



Group of hydraulic road binders **CONECTON**

produced in **Cemex Poland**

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ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent body 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 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A3, in accordance with EN 15804+A2 („Cradle-to-Gate”)

The year of preparing the EPD: 2025

CONNECTON HSD E 24 - reference document: National Technical Assessment IBDiM-KOT-2023/0950

CONNECTON HRB E3 - product standard: EN 13282-1

Service Life: according to EN 16908 no reference service life of binders is declared as they are intermediate products used in construction

PCR: ITB-PCR A (PCR based on EN 15804) and EN 16908

Declared unit: 1 ton (Mg) of hydraulic road binder CONNECTON

Reasons for performing LCA: B2B

Representativeness: Polish production, CONNECTON HSD E 24 - year 2023
CONNECTON HRB E3 - year 2024



BASIC INFORMATION

Group of hydraulic road binders CONECTON covered by this EPD are manufactured by Cemex in Poland: CONECTON HSD E 24 in Chełm and CONECTON HRB E3 in Rudniki. The life-cycle assessment was carried out according to the following standards: PN-EN 15804, PN-EN 16908, PN-EN ISO 14025, PN-EN ISO 14040 and the product categorization rules provided in document ITB PCR-A. Declared reference unit is 1 ton of hydraulic road binder CONECTON. Reference service life according to EN 16908 is not declared as binders are intermediate products used in construction.

All LCI data was collected by Cemex Poland plants between January and December 2023 (12 months) for CONECTON HSD E 24 and between January and December 2024 (12 months) for CONECTON HRB E3 and gathered data is representative for production technology used in specific year. ITB data on minor additional constituents and fly ash were used based on an economic allocation. LCA assessment was carried out using internal ITB algorithms dedicated to calculate the LCA and data collected by the industry over the last 10 years. System boundary description were adopted according to EN 16908.

Hydraulic road binder CONECTON is an intermediate product with large number of final uses and it is usually impossible to present information on the environmental impact of binder during construction, operation and

at the end of life, as it largely depends on the purpose of binder and use scenarios. Calculations made for the purposes of this document cover LCA assessment stages (aggregated) of raw material production (A1), its transport to the production site (A2) and the production process (A3), i.e. „Cradle-to-Gate” according to the guidelines of EN 15804. The EPD does not include product life-cycle stages A4, A5, C1-C4 and D according to EN 15804.

The EPD can be used to prepare an assessment of a specific use of binder over its entire life cycle in the construction.

Hydraulic road binder CONECTON production is subject to National and European regulations governing its environmental impact, such as the mining of natural resources, the reclamation of a mine, the energy and material recovery from waste, the emission of noise, dust and other hazardous substances (NO_x , SO_2 , heavy metals etc.).

Hydraulic road binder CONECTON HSD E 24 covered by the Type III Environmental Product Declaration comply with the National Technical Assessment IBDiM-KOT-2023/0950.

Hydraulic road binder CONECTON HRB E3 covered by the Type III Environmental Product Declaration comply with the harmonized European standard EN 13282-1.



PRODUCT DESCRIPTION

Hydraulic road binder CONECTON belongs to the family of hydraulic binders, mixtures used for road bases and for stabilizing the ground. During the binding of the binder, a chemical process occurs between the binder and water. After the binding is complete, the strength of the combined material increases, creating a durable composite.

Hydraulic road binders produced in a factory and supplied ready for treatment can be used to produce materials for bases, sub-bases and capping layers as well as earthworks, in road, railway, airport and other types of infrastructure.

CONECTON HSD E 24 is a hydraulic road binder and has a National Technical Assessment IBDiM-KOT-2023/0950, which confirms the safety of its use and fulfillment of the declared properties. Composition of CONECTON HSD E 24 is based on Portland cement clinker and mineral constituents that shape its additional properties. The original composition of the binder means that the advantages and properties of cement and lime have been combined in one product and can be successfully used in many applications

CONECTON HRB E3 is a rapid hydraulic road binder manufactured based on the requirements of the standard EN 13282-1 Rapid hardening hydraulic road binders – Composition, specifications and conformity criteria. The composition of the CONECTON HRB E3 binder is based on active and inert mineral raw materials ensuring its special properties shaped accordingly to the intended applications.

One of the main components of the product is the Portland clinker. For its production, calcareous materials (for example, limestone, chalk) and other natural or waste materials are used, correcting the proportion of the silicates and aluminates, such as: clay, sand, fly ash, iron-bearing additives or slag from the steel industry.

All of these materials are crushed, homogenised and introduced into a rotary kiln where they are sintered at 1450°C.

In Cemex Poland the clinker is produced in two plants (Chełm, Rudniki). The main fuels used in the clinker firing process are alternative waste-derived fuels. Year by year, the share of the alternative fuels is gradually increasing, while the use of fossil fuels is decreasing. Among alternative fuels, there is the biomass for which the carbon footprint is zero.

The amount of the CO₂ calculated in accordance with the European regulations for monitoring the production of the CO₂ for the plant in Rudniki in connection with the production of the clinker is 722 kg of the CO₂/Mg of clinker, and in Chełm 725 kg of the CO₂/Mg of clinker.

Binder is produced by the joint grinding of the main constituents (for example, clinker, fly ash, blast furnace slag) with minor additional constituents, setting time adjuster and other additives.

Cemex Poland produces hydraulic road binder in two plants (Chełm, Rudniki).

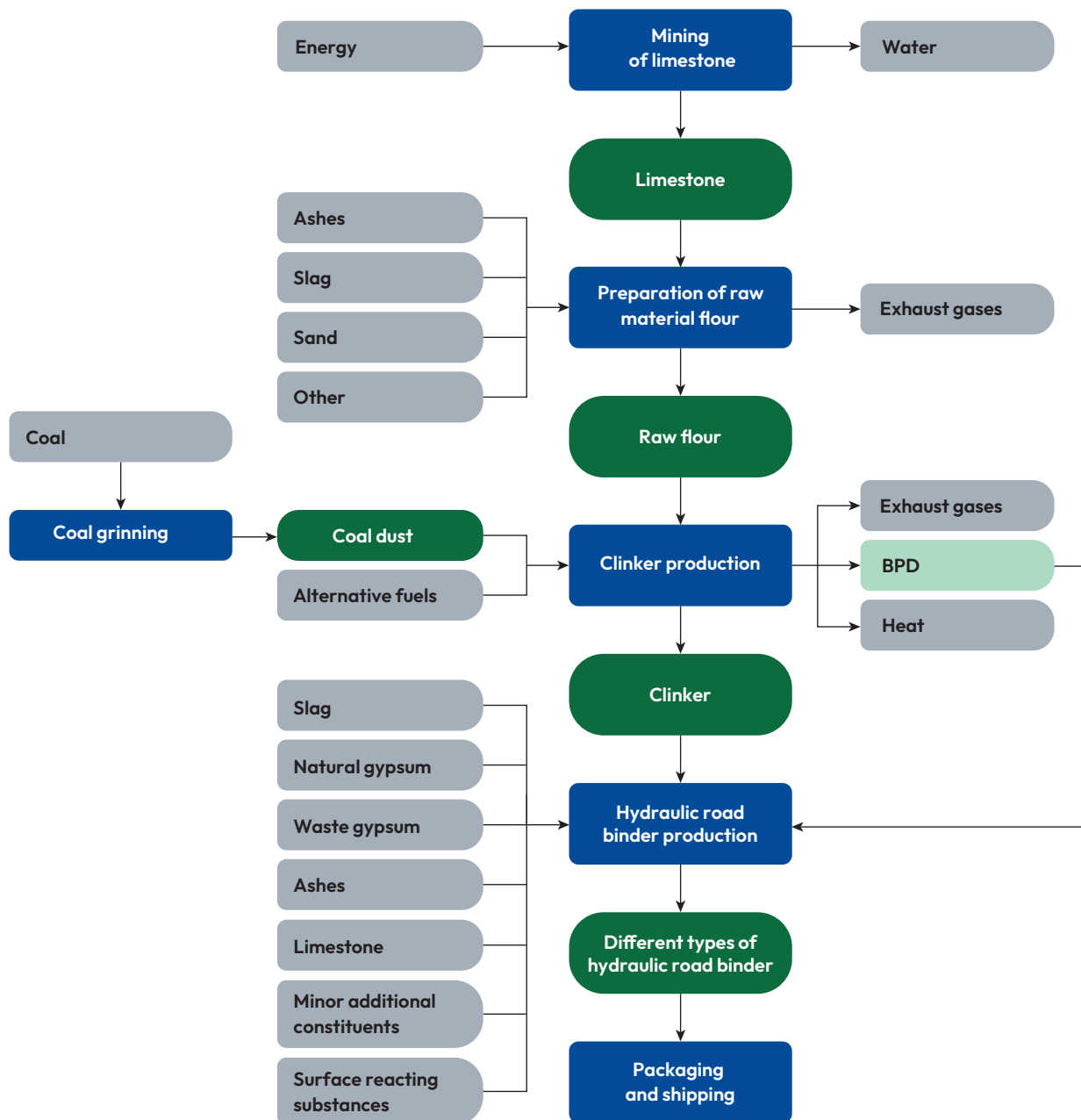
The product phase (A1-A3, see Table 3) and the following processes/modules were taken into account in the LCA analysis:

- A1 – the production of raw materials: fuel extraction, raw material extraction, electricity production, alternative fuel production,
- A2 – the transport: transport of raw materials,
- A3 – the production of a product: production of raw meal, fuel consumption for firing, consumption of the electricity for grinding.

The figure below (Figure 1) shows the product manufacturing process from the quarry to the shipment (production phase) in a schematic way.



Figure 1. Hydraulic road binder production.
General production diagram and included processes.



LIFE CYCLE ASSESSMENT (LCA) – GENERAL RULES APPLIED

Unit

The declared unit is 1 ton of representative hydraulic road binder CONECTON produced by Cemex Poland (2 manufacturing plants: Chełm and Rudniki). The group of hydraulic road binders CONECTON covered by this EPD includes:

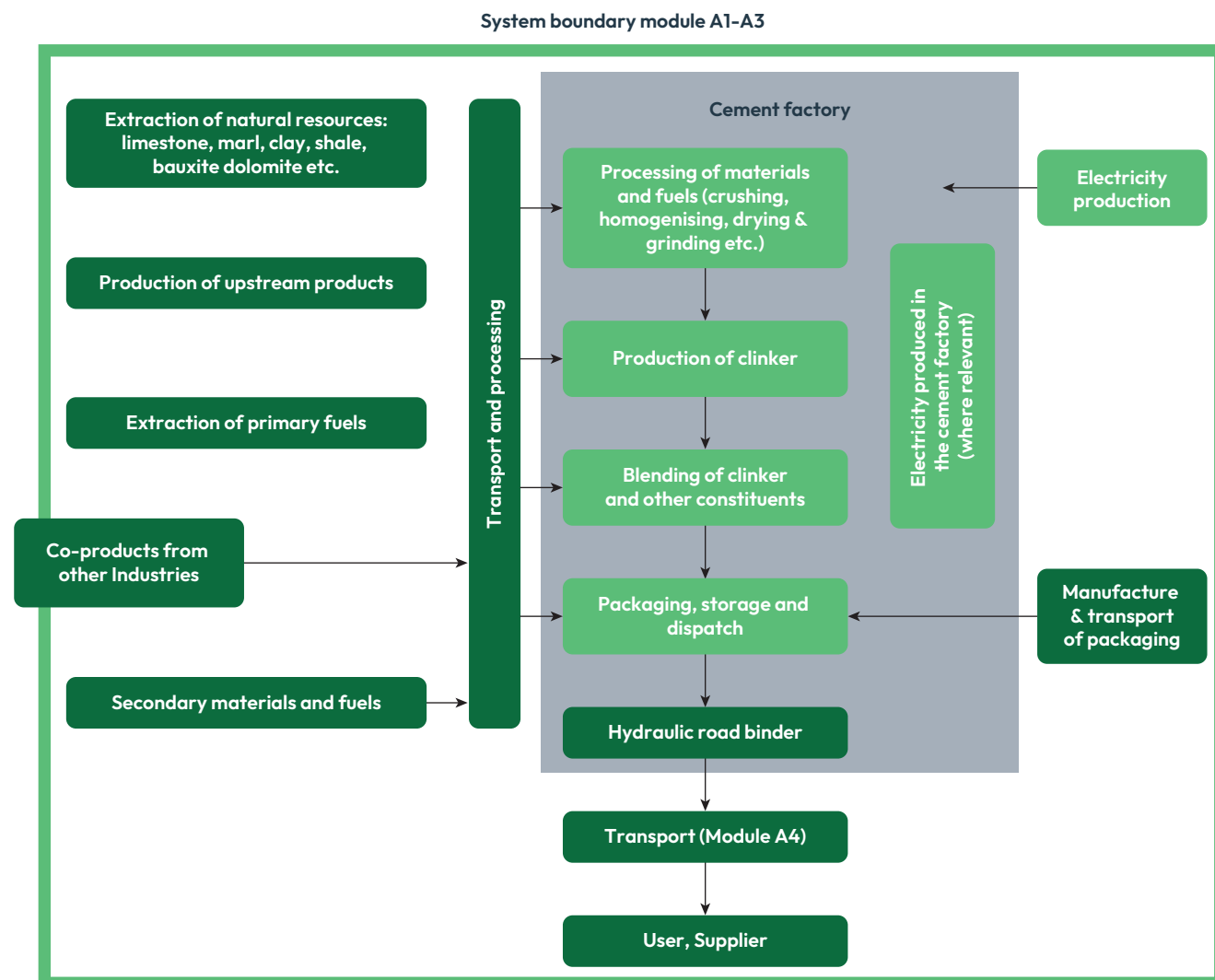
- CONECTON HSD E 24 – Chełm plant
- CONECTON HRB E3 – Rudniki plant

System boundary

The EPD covers the product stage („Cradle-to-Gate”). The selected system boundaries comprise the production of binder including raw materials’ extraction up to the finished product at the factory gate.

The selected system boundaries are in accordance with the system boundaries given in EN 16908 (Figure 2).

Figure 2. Inputs and processes of product system





Allocation rules

The allocation rules used for this EPD are based on general ITB PCR A. Production of hydraulic road binder from CONECTON group is a line process in a manufacturing plants located at Chełm and Rudniki.

Binder was calculated using allocation mass based. In the case of fly ash, a co-product from electricity production used as a binder constituent, economic allocation was applied. For a synthetic gypsum, allocated impacts are economic based but plain gypsum waste (a value = 0) are neglected in the binder LCA due to its very low impact.

Minimum 99.5% of impacts from the production lines were allocated to product covered by this declaration. Energy supply was inventoried and allocated to the products assessed on the mass basis.

System limits

99.5% of the consumed materials and 100% energy consumption was inventoried in factory and were included in calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all raw material used per formulation, utilized energy, and electric power consumption, direct production waste, and available emission measurements. The following processes were excluded from the LCA study: use of chromate reducing agents (total mass < 0.2% of binders), use of grinding balls. The total of neglected input flows per module A1-A3 does not exceed the permitted maximum of 1% of energy usage and mass.

Tires consumption for transport was not taken into account. Pre components, dyes, foils, papers, labels, tapes with a percentage share of less than 0.1% were not included in the calculations. It is assumed that the total sum of omitted processes does not exceed 1% of all impact categories. In accordance with EN 15804 machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

A1 – A2 Modules: Raw materials supply and transport

Constituents of CONECTON HRB E3 regarding to EN 13282-1 standard are in Table 1.

Table 1. Constituents of CONECTON HRB E3 regarding to EN 13282-1 standard

Main constituents	The main constituents of a binder are those in a proportion exceeding 10 % by mass. They shall be selected from constituents defined as main constituents in EN 197-1 and hydrated calcium lime and natural hydraulic lime which conform to EN 459-1. The main constituents for CONECTON HRB E3 are: clinker (above 20%), limestone and calcareous fly ash (20-60%)
Minor additional constituents	Minor additional constituents may be added in a proportion not exceeding 10 % by mass in total. Minor additional constituent for CONECTON HRB E3 is: inorganic mineral materials derived from the clinker production process (0-10%)
Calcium sulphate	Calcium sulphate occurs as a natural material (e.g. gypsum and anhydrite) or a by-product of industrial processes and acts as a binding time regulator in hydraulic road binder
Additives	Additives are components added to improve the production or properties of hydraulic road binder and their total amount may not exceed 1.0% of the binder mass

For the LCA model, the following composition of CONECTON HRB E3 was adopted: clinker (above 20%), limestone and calcareous fly ash (20-60%), minor additional constituents (0-10%), calcium sulphate.

Constituents of CONECTON HSD E 24 regarding to National Technical Assessment IBDiM-KOT-2023/0950:

Clinker (20-40%), siliceous fly ash (10-35%), calcareous fly ash (25-50%), inorganic mineral materials derived from the clinker production process (10%-20%), calcium sulphate.

For the LCA model, the above composition of CONECTON HSD E 24 was adopted.

A3 Module Production

Binder is produced by grinding and mixing constituents according to National Technical Assessment IBDiM-KOT-2023/0950 (CONECTON HSD E 24) or EN 13282-1 standards (CONECTON HRB E3).

Production data was inventoried and verified. Data on transport of the different input products to the manufacturing plants were inventoried in detail and modelled. For transport calculation purposes European fuel averages are applied.

All manufacturing plants use “green electricity” (made of wind, 100% in total electricity consumption) and have presented a certificate issued by the energy supplier confirming this fact. The percentage of alternative fuels in clinker production at the cement plants in Cemex Poland in 2023 and 2024 was above 90%.

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2023 – 31.12.2023 (1 year) for CONECTON HSD E 24 and 01.01.2024 – 31.12.2024 (1 year) for CONECTON HRB E3. The life cycle assessments were done for Poland as reference area.

Data quality - production

The values determined to calculate A3 originate from verified Cemex Poland LCI inventory data. A1 values (raw materials) were prepared considering specific national EPDs, Ecoinvent data and economic allocation.

Assumptions and estimates

All production processes (A3) were assigned to different types of products in an equal way (based on recipe). Data regarding production per 1 ton of product were averaged for the analyzed production of each product group.

Calculation rules

LCA was done in accordance with ITB PCR A document. Characterization factors are EF 3.1. No mass balance approach was used.

ITB-LCA software were used for impact calculations. A1 was calculated based on data from the database and specific EPDs. Modules A2 and A3 are calculated based on the LCI questionnaire provided by the manufacturer.

Databases

The background data for the processes come from the following databases: Ecoinvent v.3.10 (sand, water, wind electricity production for Poland, transport), specific emission reporting data for clinker production by Cemex Poland, specific EPDs for a raw material (sand, gypsum, limestone, FGD Gypsum, additives), allocated impacts for ash and slag production calculated by ITB, KOBIZE (combustion factors for selected fuels). Electricity provider PGE guarantees a certificate of origin of 100% renewable electricity used by Cemex Poland plants. Specific (LCI) data quality analysis was a part of audit. The time related quality of the data used is valid (5 years).

LIFE CYCLE ASSESSMENT (LCA) – RESULTS

System boundaries

System boundaries in environmental assessment are presented in Table 2.

Declared unit

The declaration refers to the unit (DU) – 1 ton of hydraulic road binder CONECTON produced by Cemex Poland (Table 3 and Table 4).

Table 2. System boundaries (life stage modules included) in a product environmental assessment

Environmental assessment information																
(MA – Module assessed, MNA – Module not assessed, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MA	MA	MA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA

Table 3. Environmental product characteristic – 1 ton of CONECTON HSD E 24 (Cetm)

Environmental impacts: (DU) 1 ton		
Indicator	Unit	A1-A3
Global Warming Potential total (GWP-total) - gross value ¹	kg CO ₂ eq.	256
Global Warming Potential total (GWP-total) - net value ²	kg CO ₂ eq.	188
Global Warming Potential fossil fuels (GWP-fossil)	kg CO ₂ eq.	256
Global Warming Potential biogenic (GWP-biogenic)	kg CO ₂ eq.	0.67
Global Warming Potential land use and land use change (GWP-luluc)	kg CO ₂ eq.	0.057
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	0.0000002
Acidification potential, Accumulated Exceedance (AP)	mol H ⁺ eq.	0.94
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq.	0.065
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq.	0.092
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq.	2.75
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	0.69
Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	kg Sb eq.	0.002
Abiotic depletion for fossil resources potential (ADP-fossil)	MJ	1210
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m ³ eq.	23.9
Indicators describing resource use: (DU) 1 ton		
Indicator	Unit	A1-A3
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	571
Use of renewable primary energy resources used as raw materials	MJ	0.00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	571
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	730
Use of non-renewable primary energy resources used as raw materials	MJ	0.00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	730
Use of secondary material	kg	507
Use of renewable secondary fuels	MJ	836
Use of non-renewable secondary fuels	MJ	401
Net use of fresh water	m ³	0.818
Other environmental information: (DU) 1 ton		
Indicator	Unit	A1-A3
Hazardous waste disposed	kg	2.33
Non-hazardous waste disposed	kg	83.6
Radioactive waste disposed	kg	0.001
Components for re-use	kg	0.00
Materials for recycling	kg	0.095
Materials for energy recover	kg	0.00
Exported energy	MJ	0.47

1) the indicated gross value includes the CO₂ emissions from alternative fuels (based on waste) excluding biomass fraction of fuels

2) the net value excludes CO₂ emissions from alternative fuels (based on waste)

Table 4. Environmental product characteristic – 1 ton of CONECTON HRB E3 (Rudniki)

Environmental impacts: (DU) 1 ton		
Indicator	Unit	A1-A3
Global Warming Potential total (GWP-total) – gross value ¹	kg CO ₂ eq.	182
Global Warming Potential total (GWP-total) – net value ²	kg CO ₂ eq.	146
Global Warming Potential fossil fuels (GWP-fossil)	kg CO ₂ eq.	182
Global Warming Potential biogenic (GWP-biogenic)	kg CO ₂ eq.	1.54
Global Warming Potential land use and land use change (GWP-luluc)	kg CO ₂ eq.	0.11
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	0.0000002
Acidification potential, Accumulated Exceedance (AP)	mol H ⁺ eq.	1.06
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq.	0.092
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq.	0.192
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq.	3.24
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	0.88
Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	kg Sb eq.	0.003
Abiotic depletion for fossil resources potential (ADP-fossil)	MJ	1333
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m ³ eq.	28.4
Indicators describing resource use: (DU) 1 ton		
Indicator	Unit	A1-A3
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	576
Use of renewable primary energy resources used as raw materials	MJ	0.00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	576
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	1335
Use of non-renewable primary energy resources used as raw materials	MJ	0.00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1335
Use of secondary material	kg	587
Use of renewable secondary fuels	MJ	426
Use of non-renewable secondary fuels	MJ	158
Net use of fresh water	m ³	0.98
Other environmental information: (DU) 1 ton		
Indicator	Unit	A1-A3
Hazardous waste disposed	kg	2.88
Non-hazardous waste disposed	kg	141
Radioactive waste disposed	kg	0.001
Components for re-use	kg	0.00
Materials for recycling	kg	0.103
Materials for energy recover	kg	0.00
Exported energy	MJ	0.701

1) the indicated gross value includes the CO₂ emissions from alternative fuels (based on waste) excluding biomass fraction of fuels

2) the net value excludes CO₂ emissions from alternative fuels (based on waste)

RESULTS INTERPRETATION

The gross value of emissions CO₂ equivalent (EN15804/ISO 14067 based method) CONECTON HSD E24 production by Cemex Poland is 256 kg of CO₂/ton of product and for CONECTON HRB E3 is 182 kg CO₂/ton of product. The net value of emissions CO₂ equivalent, excluding alternative waste-based fuels, is 188 kg of CO₂/ton of binder for CONECTON HSD E 24 and 146 kg CO₂ /ton of product for CONECTON HRB E3.

The fossil fuels depletion potential is 1210 MJ/ton for CONECTON HSD E 24 and 1335 MJ/ton for CONECTON HRB E3, which is related to the low use of fossil fuels and significant use of alternative fuels (over 90%) of energy total.

The good result is significantly influenced by the use of wind electricity (100% electricity in total - certified). The LCA of hydraulic road binders is mainly influenced by the following factors:

- low content of Portland cement clinker in the product,
- high content of secondary raw material in the product,
- fuel mix and high share of alternative fuels to fossil fuels in clinker production,
- specific process emission of clinker production,
- electricity (wind) used in the respective plant.



VERIFICATION

The process of verification of this EPD was in accordance with ISO 14025 and ISO 21930. After verification this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A

Independent verification corresponding to EN 15804 and ITB PCR A

☒ external ☐ internal

External verification of EPD: Ph.D. Eng. Halina Prejzner

LCA \ LCI audit and input data verification: Ph.D. D.Sc. Eng. Michał Piasecki, m.piasecki@itb.pl

Note 1. The purpose of this EPD is to provide the basis for assessing buildings and other construction works. A comparison of EPD data is only meaningful if all the data sets compared were developed according to EN 15804 and the product-specific performance characteristics and its impacts on the construction works are taken into account.

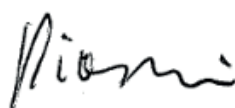
Note 2. The declaration owner has the sole ownership, liability and responsibility for the for the information provided and contained in EPD. Declarations within the same product category but from different programmes may not be comparable. Declarations of construction products may not be comparable if they do not comply with EN 15804 + A2. For further information about comparability, see EN 15804+A2 and ISO 14025. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

Note 3. ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization. ITB-EPD program is recognized and registered member of The European Platform – Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products (2023)
- EN 13282-1:2013 Hydraulic Road Binders – Part 1: Rapid hardening hydraulic road binders – Composition, specifications and conformity criteria
- National Technical Assessment No. IBDiM-KOT-2023/0950, edition 1, issuance date: 20.07.2023
- PN-EN ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations. Principles and procedures
- PN-EN 15804+A2:2020-03 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- PN-EN 16908:2017-02 Cement and building lime. Environmental product declarations. Product category rules complementary to EN 15804
- PN-EN ISO 14040:2009 Environmental management – Life cycle assessment – Principles and framework
- ECRA (European Cement Research Academy) – Background report “TR-ECRA 0181/2014 Environmental Product Declarations for representative European cements”
- KOBiZE Wskaźniki emisyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej, 2024 (Eng. KOBiZE emission indicators CO₂, SO₂, NO_x, CO and total dust for electricity, 2024)

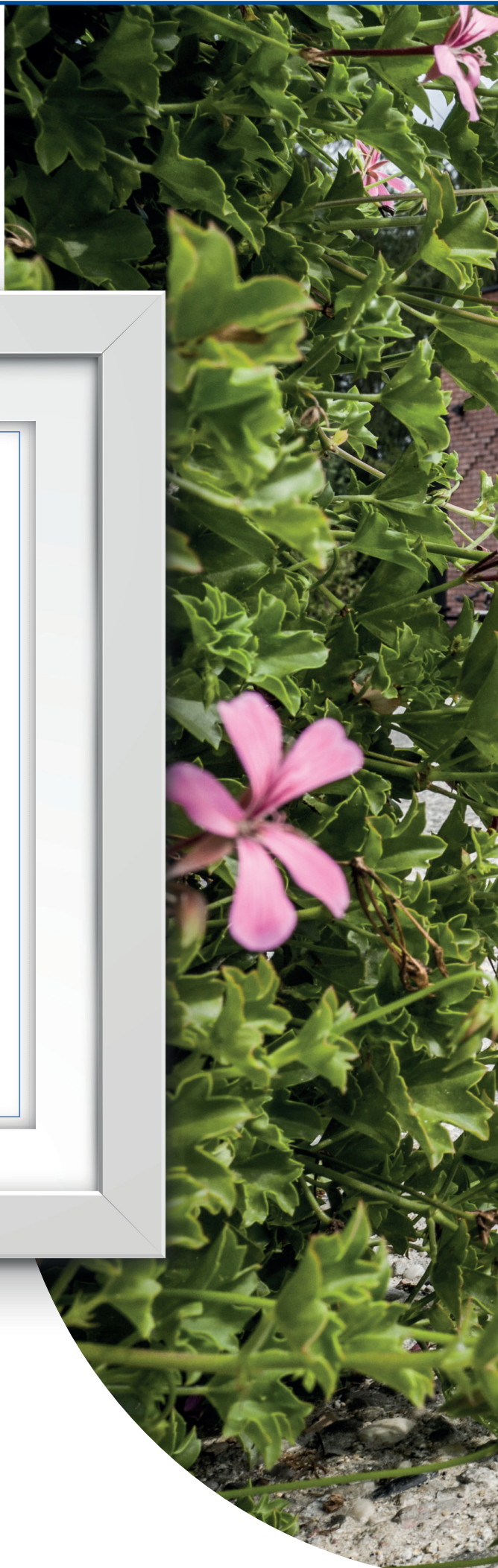
Head of the Thermal Physic, Acoustics
and Environment Department



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CERTIFICATE No 812/2025
of TYPE III ENVIRONMENTAL DECLARATION

Products:
Group of hydraulic road binders CONECTON:
CONECTON HSD E 24 Chełm, CONECTON HRB E3 Rudniki

Manufacturer:
CEMEX Polska Sp. z o.o.
ul. Krakowiaków 46, 02-255 Warsaw, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 18th June 2025 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physics, Acoustics
and Environment Department

Agnieszka Winkler-Skalna, PhD



Deputy Director
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Krzysztof Kućzyński, PhD

Warsaw, June 2025





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