

# CEM II/B-M (P-W-L) 42.5N
# CEM II/B-M (P-W-L) 42.5R

## Environmental Product Declaration
for Composite Portland Cement


**Programme** The International EPD® System
**Programme operator** EPD International AB
**EPD registration number** S-P-03611
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**Revision date** 2023-02-10
**Valid until** 2026-05-25


in accordance with ISO14025 and 15804:2012+A2:2019

EPD®
THE INTERNATIONAL EPD® SYSTEM

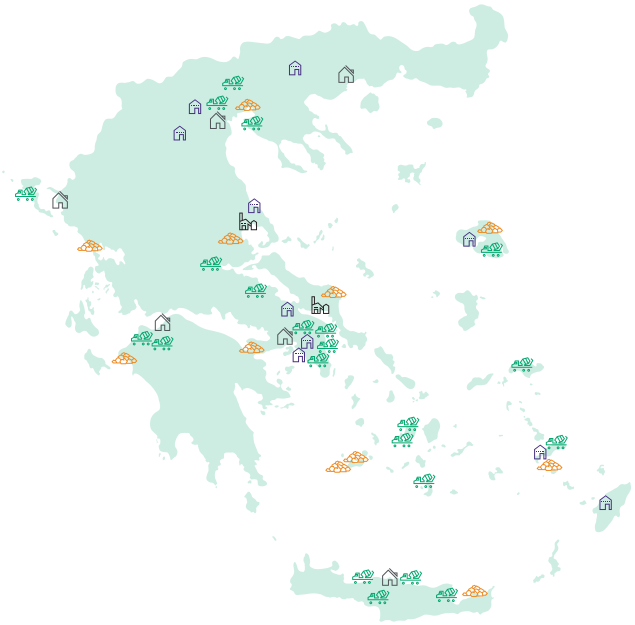
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HERACLES GROUP OF COMPANIES

# COMPANY INFORMATION

HERACLES Group of Companies, a member of LafargeHolcim, is the leader in cement sales in Greece, having 110 years of presence in the market. Having a network of 30 production and commercial facilities throughout Greece, the Company is active in the production and marketing of cement, aggregates, concrete and industrial minerals, offering products and solutions that meet the diversified needs of customers and the requirements of modern construction.

Main drivers for creating value are growth, the simplification of procedures and performance, financial strength and development of HERACLES Group people. Guided by sustainable development, the company implements effective resource management, which in combination with the organizational structure at all levels, enables to export cement, clinker, pumice, industrial materials and solid fuels, in more than 20 countries worldwide, contributing substantially to the national economy.



For HERACLES Group, Sustainable Development is a long-term commitment and non-negotiable priority that guides our daily business activity. We believe in building a greener and more sustainable world for people and the planet. A world that operates with respect for water and nature and upgrades the quality of life for all. We advocate an innovative, climate-neutral construction industry that will apply the principles of circular economy regarding the use of resources. To this end, we focus on four strategic pillars for sustainable development - Local Communities, Climate & Energy, Circular Economy, Nature - that create value for our activities, shareholders and our social partners. We are leading the transition to a lower carbon sector through the development and delivery of green products and solutions, saving natural resources, using alternative fuels and promoting circular economy.

**5** Companies

**2** Cement plants

**20** Types of cement

**10** Third Party bag depots

**12** Ports

**25** Ready-Mix concrete plants

**3.500** Customers

**12** Quarries

**6** Distribution centers

**30** Points of presence

# PRODUCT DESCRIPTION

Cement is one of the most important building materials used in the construction industry, working as binder that sets, hardens and adheres to other materials to bind them together. It is the main raw material for the production of concrete, mortars, grouts and plasters.

This is a product specific EPD for the Composite Portland Cement **CEM II/B-M (P-W-L) 42.5N 'BASIS'** and **CEM II/B-M (P-W-L) 42.5R** which conform to the requirements of EN 197-1 and are produced by Volos Cement Plant of HERACLES GCCo that is located near Volos town in Greece.
It is the ideal solution for civil engineering projects, construction works, ready-mixed concrete and concrete products.




The product CEM II /B-M(P-W-L) 42.5N, can be delivered in bulk and packed via the following methods:
- Bulk in silo trucks
- Bulk in bulk carrier vessels
- Big bags of 1.5 tns
- Bags of 40 and 20kg package under the brand name **BASIS**

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The product's technical characteristics and composition are presented at the tables below. Product declarations and certificates can be found at the company's website www.lafarge.gr

| Technical characteristics according to EN 197-1 | | CEM II/B-M (P-W-L) 42.5N<br>CEM II/B-M (P-W-L) 42.5R |
|---|---|---|
| Mechanical properties | Compressive Strength 2 days (MPa) [42.5N] | ≥ 10 |
| | Compressive Strength 2 days (MPa) [42.5R] | ≥ 20 |
| Chemical properties | Compressive Strength 28 days (MPa) | 42,5 – 62,5 |
| | Sulfate content ($SO_3$, % w/w) | ≤ 3,5 |
| Physical properties | Chloride content (Cl, % w/w) | ≤ 0,1 |
| | Initial setting time (min) | ≥ 60 |
| | Soundness (mm) | ≤ 10 |

| Composition according to EN 197-1 (% by mass)* | |
|---|---|
| Clinker | 65 - 79 |
| Pozzolana (P) - Fly ash (W) - Limestone (L) | 21 - 35 |
| Minor additional constituents | 0 - 5 |

**Gypsum is not included in the aforementioned composition*

## LCA INFORMATION

**DECLARED UNIT**
The declared unit is 1 tn (1.000 kg).

**GOAL AND SCOPE**
This EPD evaluates the environmental impacts of the production of 1 tn CEM II/B-M (P-W-L) 42.5N or CEM II/B-M (P-W-L) 42.5R from Cradle to gate.

**BACKGROUND DATA**
The most recent version of Ecoinvent database (v.3.7.1) was used as a source of background data.

**SOFTWARE**
The software used for the production of the LCA results is OpenLCA 1.10.3.

**DATA QUALITY**
ISO 14044 was applied in terms of data collection and quality requirements. The data concerning the modules A3 (product manufacturing) and A2 (transportation) were provided by HERACLES GCCo and involved all input and output materials to the plant, the consumed utilities (energy, water) and the distances and means of transport for each input stream. The background data for the module A1 e.g. electricity generation, raw materials and fuels production were recovered from Ecoinvent database (v.3.7.1). Regarding electricity mix, guarantees of origin in combination with the latest (2019) national residual electricity mix as published in DAPEEP SA were utilized.

**TIME REPRESENTIVENESS**
All primary data used in this study is for the full year 2020.

**GEOGRAPHICAL SCOPE**
Worldwide

**ALLOCATIONS**
Wherever possible allocation was avoided. The production was divided into two sub-processes, clinker and cement, and the related input and output data to each sub-process were collected. In some cases that data were not able to be attributed directly to the specific product production, they were allocated by physical properties (mass).

**ASSUMPTIONS**
It is assumed that for the road and sea transportation a lorry 16-32 metric ton, EURO4 and bulk carrier for dry goods were used respectively. All data were collected for the full year 2020. Only the cement recipe (materials percentage), is based on the last two months of the aforementioned year. Since then, an important change has been applied in the recipe and is valid till now.

**CUT-OFF RULES**
The cut-off rule for insufficient data or data gaps that are less than 1% of the total input mass and less than 5% of energy usage and mass per module was applied only to the grinding aid.

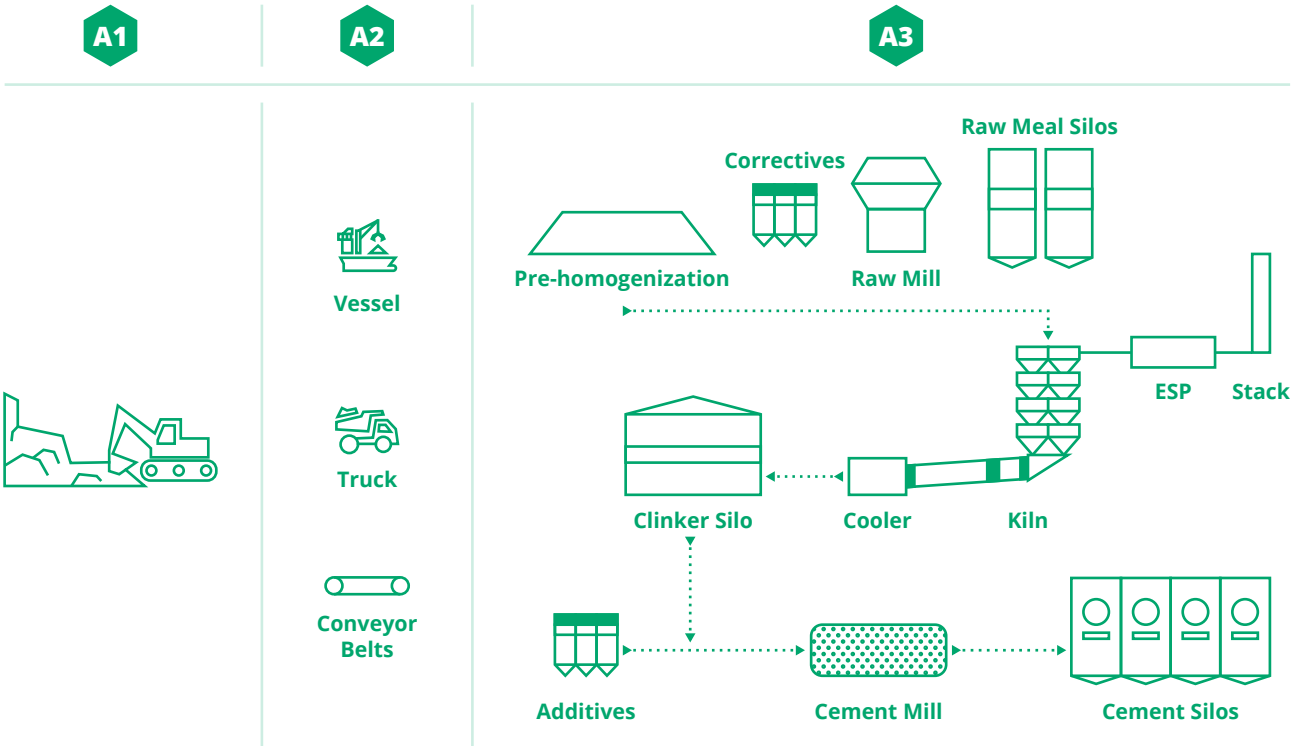
**COMPARABILITY**
EPDs of construction products may not be comparable if they do not comply with EN 15804. EPDs within the same product category but from different programmes may not be comparable.

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# SYSTEM BOUNDARY

The scope of this study is “Cradle to gate” covering the product stage (modules A1-A3), since the product fulfills the three conditions required by EN 15804:2012+A2:2019, about the exclusion of modules C1-C4 and D.

| X= Included, MND= Module Not Declared | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Product Stage | | | Construction Stage | | Use Stage | | | | | | | End-of-life Stage | | | | Resource Recovery |
| Raw Materials Supply | Transport | Manufacturing | Transport | Construction installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction and demolition | Transport | Waste processing for reuse, recovery and/or recycling | 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 | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |




## A1: Raw Material Supply

Production starts with raw materials supply. This stage includes the mining and processing of raw materials, the extraction and processing of fuels and the recycling of secondary materials.

## A2: Transportation of raw materials to manufacturer

Transport concerns the delivery of raw materials from the supplier to the gate of the manufacturing plant. Raw materials are transported by truck, vessels and conveyor belts from nearby quarries.

### A3: Manufacturing

The cement manufacturing starts with the formation of a raw materials homogeneous stockpile that has the right proportion of calcium oxide, alumina, silica and iron oxide. This stockpile is called pre-blending and contains mainly limestone and clay with additional materials in smaller proportions like fluoride, bauxite and hornstone. The stockpile is reclaimed, regularly analyzed and adjusted by correctives addition to fulfill the raw mix design requirements in terms of chemistry. Then, it is fed to the raw mill for grinding where a fine powder, called raw meal, is produced. The raw meal is stored into silos where further homogenization takes place and then fed to the rotary kiln for sintering where the temperature rises at around 1450°C by fuels burning and clinkerization reactions take place. At the end of the kiln, the sintered material is rapidly cooled and clinker is formed. Finally, cement is produced in the cement mills where clinker is ground with gypsum and certain natural or artificial materials and then stored into silos.

## ENVIRONMENTAL PERFORMANCE INDICATORS

| ENVIRONMENTAL IMPACTS per 1 ton CEM II/B-M (P-W-L) 42.5N / CEM II/B-M (P-W-L) 42.5R | | Unit | A1-A3 |
|---|---|---|---|
| **GWP-total** | **Global warming potential - total** | kg $CO_2$ eq | 6,89E+02 |
| **GWP-fossil** | **Global warming potential - fossil** | kg $CO_2$ eq | 6,89E+02 |
| **GWP-biogenic** | **Global warming potential - biogenic** | kg $CO_2$ eq | 1,25E-01 |
| **GWP-luluc** | **Global warming potential - luluc** | kg $CO_2$ eq | 5,74E-02 |
| **GWP-GHG[1]** | **Global warming potential - GHG** | kg $CO_2$ eq | 6,86E+02 |
| **ODP** | **Ozone Depletion Potential** | kg CFC-11 eq | 3,17E-05 |
| **AP** | **Acidification Potential** | mol $H^+$ eq | 1,59E+00 |
| **EP-freshwater** | **Eutrophication potential - freshwater** | kg $PO_4^{-3}$ eq | 2,69E-01 |
| **EP-freshwater[2]** | **Eutrophication potential - freshwater** | kg P eq | 8,76E-02 |
| **EP-marine** | **Eutrophication potential - marine** | kg N eq | 5,71E-01 |
| **EP-terrestrial** | **Eutrophication potential - terrestrial** | mol N eq | 6,21E+00 |
| **POCP** | **Photochemical oxidant formation Potential** | kg NMVOC eq | 1,52E+00 |
| **ADPe[3]** | **Abiotic depletion potential - Elements** | kg Sb eq | 3,30E-04 |
| **ADPf[3]** | **Abiotic depletion potential - Fossil resources** | MJ | 3,07E+03 |
| **WDP[3]** | **Water scarcity potential** | $m^3$ eq | 3,45E+01 |

*[1] This indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide emissions and uptake and biogenic carbon stored in the product with characterization factors (CFs) based on IPCC (2013).*

*[2] Eutrophication aquatic freshwater shall be given in both kg $PO_4^{-3}$ eq and kg P eq.*

*[3] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.*

| RESOURCE USE per 1 ton CEM II/B-M (P-W-L) 42.5N / CEM II/B-M (P-W-L) 42.5R | | Unit | A1-A3 |
|---|---|---|---|
| **PERE** | **Use of renewable primary energy excluding renewable primary energy resources used as raw materials** | MJ | 3,11E+02 |
| **PERM** | **Use of renewable primary energy resources used as raw materials** | MJ | 0 |
| **PERT** | **Total use of renewable primary energy resources** | MJ | 3,11E+02 |
| **PENRE** | **Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials** | MJ | 3,04E+03 |
| **PENRM** | **Use of non-renewable primary energy resources used as raw materials** | MJ | 0 |
| **PENRT** | **Total use of non-renewable primary energy resources** | MJ | 3,04E+03 |
| **SM** | **Use of secondary material** | kg | 5,29E+01 |
| **RSF** | **Use of renewable secondary fuels** | MJ | 2,45E+02 |
| **NRSF** | **Use of non-renewable secondary fuels** | MJ | 2,92E+02 |
| **FW** | **Use of net fresh water** | $m^3$ | 2,58E-01 |

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| OUTPUT FLOWS AND WASTE CATEGORIES per 1 ton CEM II/B-M (P-W-L) 42.5N / CEM II/B-M (P-W-L) 42.5R | | Unit | A1-A3 |
|---|---|---|---|
| HWD | Hazardous waste disposed | kg | 1,36E-03 |
| NHWD | Non-hazardous waste disposed | kg | 8,11E+00 |
| RWD | Radioactive waste disposed | kg | 1,49E-02 |
| CRU | Components for re-use | kg | 4,44E-03 |
| MFR | Materials for recycling | kg | 4,42E-01 |
| MER | Materials for energy recovery | kg | 0 |
| EE | Exported energy | MJ | 0 |

## ADDITIONAL INFORMATION

HERACLES GCCo hereby declares that all cement products are in compliance with the REACH Regulation (EC) No 1907/2006, concerning the Registration, Evaluation, Authorization and Restriction of Chemicals. Cement does not contain any Substances of Very High Concern (SVHC) currently on the candidate list. REACH SVHC list is not static and is updated frequently thus the company will continue to evaluate, research and review to fulfil the demands of the regulation. More information about cement safety handling is available at the Safety Data Sheet (SDS) published at the company's website www.lafarge.gr

The EPD does not give information on release of dangerous substances to soil, water and indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

## REVISION DETAILS

Product name change CEM II/B-M (P-W-L) 42.5N and CEM II/B-M (P-W-L) 42.5R.

## REFERENCES


- **GPI v.3.01:2019-09-18** General Programme Instructions of the International EPD® System
- **PCR 2019:14 v.1.11** Product Category rules | Construction products | The International EPD® System
- **EN 15804:2012+A2:2019** Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products
- **c-PCR-001** Cement and building lime (EN 16908:2017) | The International EPD® System
- **EN 16908:2017** Cement and building lime - Environmental product declarations - Product category rules complementary to EN 15804
- **EN 413-1:2011** Masonry cement. Composition, specifications and conformity criteria
- **ISO 14020:2000** Environmental labels and declarations - General principles
- **ISO 14025:2006** Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- **ISO 14040:2006** Environmental management - Life Cycle Assessment - Principles and framework
- **ISO 14044:2006** Environmental management - Life Cycle Assessment - Requirements and guidelines
- **Ecoinvent Centre**| www.Eco-invent.org
- **DAPEEP SA:** Renewable Energy Sources Operator & Guarantees of Origin | Greece | www.dapeep.gr


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## CONTACT INFORMATION

| | | |
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## PROGRAMME-RELATED INFORMATION

Product group classification: UN CPC 3744

The CEN standard EN 15804 serves as the core Product Category Rules

PCR 2019:14 Construction products (EN 15804:A2); Version 1.11; 2021-02-05
c-PCR-001 Cement and Building Lime (EN 16908:2017) 2010-12-20

PCR review was conducted by
The Technical Committee of the International EPD® System.

Independent third-party verification of the declaration and data in accordance with ISO 14025:2006
☐ EPD process certification ☒ EPD verification

Procedure for follow-up during EPD validity involves third party verifier
☒ Yes ☐ No

**The EPD owner has the sole ownership, liability and responsibility of the EPD.**



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