закон за управление на отпадъците)

[18] Bulgarian Waters Act, State Gazette No 67 dated 91 dated 27.07.1999, and further amendments (Закон за водите)

[19] Bulgarian Ordinance No.6 for construction and use of landfills and other facilities for waste recovery and disposal, State Gazette No 80 dated 13 Sept 2013г., and further amendments (Наредба № 6 от 27 август 2013 г. за условията и изискванията за изграждане и експлоатация на депа и на други съоръжения и инсталации за оползотворяване и обезвреждане на отпадъци).

[20] Bulgarian Ordinance No 1 on the procedure and forms for providing information about the activities on waste and procedures for keeping the public registers, State Gazette No 51 dated 20 June 2014, and further amendments (Наредба № 1 от 04 юни 2014 г. за реда и образците, по които се предоставя информация за дейностите по отпадъците, както и реда за водене на публични регистри)

[21] Bulgarian Ordinance for C&D waste management and use of recycled building materials, State Gazette No 98 dated 8 December 2017 (Наредба за управление на строителните отпадъци и за влагане на рециклирани строителни материали, 2017)


Signature Not Verified

Dokument podpisany przez Agnieszka Winkler-Skalna; ITB
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dr inż. Agnieszka Winkler-Skalna

Kierownik Zakładu Fizyki Cieplnej, Akustyki i Środowiska