Environmental Product Declaration

according to ISO 14025 and EN 15804

This declaration is for:

Cement: Werk Neuwied CEM III/B 42,5 L-LH/SR 2020 - NL

Provided by:

Dyckerhoff GmbH – Werk Neuwied

program operator
Stichting MRPI®
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MRPI® REGISTRATION

1.1.00245.2021

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EXPIRY DATE

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PRODUCT

Cement: Werk Neuwied CEM III/B 42,5 L-LH/SR 2020 - NL

DECLARED UNIT/FUNCTIONAL UNIT

The production of 1 metric ton of cement

DESCRIPTION OF PRODUCT

Blast furnace slag cement: CEM III/B 42,5 L-LH/SR 2020 - NL

VISUAL PRODUCT

MORE INFORMATION

www.dyckerhoff.com

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Anne Kees Jeeninga, Advieslab VOF.**
The LCA study has been done by **Ruben van Gaalen, EcoReview B.V. .**
The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2 (incl. A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2 (incl. A1). Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®
Kingsfordweg 151
1043GR
Amsterdam

ir. J-P den Hollander, Managing director MRPI®

DEMONSTRATION OF VERIFICATION
CEN standard EN15804 serves as the core PCR[a]
Independent verification of the declaration and data, according to EN ISO 14025:2010: internal: external: X
Third party verifier:  Anne-Kees Jeeninga, Advieslab v.o.f.
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

This Dyckerhoff Werk Neuwied CEM III/B 42,5 L-LH/SR 2020 - NL consisting mainly of Ground Granulated Blastfurnace Slag (GGBS) and a significant amount of Dyckerhoff produced Clinker. The production processes needed to come to this product are: grinding and mixing. This CEM III is a Low Heat (LH) and Sulfate Resisting (SR) cement with a given strength of 42.5 MPa. It's an intermediate product for making cementitious-bound materials (concrete). Reference Service Life for this product is 100 years, although this depends on the specific application of the cement and the construction in which it's used.

In this EPD only the production of bulk products is considered. Packaging materials are not included.

COMPONENT (> 1%)	[kg / %]
708000 - Werk Deuna Klinker gesamt 2020	21%
Granulated Ground Blastfurnace Slag	77%

(*) > 1% of total mass

SCOPE AND TYPE

The cement in this EPD is produced at the production location of Dyckerhoff in Neuwied.
Cement is a hydraulic binder, mainly used for concrete, mortar and cement screed. Since cement is a semi-finished product, only the production of the cement is included in the LCA (A1-A3).

The LCA is compiled using the “NMD Bepalingsmethode Milieuprestatie Bouwwerken v1.0” as PCR, Ecoinvent v3.6 for background processes, SimaPro 9.1.1.1 LCA software. The main impact categories have been calculated with the characterization factors in “EN 15804 +A2 Method V1.00 / EF 3.0 normalization and weighting set" and "NMD Bepalingsmethode 1.0, jul 2020 (NMD 3.3) V3.04 / MKI-SBK single-score".

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to 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	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

X = Modules Assessed

ND = Not Declared

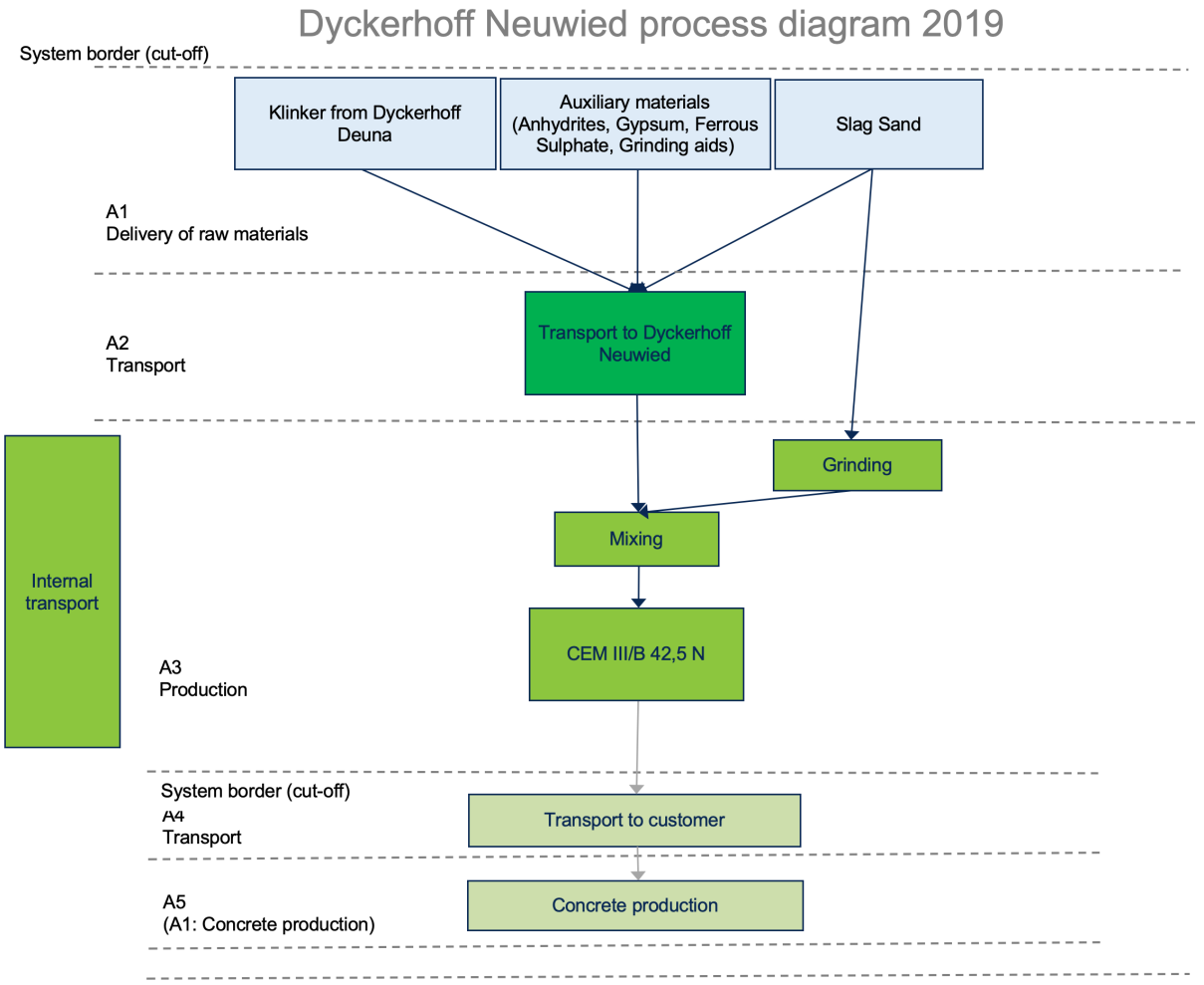

Figure: LCA process diagram according to EN 15804 (7.2.1)

REPRESENTATIVENESS

This EPD is representative for products produced and sold in the EU. The CEM III is produced in one production site of Dyckerhoff in Neuwied.

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	UNIT	A1	A2	A3	A1-A3
ADPE	kg Sb. eq.	2.84E-4	1.22E-4	3.25E-4	7.31E-4
ADPF	MJ	3.80E+2	1.60E+2	8.05E+2	1.35E+3
GWP	kg CO2 eq.	2.05E+2	1.17E+1	5.37E+1	2.70E+2
ODP	kg CFC 11 eq.	1.84E-6	1.64E-6	2.31E-6	5.79E-6
POCP	kg ethene eq.	1.22E-2	7.48E-3	6.56E-3	2.62E-2
AP	kg SO2 eq.	7.14E-2	7.63E-2	8.45E-2	2.32E-1
EP	kg (PO4)3- eq.	2.17E-2	1.59E-2	4.38E-2	8.14E-2

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB-eq.	4.72E+0	4.03E+0	5.61E+0	1.44E+1
FAETP	kg DCB-eq.	1.21E-1	8.32E-2	2.23E-1	4.27E-1
MAETP	kg DCB-eq.	4.29E+2	2.94E+2	8.52E+2	1.58E+3
TETP	kg DCB-eq.	1.40E-1	1.97E-2	4.12E-2	2.01E-1
ECI	Euro	1.13E+1	1.46E+0	4.09E+0	1.68E+1
ADPF	kg Sb. eq.	1.83E-1	7.70E-2	3.87E-1	6.47E-1

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources expressed in [kg Sb-eq.]
ND = Not Declared

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	UNIT	A1	A2	A3	A1-A3
GWP-total	kg CO2 eq.	2.06E+2	1.19E+1	5.41E+1	2.72E+2
GWP-fossil	kg CO2 eq.	2.06E+2	1.18E+1	5.40E+1	2.72E+2
GWP-biogenic	kg CO2 eq.	3.34E-2	3.68E-2	6.38E-2	1.34E-1
GWP-luluc	kg CO2 eq.	5.45E-3	1.64E-2	8.81E-3	3.07E-2
ODP	kg CFC11 eq.	1.97E-6	1.97E-6	2.07E-6	6.01E-6
AP	mol H+ eq.	2.32E-1	1.04E-1	1.06E-1	4.42E-1
EP-freshwater	kg PO4 eq.	3.53E-3	2.83E-4	1.13E-2	1.51E-2
EP-marine	kg N eq.	8.16E-2	4.07E-2	2.16E-2	1.44E-1
EP-terrestrial	mol N eq.	7.76E-1	4.49E-1	2.60E-1	1.49E+0
POCP	kg NMVOC eq.	2.30E-1	1.19E-1	6.46E-2	4.14E-1
ADP-minerals& metals	kg Sb eq.	2.84E-4	1.22E-4	3.25E-4	7.31E-4
ADP-fossil	MJ, net calorific value	3.40E+2	1.64E+2	6.64E+2	1.17E+3
WDP	m3 world eq. deprived	6.22E+0	1.03E+0	2.79E+0	1.00E+1

GWP-total = Global Warming Potential total
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 = Depletion potential of the stratospheric ozone layer
AP = Acidification Potential, Accumulated Exceedence
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 Exceedence
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals = Abiotic Depletion Potential for non fossil resources [2]
ADP-fossil = Abiotic Depletion for fossil resources potential [2]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]
ND = Not Declared

Disclaimer [2]

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 experienced with the indicator.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	UNIT	A1	A2	A3	A1-A3
PM	Disease incidence	1.43E-6	6.25E-7	4.18E-7	2.47E-6
IRP	kBq U235 eq.	9.10E-1	7.93E-1	1.42E+0	3.12E+0
ETP-fw	CTUe	9.00E+2	1.58E+2	2.96E+2	1.35E+3
HTP-c	CTUh	1.13E-8	7.87E-9	8.90E-9	2.81E-8
HTP-nc	CTUh	9.22E-7	1.49E-7	3.48E-7	1.42E-6
SQP	---	2.12E+2	1.22E+2	5.91E+2	9.25E+2

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]
ND = Not Declared

Disclaimer [1]

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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer [2]

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 experienced with the indicator.

RESOURCE USE per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3
PERE	MJ	3.42E+1	7.95E+0	2.44E+2	2.86E+2
PERM	MJ	0.00	0.00	0.00	0.00
PERT	MJ	3.42E+1	7.95E+0	2.44E+2	2.86E+2
PENRE	MJ	3.70E+2	1.73E+2	7.31E+2	1.27E+3
PENRM	MJ	0.00	0.00	0.00	0.00
PENRT	MJ	3.70E+2	1.73E+2	7.31E+2	1.27E+3
SM	kg	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00
FW	m3	1.83E-1	4.90E-2	4.89E-1	7.21E-1

PERE = Use of renewable energy excluding renewable primary energy resources
PERM = Use of renewable energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable 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 materials
RSF = Use of renewable secondary fuels
NRSF = Use of non renewable secondary fuels
FW = Use of net fresh water
ND = Not Declared

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3
HWD	kg	3.70E-4	3.78E-4	6.35E-4	1.38E-3
NHWD	kg	3.09E+0	2.84E+0	3.35E+0	9.28E+0
RWD	kg	1.22E-3	1.04E-3	1.81E-3	4.07E-3
CRU	kg	1.66E-1	0.00	0.00	1.66E-1
MFR	kg	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	0.00	0.00
ETE	MJ	0.00	0.00	0.00	0.00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy
ND = Not Declared

BIOGENIC CARBON CONTENT per functional unit or declared unit (A2)

	UNIT	A1	A2	A3	A1-A3
BCCpr	kg C	0.00	0.00	0.00	0.00
BCCpa	kg C	0.00	0.00	0.00	0.00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging
ND = Not Declared

CALCULATION RULES

Data quality

Data flows have been modeled as realistically as possible. Data quality assessment is based on the principle that the primary data used for processes occurring at the production site is selected in the first instance. Where this is not available, other reference data is selected from appropriate sources.

Data collection period

The dataset is representative for the production processes used in 2020.

Methodology and reproducibility

The process descriptions and quantities in this study are reproducible in accordance to the reference standards that have been used. The references of all sources, both primary and public sources and literature, have been documented. In addition, to facilitate the reproducibility of this LCA, a full set of data records has been generated.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

A1. Raw materials supply

For all purchased materials, relevant EPD's have been used.

The use of GBS (Granulated Blastfurnace Slag) is free of burden. No emissions from the steel production are allocated onto the blast furnace slag. This approach is in accordance with CEN/TC 51 PCR for cement and building lime, 2015.

For modelling reasons, the clinker produced by Dyckerhoff is used as an input product in the LCA of the product on this EPD. Therefore, all impacts allocated to the clinker are allocated to the A1 section of the product on this EPD.

A2. Transport of raw materials to manufacturer

Incoming transports of the purchased materials are done by truck, train and ship (inland).

A3. Manufacturing

This module covers the manufacturing of the Dyckerhoff CEM III and includes all processes linked to production such as GBS drying, grinding internal transportation and mixing. Use of electricity, fuels and auxiliary materials are all taken into account.

DECLARATION OF SVHC

None of the substances contained in the product are listed in the “Candidate List of Substances of Very High Concern for authorisation”, or they do not exceed the threshold with the European Chemicals Agency.

REFERENCES

- CML - Department of Industrial Ecology, CML-IA Characterisation Factors, Dated August 2016, Leiden University, Leiden, Netherlands Available at: https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors
- NEN-EN 15804+A2 and NMD Bepalingsmethode Milieuprestatie en bouwwerken 1.0
- ISO 14040: Environmental management - Life cycle assessment – Principles and Framework', International Organization for Standardization, ISO14040:2006.
- ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines', International Organization for Standardization, ISO14044:2006.
- ISO 14025: Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures', International Organization for Standardization, ISO14025:2006.
- Simapro 9.1.1.1

REMARKS

EPD of construction products may not be comparable if they do not comply with EN15804