GLADSTONE | Fly Ash Blend

ENVIRONMENTAL PRODUCT DECLARATION

CEMENT AUSTRALIA®

Program: The International EPD® System, www.environdec.com
Program Operator: EPD Australasia
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In accordance with ISO 14025 and EN 15804: 2012+A2:2019
For Gladstone Fly Ash Blend from Cement Australia

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Version History

Version

Version :	1.1
Revision Date :	24 April 2023 (Valid until 30 March 2028)

Version differences

Version	Amendment summary
1.0	Original version
1.1	An error was identified in the System Diagram on page 9 of the EPD that has been rectified.

Program Information and Verification

Program

The International EPD ® System

Program Operator

EPD Australasia Ltd

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Declaration owner

Cement Australia Pty Ltd

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

Third Party Verifier accredited or approved by EPD Australasia Ltd

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

Gladstone Type Fly Ash Blend from Cement Australia Pty Ltd

Landing Road, Gladstone QLD, 4680, Australia

Product Category Rules:

Version 1.11, 2021-02-05
Complementary Product Category Rules (C-PCR) to PCR 2019:14, Cement and Building Lime, Version 2022-05-18

EPD Tool:

GCCA's Industry EPD Tool for Cement and Concrete (V3.1), International version

Reference Year for Data:

01/01/2021-31/12/2021

General Information

To serve increasing market demand and in particular, to facilitate whole-project, whole-life environmental impact assessment, the cement and concrete industry can provide “cradle to gate” environmental product declarations (EPDs) for their products.

The intention is that EPDs are used by engineers, architects, developers and clients to compare products that have functional equivalence and to pass environmental information down the value chain.

However, EPD’s within the same product category but from different programmes may not be comparable. They also may not be comparable if they do not comply with EN15804+A2. For further information about comparability, see EN15804+A2 and ISO14025.

The Global Cement and Concrete Association (GCCA) makes available to the concrete industry across the world a verified EPD tool (GCCA EPD Tool).

This enables producers to derive EPD data to run comparisons during product development stage and data to input into EPDs.

The GCCA EPD tool is verified against recognised international standards and relevant product category rules.

The EPD tool was originally developed under the Cement Sustainability Initiative, part of the World Business Council for Sustainable Development.

Company information

Owner of the EPD

Cement Australia Pty Ltd

Description of the organisation

Cement Australia Holdings Pty Ltd is owned by controlled entities of Holcim Group Ltd (Switzerland) and Heidelberg Cement AG (Germany) in the proportions of 50% and 50% respectively.

Separately, a partnership has been formed between controlled entities of Holcim Group Ltd and Heidelberg Cement AG with interests held in the Cement Australia Partnership in the same proportions of 50% and 50% respectively.

Cement Australia's main business involves the manufacture and sale of cement and cementitious products in Australia. Cement Australia manufactures high performance cement products including customised blends for special applications.

In addition, we supply concrete-grade fly ash and ground granulated blast furnace slag along with high-grade lime products in bulk and packaged forms.

Our products meet required Australian Standards, and have been tested to withstand Australian climate conditions.

Cement Australia operates in accordance with its management systems which are certified to the following International Standards:

- **ISO 9001** Quality Management Systems
- **ISO 14001** Environmental Management Systems
- **ISO 45001** Occupational Health and Safety Management Systems.

Name and location of production site(s)

Fisherman's Landing, Landing Road, Gladstone QLD 4680 Australia

The Cement Australia operations located at Fisherman's Landing operate 24 hours a day, 7 days a week by a skilled and experienced team with intelligent control systems, utilising the latest milling technology providing a consistent and reliable product to meet the demands of the construction materials industry.

The site employs industry best practice environmental controls at all stages of the production process going beyond compliance, to setting the industry standard in minimising our operational impacts on the receiving environment.

Declared Products

Product Name

Gladstone Fly Ash Blend

Product Identification

Gladstone FAB

Product Description

Fly ash is a by-product of coal combustion in power stations. Aside from offering environmental advantages by re-using industry waste, blending fly ash with General Purpose Cement also improves the overall performance and quality of concrete.

Fly Ash blended cement is a uniform blend of Portland cement and fly ash that complies with the requirements specified in Australian Standard 3972 for Type GB (Blended cement) . It also complies with the AS3972 requirements for Type SL (Shrinkage Limited) and Type SR (Sulfate Resisting) cements.

Blended Cement is manufactured for use in general purpose concrete applications, cement based products, mortars and grouts where the use of fly ash has been approved. Concrete made with fly ash cement delivers improved later-age strength workability and enhances the durability performance of concrete. Additionally, fly ash is a recycled by-product of industry, the use of these in cement blends assists with reducing carbon emissions.

Cements blended with fly ash when incorporated into a concrete mix can be expected to provide the following benefits:

- Improved workability and pumpability
- Reduced water demand
- Enhanced bleed control
- Lower drying shrinkage and creep
- Improved resistance to sulfate attack and chloride penetration
- Reduced potential for Alkali Aggregate Reaction
- Lower embodied carbon content

UN CPC Code

3744

Declared Products

Product Composition

The nominal product composition of the Gladstone Fly Ash blend (FAB, also know as GB) is presented in the following table.

Material Description	Composition (%)	Post Consumer Material (%)	Renewable Material (%)
Clinker	61.25	0.0	0.0
Fly Ash	30	0.0	0.0
High Grade Limestone	5.25	0.0	0.0
Gypsum	3.5	0.0	0.0

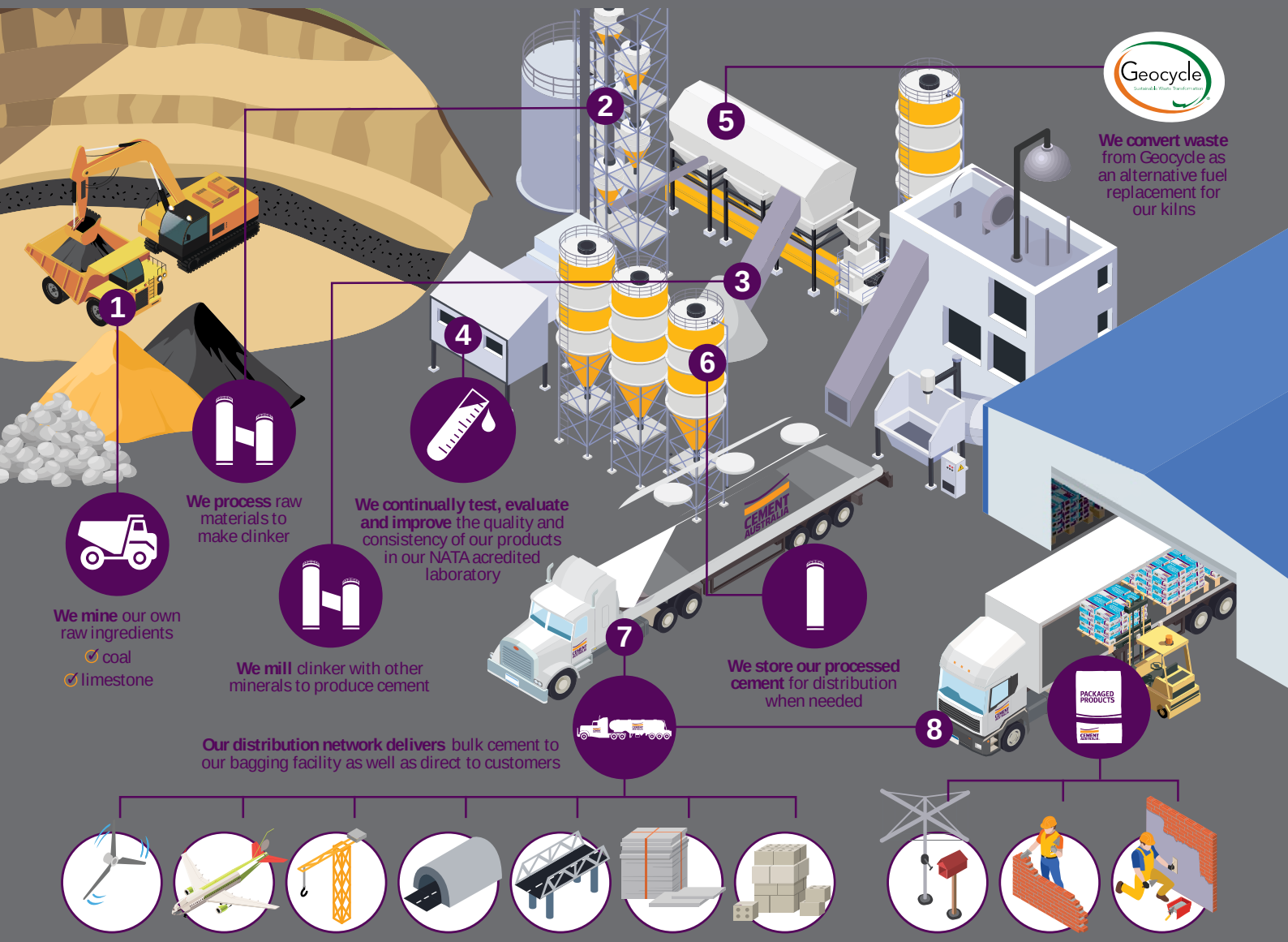
* Product is sold as bulk, therefore no packaging component.

* This product is classified as Hazardous according to the Safe Work Australia guidelines for Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

Cement Australia Process Overview

Mined. Milled. Manufactured.

Our cement has been proudly Made Right Here in Queensland since 1914



Bulk product is available directly from Cement Australia and is used in a wide range of civil, construction, government and infrastructure sectors, as well as for producing other cement based products

Bagged product is available through retailers across Queensland and is suitable for a variety of projects around the home

Life Cycle Assessment (LCA) Information

Description of System Boundaries

This EPD covers the cradle to gate life cycle stages (A1–A3) of cement production.

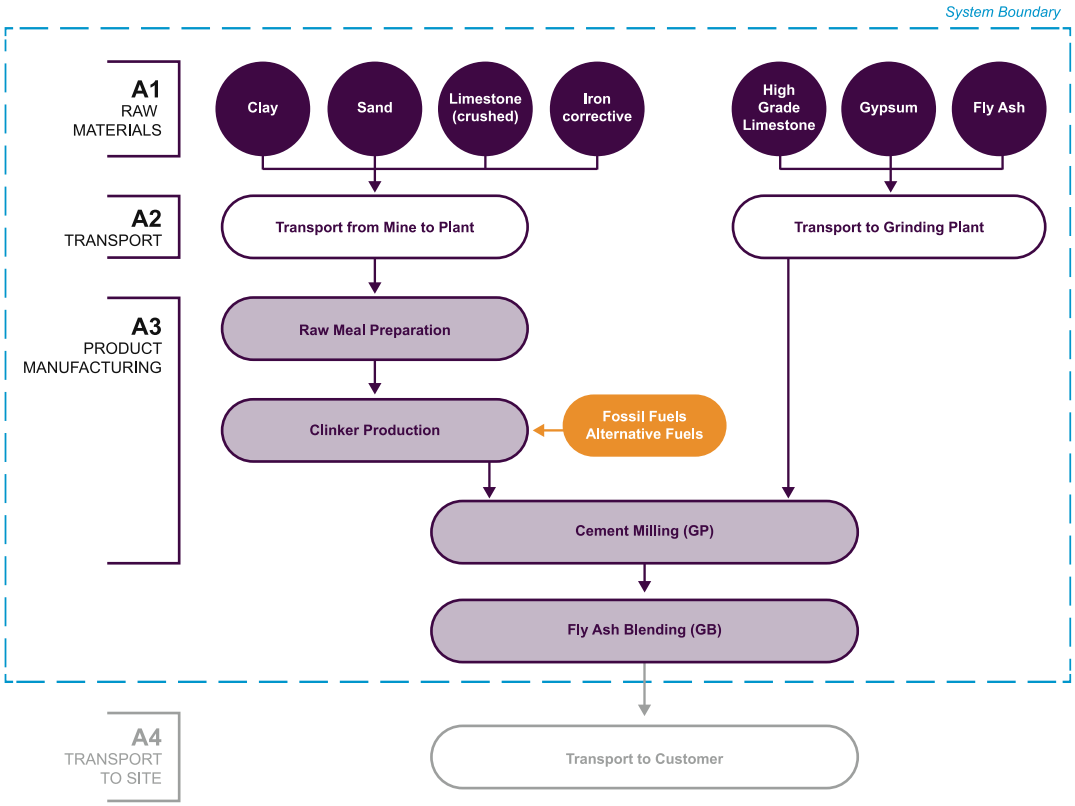
This system includes the extraction and production of raw materials, transportation of raw materials to the cement plant, cement manufacturing process (including onsite transportation) and treatment of waste produced within the processes throughout the cement plant.

According to EN 15804+A2 Section 5.2, EPDs of this type shall only be used where the following three conditions are valid:

- the product or material is physically integrated with other products during installation so they cannot be physically separated from them at end of life, and
- the product or material is no longer identifiable at end of life as a result of a physical or chemical transformation process, and
- the product or material does not contain biogenic carbon.

All processes related to the use stage, and end of life of cement and module D are outside the scope of this EPD as cement will be used as a mix component in manufacturing for other products (i.e., concrete and masonry) and cement cannot be physically separated from other products at end of life.

System Diagram



Life Cycle Assessment (LCA) Information

Scope of EPD

	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	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

X - Module is included in this study, ND - Module is not declared

Declared Unit

1 tonne

Reference Service Life

Not applicable

Time Representativeness

All material and energy flows within the scope of the study are based on plant specific data collected between 01/01/2021 – 31/12/2021.

Database(s) and LCA Software Used

GCCA EPD tool EN59 A2 software. Industry EPD Tool for Cement and Concrete (V3.1), International version.

The life cycle inventory database used in the tool is the ecoinvent database (v3.5), cut-off system model. The ecoinvent LCI database is the most widely used LCI database worldwide and the reference database for a large number of EPDs and sector-specific LCI datasets.

Life Cycle Assessment (LCA) Information

Background Data

The data provided for use in this EPD has been taken directly from the Gladstone Technical Information System (TIS) network and reflects real time data measured and collated by our process systems. All applicable data is derived by devices and instrumentation that are calibrated against the relevant Australian and International standards.

The source of Electricity supply data is the Department of Industry, Science, Energy and Resources (2021) Australian Energy Statistics, Table O. Energy usage data is monitored through site meters and energy billing information.

Australian electricity generation, by fuel type, physical units, calendar year 2020 - QLD

Non Renewable Fuels	GWh	Renewable Fuels	GWh
Black Coal	4.71E4	Biomass	1.22E3
Brown Coal	0.0E0	Wind	1.37E3
Natural Gas	1.15E4	Hydro	6.51E2
Oil Products	9.85E2	Large-scale solar PV	3.40E3
		Small-scale solar PV	4.61E3
		Geothermal	0.0
Total	**5.96E4**	**Total**	**1.12E4**
Percentage supply	**84%**	**Percentage supply**	**16%**

Transport distances were calculated based on the distance between the material source and its destination.

Life Cycle Assessment (LCA) Information

Data Quality

Information and data utilised in this document is correct and factual at time of development.

High data quality is achieved through the use of real time, independently calibrated monitoring systems which capture resource use. Overall, the data quality for this LCA was considered High.

The EPD will be updated if changes in its life cycle inventory led to a variation of 10% or more in any of the included environmental indicators during its validity period.

Module	Input/Output	Data Source	Temporal Scope	Quality
A1	Clinker (CA produced at plant)	Gladstone Technical Information System	2021	High
	Gypsum			
	Limestone			
A2	Transport	Actual Transport distances per trip	2021	High
A3	Electricity and natural gas used for manufacturing of cement	Site Electricity and gas meters & billing information	2021	High

Life Cycle Assessment (LCA) Information

Cut Off Rules

According to EN15804+A2, Section 6.3.6, LCA data shall include a minimum of 95% of total inflows (mass and energy) per module. In addition, if less than 100% of the inflows are accounted for, proxy data or extrapolation should be used to achieve 100% completeness.

For this LCA, it has been assumed that capital equipment and personnel have an impact that is not material and thus have not been included in the system boundary.

In addition, personnel travel to and from work has also not been included as it is assumed if they were not employed by Cement Australia for the production of cement, they would be employed by another business.

Based on this guidance, all inflows and outflows have been accounted for.

Allocation Rules

For Secondary Materials (Co-Products), EN15804+A2 allocation rules require allocation to be based on physical properties (e.g., mass or volume) when the difference in value from the co-products is low (difference in revenue of the main and co-product is less than 25%).

For co-products where the difference in revenue from the main and co-product is greater than 25% (e.g co-product revenue is 10% of main product revenue), an economic allocation factor shall be determined and reported in the data survey.

Regarding inputs into Clinker, iron corrective has been allocated economically. Other secondary material inputs are defined as waste and have a zero allocation as they have no end use.

Assumptions

The key choices and assumptions in this LCA are:

- The environmental profiles are largely influenced by the primary data, which are considered high quality.
- Fly Ash is considered a waste product in this EPD and has a zero allocation factor.
- Transport distances have been calculated as a direct route from material source to plant.

Environmental Indicators

Impact categories included in this assessment

Core environmental impact indicators	Acronym	Unit
Global warming potential, excluding biogenic uptake, emissions and storage	GWP-GHG	kg CO_2 equivalent
Global warming potential (total)	GWP (total)	kg CO_2 equivalent
Global warming potential (fossil)	GWP (fossil)	kg CO_2 equivalent
Global warming potential (biogenic)	GWP (biogenic)	kg CO_2 equivalent
Global warming potential (land use / land transformation)	GWP (luluc)	kg CO_2 equivalent
Ozone depletion potential	ODP	kg CFC-11 equivalent
Acidification Potential	AP	mol H^+ eq.
Eutrophication – aquatic freshwater	EP - freshwater	kg P equivalent
Eutrophication – aquatic marine	EP - marine	kg N equivalent
Eutrophication – terrestrial	EP - terrestrial	mol N equivalent
Photochemical ozone creation potential	POCP	Kg NMVOC equivalent
Abiotic depletion potential for mineral elements	ADPE	kg Sb equivalent
Abiotic depletion potential for fossil fuels	ADPF	MJ
Water Depletion Potential	WDP	m^3 equivalent

Environmental Indicators

Parameters describing resource use

Resource Use indicators	Acronym	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ_{NCV}
Use of renewable primary energy resources used as raw materials	PERM	MJ_{NCV}
Total use of renewable primary energy resources	PERT	MJ_{NCV}
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ_{NCV}
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ_{NCV}
Total use of non-renewable primary energy resources used as raw materials	PENRT	MJ_{NCV}
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ_{NCV}
Use of non-renewable secondary fuels	NRSF	MJ_{NCV}
Use of net fresh water	FW	m^3

Parameters describing waste

Waste Category	Acronym	Unit
Hazardous waste disposed	HWP	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg

Environmental Indicators

Parameters Describing Output Flows

Output flows	Acronym	Unit
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported Energy	EE	MJ

Additional Environmental Impacts

Disease potential	Acronym	Unit
Potential incidence of disease due to PM emissions	PM	Disease incidence
Potential Human exposure efficiency relative to U235	IRP	kBq U-235 eq
Potential Comparative Toxic Unit for ecosystems	ETP-fw	CTUe
Potential Comparative Toxic Unit for humans - cancer	HTP-c	CTUh
Potential Comparative Toxic Unit for humans - non-cancer	HTP-nc	CTUh
Potential soil quality index	SQP	dimensionless

Extra Indicators

Disease potential	Acronym	Unit
Emissions from calcination and removals from carbonation	CC	kg CO_2 equivalent
Emissions from combustion of secondary fuels from renewable sources used in production processes	CWRS	kg CO_2 equivalent
Emissions from combustion of secondary fuels from non-renewable sources used in production processes	CWNRS	kg CO_2 equivalent
Removals and emissions associated with biogenic carbon content of the bio-based product	GWP-Prod	kg CO_2
Removals and emissions associated with biogenic carbon content of the bio-based packaging	GWP-Pack	kg CO_2

Environmental Performance Results

Potential Environmental Impact – Mandatory Indicators according to EN 15804+A2

Core Environmental Indicators

Indicator	Unit	Tot.A1-A3
GWP-GHG	kg CO_2 equivalents	5.45E2
GWP-total	kg CO_2 eq.	5.27E2
GWP-fossil	kg CO_2 eq.	5.27E2
GWP-biogenic	kg CO_2 eq.	3.20E-2
GWP-luluc	kg CO_2 eq.	2.92E-2
ODP	kg CFC 11 eq.	4.11E-6
AP	mol H^+ eq.	1.82E0
EP-freshwater	kg P eq.	9.66E-2
EP-marine	kg N eq.	6.05E-3
EP-terrestrial	mol N eq.	3.93E0
POCP	kg NMVOC eq.	9.43E-1
ADPE	kg Sb eq.	1.00E-4
ADPF	MJ	2.39E3
WDP	m^3	1.93E1

Per tonne cement produced

** 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.*

Environmental Performance Results

Parameters describing resource use

Indicator	Unit	Tot.A1-A3
PERE	MJ	8.33E1
PERM	MJ	0.0E0
PERT	MJ	8.33E1
PENRE	MJ	2.39E3
PENRM	MJ.	0.0E0
PENRT	MJ	2.39E3
SM	kg	3.32E2
RSF	MJ	0.0E0
NRSF	MJ	2.24E2
FW	m^3	5.31E-1

Per tonne cement produced

Environmental Performance Results

Parameters describing waste

Indicator	Unit	Tot.A1-A3
HWD	kg	0.0E0
NHWD	kg	5.87E-1
RWD	kg	0.0E0

Per tonne cement produced

Parameters describing output flows

Indicator	Unit	Tot.A1-A3
CRU	kg	0.0E0
MFR	kg	0.0E0
MFRE	kg	0.0E0
EE	MJ per energy carrier	0.0E0

Per tonne cement produced

Extra Indicators

Indicator	Unit	Tot.A1-A3
CC	kg CO_2 eq.	3.01E2
CWRS	kg CO_2 eq.	0.0E0
CWNRS	kg CO_2 eq.	1.80E1
GWP-Prod	Kg CO_2	0.0E0
GWP-Pack	Kg CO_2	0.0E0

Per tonne cement produced

Environmental Performance Results

Potential Environmental Impact – Additional Mandatory and Voluntary Indicators

Indicator	Unit	Tot.A1-A3
PM	Disease incidence	1.20E-5
IRP	kBq U235 eq	1.97E3
ETP	CTUe	4.19E1
HTPC	CTUh	9.39E-7
HTPNC	CTUh	2.86E-5
SQP	dimensionless	8.82E2

Per tonne cement produced

References

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