

ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Cementa AB, HeidelbergCement Group
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Anlängningscement FA - Portland Fly Ash Cement CEM II/A-V 42.5 N

Cementa AB, HeidelbergCement Group

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General Information

Cementa AB, HeidelbergCement Group	Portland Fly Ash Cement CEM II/A-V 42.5 N						
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	Owner of the declaration Cementa AB Marieviksgatan 25, Box 47055 SE-100 74 Stockholm						
Declaration number EPD-HCG-20210156-CAA1-EN	Declared product / declared unit 1 metric t of CEM II/A-V 42.5 N						
This declaration is based on the product category rules: Cement, 07.2014 (PCR checked and approved by the SVR)	Scope: This European Core EPD (Environmental Product Declaration) covers the environmental information for the product CEM II/A-V 42.5 N produced by Cementa AB (hereinafter called Cementa) in the plant Slite in Sweden, 2020. The LCA study was performed using a flexible, pre-verified LCA tool, i.e. GCCA (Global Cement and Concrete Association) tool for EPDs of concrete and cement, version 3.0. The GCCA-LCA tool enables the user to calculate environmental parameters for cement and concrete production in accordance with <i>EN 15804 + A2: 2019</i> and in accordance with the PCR construction products <i>PCR 2019: 14</i> to be calculated. In addition to <i>PCR 2019: 14</i> , the sub-PCRs cement and building lime <i>c-PCR-001</i> and concrete and concrete elements <i>c-PCR-003</i> were used for the calculations. The mentioned LCA tool is valid for the manufacturing of cement and concrete in several countries. 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 <i>EN 15804+A2</i> . In the following, the standard will be simplified as <i>EN 15804</i> .						
Issue date 2021-08-16							
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 Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)  Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)	Verification <table border="1"> <tr> <td colspan="2">The standard <i>EN 15804</i> serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to <i>ISO 14025:2010</i></td> </tr> <tr> <td>☐ internally</td> <td>☒ externally</td> </tr> </table>  Angela Schindler (Independent verifier)	The standard <i>EN 15804</i> serves as the core PCR		Independent verification of the declaration and data according to <i>ISO 14025:2010</i>		☐ internally	☒ externally
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Product

Product description/Product definition

Cement is a hydraulic binder. It consists of finely ground, non-metallic inorganic compounds. Cement is produced by grinding cement clinker and other main or minor constituents. When water is added to cement, a cement paste is formed, which sets and hardens by means of hydration reactions. After hardening, it retains its strength and stability even under water. The declared product is a cement conforming with the composition of Portland fly ash cement CEM II/A-V

42.5 R manufactured by Cementa in the plant Slite in 2020. The calculation is based on plant-specific data. The considered cement belongs to the main cement type CEM II/A-V in accordance with *EN 197-1*.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration *EN 197-1* and the CE-marking. For

the application and use the respective national provisions apply.

Application

The application of cement has a large variety. It is mainly used as a binder for concrete and mortar. The application in concrete is regulated in *EN 206*. According to this standard, general suitability is established for cement conforming to *EN 197-1*.

Technical Data

The declared cement corresponds to the 42.5 standard compressive strength class with normal early strength development (N) in accordance with *EN 197-1*.

Constructional data

Name	Value	Unit
Strength class acc. to /EN 197-1/	42.5	N/mm ²

Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to /EN 197-1/.

Base materials/Ancillary materials

Clinker: 80 - 94 %

Cement clinker is made of a raw material mixture that is added to the cement kiln and sintered at a temperature of 1400 °C. The basic materials for the production of cement clinker consist of calcium oxide (CaO), silicon dioxide (SiO₂) and small amounts of aluminium oxide (Al₂O₃) and iron oxide (Fe₂O₃). Raw materials that provide these constituents are limestone, chalk and clay or limestone marl as its natural occurring mixture.

Fly Ash: 6 - 20 %

Fly ash is a by-product of coal-fired power generation. It is obtained by electrostatic or mechanical precipitation of dust-like particles from the flue gases. Fly ash V is siliceous in nature having pozzolanic properties. It mainly consists of reactive silicon dioxide (SiO₂ ≥ 25 % by mass) and aluminium oxide (Al₂O₃). Minor constituents are iron oxide (Fe₂O₃), calcium oxide (CaO) and other compounds. The CaO content is restricted according to *EN 197-1*.

Minor additional constituents: 0 - 5 %

Minor additional constituents are specially selected, inorganic natural mineral materials, inorganic mineral materials derived from the clinker production process or constituents as granulated blast furnace slag, pozzolanic materials, fly ash, burnt shale, limestone or silica fume.

Gypsum/Anhydrite/Residual gypsum: 0 - 5 %

Gypsum and anhydrite are added as setting regulators to cement. Many cement plants use residual gypsum from flue gas desulfurization as well.

This product contains substances listed in the candidate list (date: 21.11.2019) exceeding 0.1 percentage by mass.; No

Reference service life

This study covers the production stage information (from A1 to A3) of the product. As no use stage is declared, the reference service life for cement is irrelevant.

LCA: Calculation rules

Declared Unit

The declared unit is 1 metric t of CEM II/A-V 42.5 N.

Declared unit

Name	Value	Unit
Declared unit	1	t
Declared unit	1000	kg
Conversion factor to 1 kg	1000	-

System boundary

Type of EPD: cradle-to-gate

For the modelling of cement, both specific production data from HeidelbergCement and background data (especially for upstream processes) have been used. For life cycle modelling of the considered product, the verified Global Cement and Concrete Association GCCA online tool for EPDs of concrete and cement is used. The tool was developed by *Quantis* and is owned by the Global Cement and Concrete Association. The life cycle assessment in the tool has been implemented in compliance with *EN 15804, General Programme Instructions (GPI 3.01)* for the International EPD® System, the product category rules *c-PCR-003 Concrete* and *c-PCR-001 Cement*. For the present study, version 3.0 of the GCCA Concrete EPD tool was used, largely being based on the database *ecoinvent v3.3*.

A significant factor regarding primary data collection is the emission measurement directly at the plant. In line with the official regulations, regular data collections are established at HeidelbergCement group. The emission data of the clinker burning process are included in this LCA study. Preferably directly measured kiln emission values in the specific plant are considered. Noise, landscape impact, vibration etc. are not within the scope of this study. In case that specific kiln emission data are not available, default values are automatically used by the CCA tool.

The selected system boundaries comprise the production of cement including raw material extraction up to the finished product at the factory gate.

The product stage contains:

Module A1: Extraction and processing of raw materials.

Module A2: Transport of raw materials to the factory gate and internal transport.

Module A3: Cement production.

The construction stage, the use stage and the disposal stage are not included in the life cycle assessment of cement.

According to the PCR, an economical allocation for secondary materials (allocation that bases on the market values) of the impacts should be performed.

Here is an economic allocation done for the use of Fly Ash.

were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared

LCA: Scenarios and additional technical information

Characteristic product properties

Information on biogenic Carbon

Not applicable.

The development of scenarios has to be made on the finished product (e.g. concrete) and not on the upstream product cement.

LCA: Results

Disclaimer:

EP-freshwater: This indicator has been calculated as “kg P eq” as required in the characterization 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	ND	ND	ND	ND	MNR	MNR	MNR	ND	ND	ND	ND	ND	ND	ND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 metric t CEM II/A-V 42.5 N

Core Indicator	Unit	A1-A3
Global warming potential - total	[kg CO ₂ -Eq.]	6.80E+2
Global warming potential - fossil fuels	[kg CO ₂ -Eq.]	6.80E+2
Global warming potential - biogenic	[kg CO ₂ -Eq.]	1.94E-1
GWP from land use and land use change	[kg CO ₂ -Eq.]	1.26E-1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	8.39E-6
Acidification potential, accumulated exceedance	[mol H ⁺ -Eq.]	1.21E+0
Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg P-Eq.]	5.39E-2
Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	4.30E-3
Eutrophication, accumulated exceedance	[mol N-Eq.]	3.84E+0
Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	1.04E+0
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.39E-4
Abiotic depletion potential for fossil resources	[MJ]	1.39E+3
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m ³ world-Eq deprived]	2.68E+1

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 metric t CEM II/A-V 42.5 N

Indicator	Unit	A1-A3
Renewable primary energy as energy carrier	[MJ]	3.05E+2
Renewable primary energy resources as material utilization	[MJ]	0.00E+0
Total use of renewable primary energy resources	[MJ]	3.05E+2
Non-renewable primary energy as energy carrier	[MJ]	2.03E+3
Non-renewable primary energy as material utilization	[MJ]	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	2.03E+3
Use of secondary material	[kg]	2.03E+2
Use of renewable secondary fuels	[MJ]	6.55E+2
Use of non-renewable secondary fuels	[MJ]	1.07E+3
Use of net fresh water	[m ³]	6.58E-1

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 metric t CEM II/A-V 42.5 N

Indicator	Unit	A1-A3
Hazardous waste disposed	[kg]	1.30E-1
Non-hazardous waste disposed	[kg]	4.25E+2
Radioactive waste disposed	[kg]	0.00E+0
Components for re-use	[kg]	0.00E+0
Materials for recycling	[kg]	1.29E-1
Materials for energy recovery	[kg]	0.00E+0
Exported electrical energy	[MJ]	0.00E+0
Exported thermal energy	[MJ]	0.00E+0

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 metric t CEM III/A-V 42.5 N

Indicator	Unit	A1-A3
Potential incidence of disease due to PM emissions	[Disease Incidence]	1.44E-5
Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	3.77E+4
Potential comparative toxic unit for ecosystems	[CTUe]	3.83E+1
Potential comparative toxic unit for humans - cancerogenic	[CTUh]	9.73E-7
Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	8.71E-6
Potential soil quality index	[-]	1.40E+3

Remark to Global warming potential: This includes 98,7 kg CO₂-eq. from the incineration of wastes in clinker production. According to the polluter pays-principle EN 15804 that would be assigned to the production system, which has caused the waste. In this EPD the CO₂ contribution is not subtracted. This is to ensure comparability across countries of calculated global warming potentials for cements even if the used secondary fuels in other countries do not have waste status.

Remark to Waste categories: The waste indicators account for wastes from clinker and cement manufacturing only.

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

Disclaimer 2 – for the indicators: abiotic depletion potential for fossil resources, abiotic depletion potential for non-fossil resources, water (user) deprivation potential, deprivation-weighted water consumption, potential comparative toxic unit for ecosystems, potential comparative toxic unit for humans - cancer effects, potential comparative toxic unit for humans – non-cancer effects, potential soil quality index. 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.

References

CEN/TR 15941
CEN/TR 15941:2010-11 Sustainability of construction works – Environmental product declarations – Methodology for selection and use of generic data

Concrete EPD tool
<https://concrete-epd-tool.org/>

c-PCR-001
c-PCR-001 Cement and building lime (EN 16908)
<http://environdec.com>

c-PCR-003
c-PCR-003 Concrete and concrete elements (EN 16757)
<http://environdec.com>

EN ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures

EN ISO 14040
EN ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework

EN ISO 14044
EN ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines

CPR
Regulation (EU) No. 305/2011: Construction Products Regulation (CPR)

ecoinvent v3.3

ecoinvent, Zurich, Switzerland, database version 3.3, published August 2016

EN 15804+A2:2019
EN 15804+A2:2019 Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products

EN 197-1
SS- EN 197-1:2011 Cement- part 1: Composition specification and conformity criteria for common cements

EN 197-2
SS- EN 197-2:2020 Cement- part 2: Assessment and verification of constancy of performance

GCCA Core model report
GCCA tool for EPDs of concrete and cement (v3.0): LCA core model and database report, International version, Global Cement and Concrete Association, London 2020.

GCCA Project Database
GCCA tool for EPDs of concrete and cement (v3.0): Project Database, International version, Global Cement and Concrete Association, London 2020.

GPI 3.01
General Programme Instructions for the International EPD® System v3.01, Environdec.

PCR 2019:14

Product Category Rules: Construction products (EN 15804+A2:2019)
<http://environdec.com>

PCR Part A
Product Category Rules for Building-Related Products and Services, Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, Version 1.1.1
www.ibu-epd.com

PCR Part B

PCR Guidance Texts for Building Related Products and Services, Part B: Requirements on the EPD
www.ibu-epd.com

REACH
<https://echa.europa.eu/candidate-list-table>

**Publisher**

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web www.ibu-epd.com

**Programme holder**

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web www.ibu-epd.com

**Author of the Life Cycle
Assessment**

Cementa AB, HeidelbergCement
Group
Marieviksgatan 25
11743 Stockholm
Sweden

Tel +46 8 625 68 00
Fax +46 8 753 36 20
Mail bodil.wilhelmsson@cementa.se
Web www.cementa.se

**Owner of the Declaration**

Cementa AB, HeidelbergCement
Group
Marieviksgatan 25
11743 Stockholm
Sweden

Tel +46 8 625 68 00
Fax +46 8 753 36 20
Mail bodil.wilhelmsson@cementa.se
Web www.cementa.se