Environmental Product Declaration

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

Oiva-cement, CEM II B-M (S-LL) 42,5 N Parainen

FINNSEMENTTI
A CRH COMPANY

PROGRAMME:
The International EPD® System,
www.environdec.com

PROGRAMME OPERATOR:
EPD International AB

EPD REGISTRATION NUMBER:
S-P-04508

PUBLICATION DATE:
2021-09-01

VALID UNTIL:
2026-07-01

GENERAL INFORMATION
Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR):	PCR 2019:14 Construction Products – Version 1.1 c-PCR-001 Cement and building limes (EN 16908:2017)
PCR review was conducted by:	The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com. Chair of the PCR review: Claudia A. Peña Review date: 2020-07-10 until 2020-08-31
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	☐ EPD process certification ☒ EPD verification
Third party verifier:	Hannu Karppi, Ramboll Finland Oy
Approved by:	The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier:	☐ Yes ☒ No

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

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

COMPANY INFORMATION

Owner of the EPD:
Finnsementti Oy, Skräbbölentie 18, 21600 Parainen, Finland
Contact:
Ulla Leveelahti +358 206 201 346 (ulla.leveelahti@finnsementti.fi)
Description of the organisation:
Finnsementti, A CRH company, is a Finnish manufacturer of cement. Harnessing our century-long experience, we produce consistently superior cement and create jobs within our industry. The majority of Finland's cement offering is produced at Finnsementti's plants in Parainen and Lappeenranta, in addition to which the company has eight terminals in Kirkkonummi, Koverhar, Mariehamn, Oulu, Jakobstad, Pori, Raahe and Vasa. In addition to cement, our offering includes various concrete additives, admixtures and special aggregates.
Product-related or management system-related certifications:
ISO 9001:2015, ISO 14001:2015
Name and location of production site(s):
Finnsementti Oy, Parainen cement plant, Skräbbölentie 18, 21600 Parainen, Finland

PRODUCT INFORMATION

Product name:
Oiva-cement, Parainen
Product identification:
CEM II B-M (S-LL) 42,5 N (CE marked, DoP_PA_Oiva_5483)
Product description:
Cement is a hydraulic binder, i.e. a finely ground inorganic material which, when mixed with water, forms a paste which sets and hardens by means of hydration reactions and processes and which, after hardening, retains its strength and stability even under water.
UN CPC code:
3744 Cement

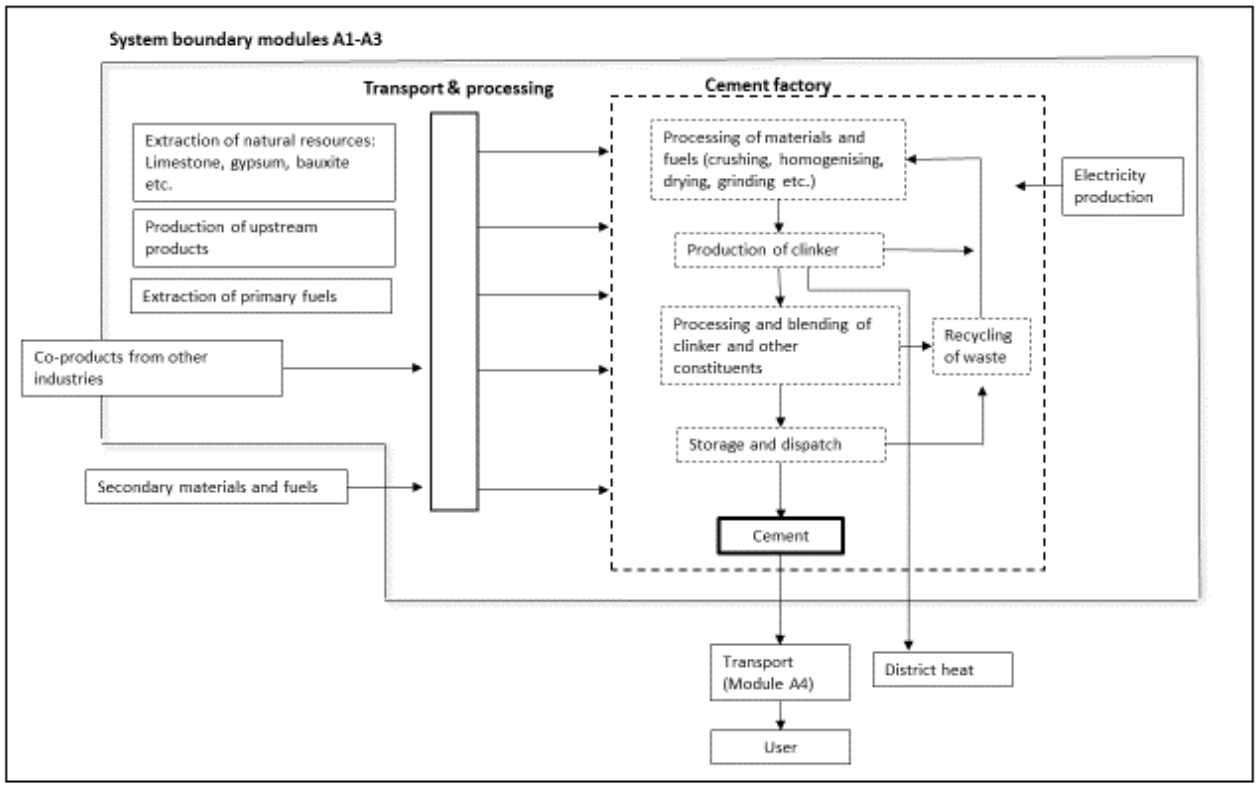
LCA INFORMATION

Functional unit / declared unit:
1 metric ton of bulk cement
Reference service life:
NA
Time representativeness:
All material flows of the clinker production process is based on site-specific data gathered for one year of operation, for the period 1st January 2020 – 31st December 2020. Production data for March and April 2021 where used for determination of cement composition and specific electricity usage.
Database(s) and LCA software used:
The Global Concrete and Cement Association (GCCA) verified LCA Model (v3.0, International version, 25 November 2020) was used for the life cycle modelling of the considered product. The GCCA EPD Tool is a web-based calculation tool for EPDs. The life cycle assessment in the tool has been implemented in compliance with EN 15804:2012+A2:2019, PCR 2019:14 Construction products (EN 15804:A2) and complementary PCRs c-PCR-001 Cement and building limes (EN 16908) and c-PCR-003 Concrete and concrete elements (EN 16757), as well as with the General Programme Instructions (GPI 3.01) of the International EPD® System. The GCCA EPD tool is largely based on the

ecoinvent v3.5 database.

Description of system boundaries:
The EPD covers the product stage, cradle to gate (A1–A3). The selected system boundaries comprise the production of cement including raw material extraction up to the finished product at the factory gate. They are in accordance with the system boundaries given in EN 16908:2017.

SYSTEM DIAGRAM:



Assumptions about electricity production:
Finnsementti Oy electricity mix is based on the Finnish 2020 Electricity breakdown (Energiateollisuus ry, Energiavuosi 2020). The electricity is market priced electricity. The emission factor used for the electricity is 177 g CO_2-eq./kWh. The emission factor includes the total CO_2 -eq. emissions from electricity production and building the power plants.

Cut-off rules:
1 % cut-off rule was applied for input flows in the inventory.

Processes that have been excluded from the LCA study:
- Ball mill charge wear (less than 1% mass)
- Kiln refractory wear (less than 1% mass)
- Internal traffic (less than 1% of primary energy usage

MODULES DECLARED, GEOGRAPHICAL SCOPE AND SHARE OF SPECIFIC DATA:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
MODULE	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules Declared	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND
Geography	EU	EU	EU														
Specific data used	>90 %					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant					-	-	-	-	-	-	-	-	-	-	-	-

X = included in LCA MND = Module Not Declared

PRODUCT DESCRIPTION

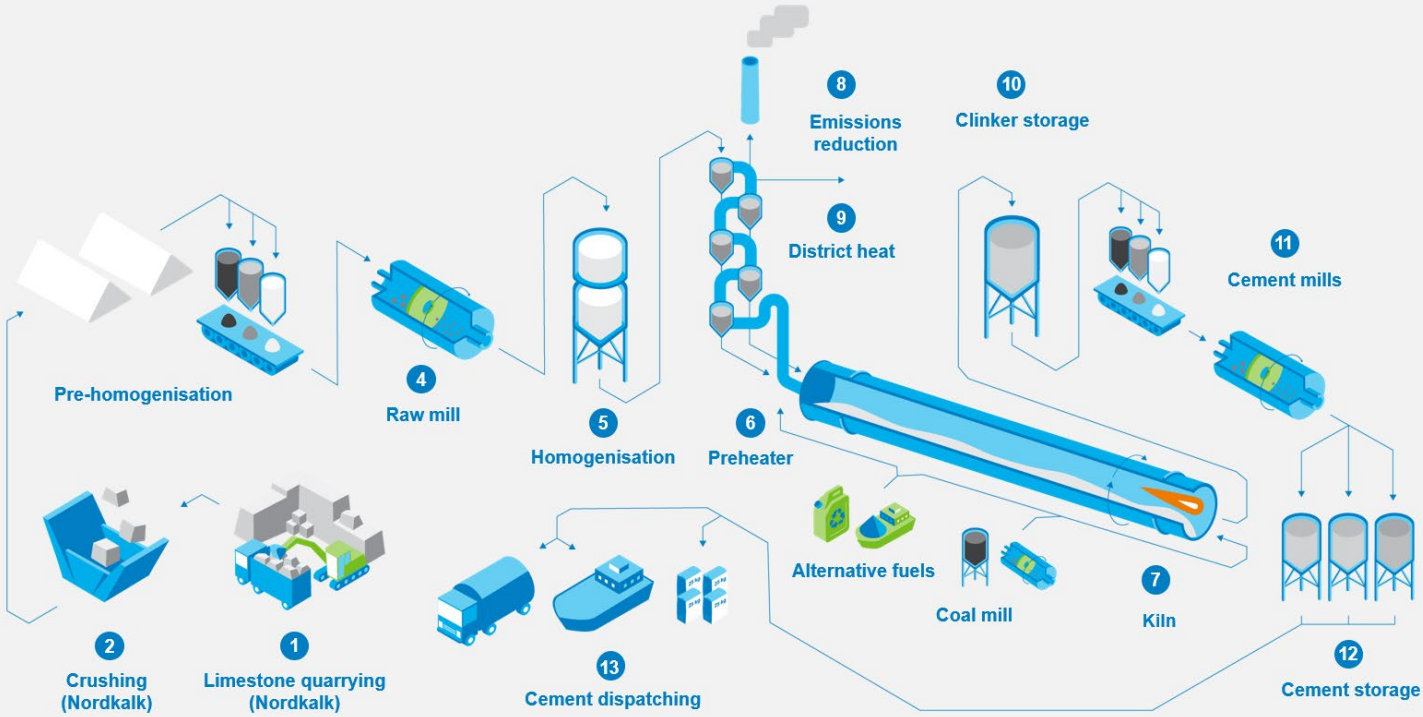
Cement
Cement is a hydraulic binder, i.e. a finely ground inorganic material which, when mixed with water, forms a paste which sets and hardens by means of hydration reactions and processes and which, after hardening, retains its strength and stability even under water.

Use
Cement is mainly used as a binder for concrete, mortar or cement screed.

Manufacturing process
The most important component of cement according to EN 197-1 is clinker. It is produced from raw materials such as limestone and industrial co-products or wastes which are crushed, homogenized and fed into a rotary kiln. The raw materials are sintered at a temperature of 1450°C to form new compounds. Clinker consists mainly of calcium-, silicium-, aluminium- and iron-oxides.

In a second phase calcium sulphates and possibly additional cementitious or inert materials are added to the clinker. All constituents are ground leading to a fine and homogenous powder.

The following figure is a schematic representation of the cement manufacturing process from quarry to dispatch (production stage, information modules A1 to A3).



Content information
Cement according to EN 197-1 is produced by grinding and mixing the constituents defined in the standard.

CONSTITUENTS OF FINNSEMENTTI CEMENTS AS DEFINED IN EN 197-1

Main constituents	Portland cement clinker and limestone, blast furnace slag
Calcium sulphate (gypsum)	added to the other constituents of cement during its manufacture to control setting
Minor additional constituents	added to improve the physical properties of the cement, such as workability or water retention
Additives	the total quantity of additives shall not exceed 1.0 % by mass of the cement

This product is a **CEM II B-M (S-LL)** -type cement, for which the total of main constituents and minor additional constituents is composed of 65-79 M.-% cement clinker, 21-35 M.% limestone and blast furnace slag and 0-5 M.% minor additional constituents.

This product does not contain substances listed in the Candidate List of Substances of Very High Concern for Authorisation (date: 3.5.2021) exceeding 0.1 percentage by mass.

ENVIRONMENTAL INFORMATION

LCA results per 1 metric t of bulk cement

Core environmental impact indicators			A1	A2	A3	A1-A3
Global warming potential, total	**GWP-tot**	kg $CO_{2\ eq.}$	616	2,0	8,2	**626**
Global warming potential, fossil fuels	**GWP-fos**	kg $CO_{2\ eq.}$	615	2,0	8,1	**626**
Global warming potential, biogenic	**GWP-bio**	kg $CO_{2\ eq.}$	0,09	0,002	0,02	**0,11**
Global warming potential, land use and land use change	**GWP-luc**	kg $CO_{2\ eq.}$	0,055	0,001	0,034	**0,091**
Ozone depletion potential	**ODP**	kg $CFC_{11\ eq.}$	1,2E-05	3,2E-07	2,8E-06	**1,6E-05**
Acidification potential	**AP**	mol H+ eq.	1,1	0,05	0,07	**1,3**
Eutrophication potential, freshwater	**EP-fw**	kg $PO_{4\ eq.}$	0,062	0,001	0,01	**0,076**
	EP-fw*	kg P eq.	0,020	0,0003	0,004	**0,025**
Eutrophication potential, marine	**EP-mar**	kg $N_{eq.}$	1,7E-03	2,1E-05	4,7E-04	**2,2E-03**
Eutrophication potential, accumulated exceedance	**EP-ter**	mol $N_{eq.}$	5,1	0,05	0,2	**5,3**
Formation potential of tropospheric ozone	**POCP**	kg $NMVOC_{eq.}$	1,2	0,02	0,04	**1,3**
Abiotic depletion potential for non-fossil resources	**ADPE**	kg $Sb_{eq.}$	8,0E-05	1,2E-06	2,6E-05	**1,1E-04**
Abiotic depletion for fossil resources potential	**ADPF**	MJ	1224	28	93	**1345**
Water deprivation potential	**WDP**	m^3 eq.	29	0,2	5,7	**35**

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

Remark to GWP-tot: This includes 42 kg CO_2-eq. from the incineration of wastes in clinker production. According to the "polluter pays – principle" in EN 15804, that would be assigned to the production system, which has caused the waste. In this EPD the CO_2 contribution is not subtracted. This is to ensure comparability with EU ETS and across countries for calculated global warming potentials for cements even if the used secondary fuels in other countries do not have waste status.

Additional environmental impact indicators			A1	A2	A3	A1-A3
Potential incidence of disease due to pm emissions	**PM**	Disease incidence	1,2E-05	8,0E-08	3,7E-07	**1,2E-05**
Potential human exposure efficiency relative to U235	**IRP**	kBq U235 eq.	2,0E+04	1,8E+02	1,5E+04	**3,4E+04**
Potential comparative toxic unit for ecosystems	**ETP**	CTUe	3,2E+01	9,1E-01	5,6E+00	**3,8E+01**
Potential comparative toxic unit for humans	**HTPC**	CTUh	8,3E-07	1,4E-08	1,9E-07	**1,0E-06**
Potential comparative toxic unit for humans	**HTPNC**	CTUh	2,0E-05	9,9E-08	3,1E-06	**2,3E-05**
Potential soil quality index	**SQP**	dimensionless	1682	9	1346	**3037**

Disclaimer: The results of ETP, HTPC, HTPNC and SQP environmental impact indicators shall be used with care as the uncertainties of these results are high.

Parameters describing resource use			A1	A2	A3	A1-A3
Use of renewable primary energy excluding renewable primary energy resources used as raw	PERE	MJ	225	1	189	**415**
Use of renewable primary energy resources used as raw materials	PERM	MJ	0	0	0	**0**
Total use of renewable primary energy resources	PERT	MJ	225	1	189	**415**
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	PENRE	MJ	1564	31	325	**1920**
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ	0	0	0	**0**
Total use of non-renewable primary energy resources	PENRT	MJ	1564	31	325	**1920**
Use of secondary material	SM	kg	195	0	0	**195**
Use of renewable secondary fuels	RSF	MJ	252	0	0	**252**
Use of non-renewable secondary fuels	NRSF	MJ	381	0	0	**381**
Net use of fresh water	NFW	m^3	0,70	0,01	0,14	**0,85**

Other environmental information describing waste categories			A1	A2	A3	A1-A3
Hazardous waste disposed	HWD	kg	0,035	0	0	**0,035**
Non-hazardous waste disposed	NHWD	kg	7,2	0	0	**7,2**
Radioactive waste disposed	RWD	kg	0	0	0	**0**

Environmental information describing output flows			A1	A2	A3	A1-A3
Components for re-use	CRU	kg	0	0	0	**0**
Materials for recycling	MFR	kg	0,43	0	0	**0,43**
Materials for energy recovery	MER	kg	0,077	0	0	**0,077**
Exported energy	EE	MJ	48	0	0	**48**

Information on biogenic carbon content

The removals and emissions associated with biogenic carbon content of i) the product and ii) the packaging is not calculated. The latter is not significant or even not relevant for the cement sector. The GWB-GHG indicator is not calculated and therefore not reported. The GWP-GHG indicator can be assimilated to the GWP-tot indicator.

Extra indicators			A1	A2	A3	A1-A3
Emissions from calcination and removals from carbonation	CC	kg CO eq.	359	0	0	**359**
Emissions from combustion of waste from renewable sources	CWRS	kg CO eq.	0,080	0	0	**0,080**
Emissions from combustion of waste from non-renewable sources	CWNRS	kg CO eq.	42	0	0	**42**

ADDITIONAL INFORMATION

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

Carbonation
During and after the lifetime of concrete structures or other cement-containing products, hydrated cement contained within the product reacts with CO_2 in the air. Part of the CO_2 emitted during cement production is reabsorbed by the cement through carbonation, a reaction also referred to as cement carbonation. The quantity of CO_2 taken up will depend on the type of application and its treatment after its lifetime. This reaction takes place mainly on the surface of cement-based products. Structural concrete applications are designed according to strict codes which ensure that carbonation at the concrete surface does not lead to corrosion of reinforcement. Carbonation can nevertheless be particularly relevant after demolition when the surface in contact with air increases very significantly. Carbonation contributes to a reduced GWP impact of cement products over their whole life.

Since carbonation will depend on the application in question, please refer to the respective PCR/EPDs for ready-mix concrete, precast concrete, mortar, cement screed or other cement-based products.

Additional information on release of dangerous substances to indoor air, soil and water during the use stage

For additional information on emissions to indoor air, soil and water during the use stage, please refer to the respective EPDs for the downstream products such as ready-mix concrete, precast concrete, screed, plasters, mortars, grouts etc.

More information regarding Finnsementti's environmental objectives and activities as well as regarding safe and effective use and disposal of cement are available on www.finnsementti.fi.

REFERENCES

General Programme Instructions of the International EPD® System. Version 3.01.

PCR 2019:14
Construction Products. Version 1.1

EN 15804:2012-04 + A2 2019
Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products

EN 16908: 2017
Cement and building lime - Environmental product declarations – Product category rules complementary to EN 15804

EN 197-1: 2011
Cement. Part 1: Composition, specifications and conformity criteria for common cements.

Global Concrete and Cement Association (GCCA) verified LCA Model
(v3.0, International version, 25 November 2020)

Candidate List of Substances of Very High Concern for Authorization European Chemical Agency
www.echa.europa.eu