Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Ground granulated blast-furnace slag

from

Quang Ninh Construction and Cement Joint Stock Company

Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Licensee:	EPD Southeast Asia, www.epd-southeastasia.com
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GENERAL INFORMATION

Programme Information	
Programme:	**The International EPD® System** EPD registered through the fully aligned regional hub: EPD Southeast Asia
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Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products (EN 15804+A2). Version 2.0.1 ***UN CPC code(s): 3744***
PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Rob Rouwette | start2see (chair), Noa Meron | thinkstep-anz (co-chair). The review panel may be contacted via the Secretariat www.environdec.com/contact.
c-PCR: C-PCR-001 Cement and building lime (EN 16908)

Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ **Individual EPD verification without a pre-verified LCA/EPD tool** Third-party verifier: Claudia A. Peña, PINDA LCT SpA, +56 993599210; E-Mail: claudia@epd-chile.com Approved by: 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 published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.
For further information about comparability, see EN 15804 and ISO 14025.

INFORMATION ABOUT EPD OWNER

Owner of the EPD:

- Owner of the EPD: Quang Ninh Construction and Cement Joint Stock Company.
- Address: Hop Thanh Area, Yen Tu Ward, Quang Ninh Province, Vietnam.
- Contact: Ms. Luu Thi Phuong Thao.
- E-mail: thao.lp@vawaz.com.vn .
- Phone: (+84) 93456 8591.

Description of the organisation:
Lam Thach cement is a well-known commodity developed by Quang Ninh cement and construction Joint Stock Company. It is critically produced with advanced production line of waterless technology. The facilities are selectively updated according to European standards. The factory's location is adjacent to abundance input materials for cement production including Canxi carbonate or limestone, coal, clay, additives. Economically, it is a notable convenience for transportation not only via road network, but also waterway.

Product-related or management system-related certifications:
ISO 9001, ISO 14001.

Address and contact information of the LCA practitioner commissioned by the EPD owner: SGS INTRON, C. Houben, Dr. Nolenslaan 126, 6136 GV Sittard, the Netherlands.
chantal.houben@sgs.com

PRODUCT INFORMATION

Product name: Ground granulated blast-furnace slag (GGBFS)

Product identification: GGBFS is a powder-like product.

Technical data:
ISO 22904:2020 GGBFS for concrete, mortar, and grout
ASTM C989: Ground Granulated Blast-Furnace Slag for use in concrete and mortars / Standard Specification for Slag Cement for use in Concrete and Mortars
EN 15167-1: Ground granulated blast furnace slag for use in concrete, mortar and grout
TCVN 11586: Ground granulated blast-furnace slag for concrete, mortar

Key Characteristics: Specific surface area (Blaine) of 450-550 m^2/kg, consistent with latent hydraulic properties.

Visual representation of the product

UN CPC code: 3744

Product description:
Ground granulated blast-furnace slag is either sold to customers or used as input material for slag cement production in the QNC Lam Thach II factory. Due to its hydraulic characteristics, it replaces portland clinker, thereby reducing the environmental impact of the cement.

Name and location of production site:
Hop Thanh Area, Yen Tu Ward, Quang Ninh Province, Vietnam.

References to any relevant websites for more information or explanatory materials, if applicable.
More information: qncc.vn.
For more information about the LCA the LCA practitioner can be contacted via nl.intron@sgs.com.

CONTENT DECLARATION

The mass (weight) of one unit of a product, as purchased or per declared unit: 1 ton

The product does not contain biogenic carbon content.

Product content	Mass	Post-consumer recycled material, mass-% of product	Biogenic material, mass-% of product	Biogenic material, kg C/ declared unit
Ground granulated blast-furnace slag	1 ton	0*	0	0
TOTAL	1 ton	0	0	0

* The input material granulated blast-furnace slag is pre-consumer material and defined as a co-product

The mass and the content of distribution and/or consumer packaging:
The product is not packed.

Information on the environmental and hazardous/toxic properties of a substances contained in the product:
No substances have been declared that surpass the registration limit for substances that are included in the most recent version of the “candidate list of substances of very high concern for authorization”.

Other information on substances with hazardous and toxic properties: None

LCA INFORMATION

Declared unit: 1 ton ground granulated blast-furnace slag

Time representativeness: Foreground data cover the year 2024-2025. Background data are less than 10 years old.

Geographical scope:
Foreground data cover the actual production location in Vietnam. The processes included in the background datasets are well representative for the geography covered (regional, rest-of-world or global).

Database(s) and LCA software used: Ecoinvent 3.11 / Simapro 10.2

Method: The LCIA is carried out according to EN 15804:2012+A2:2019/AC:2021 and EF3.1.

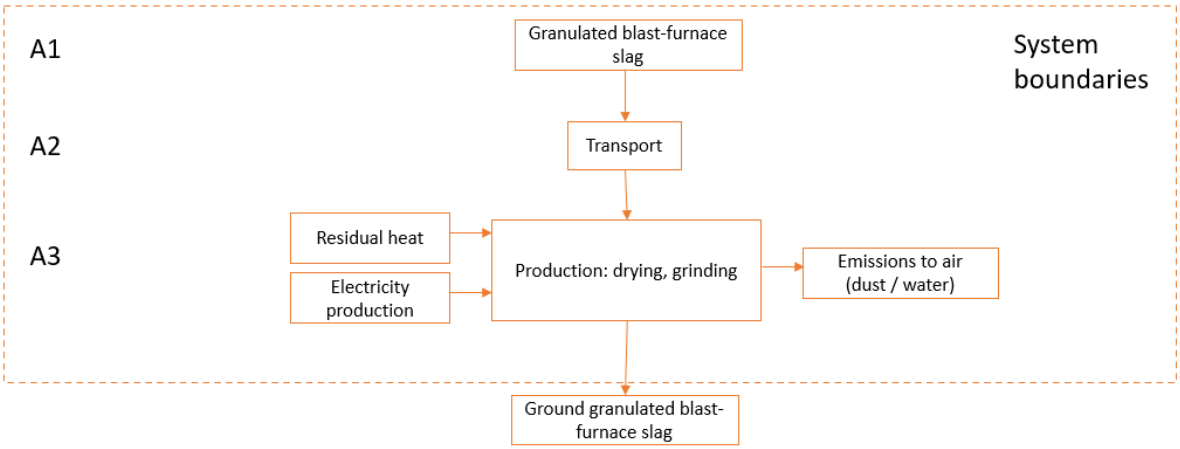
Description of system boundaries:
d) cradle-to-gate (A1-A3)

Modules A4, A5, B, C, and D are excluded.
The product is an intermediate product with many different uses. It is therefore not possible to provide information on Modules A4, A5, B, C and D in the life cycle. The product fulfils the requirement for a cradle-to-gate LCA:

- the product or material is physically integrated with other products during installation so they cannot be physically separated from them at end of life,

- 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;
- the EPD is not intended to be used for business-to-consumer communication.

Process flow diagram:



Granulated blast-furnace slag (moisture content 50kg/t) is fed from the warehouse through the Feeding Hopper system, conveyor belt to a silo, from which it is drawn down to the weight feeder according to the grinding order through the pre-grinding feeding system (conveyor belt, bucket elevator, pre-grinding conveyor belt) and fed into the grinding machine system. Internal waste heat (free of burden) recovered from the cooling system of the clinker kiln is utilized helping to dry the slag, In the grinding tray, the slag is finely ground to the required particle size through a high efficiency separator, The bag filter system and pneumatic chute discharge into the bulk truck, which transports the ground granulated blast furnace slag to a silo for storage

Data quality:
Data quality is assessed according to EN 15804+A2 Annex A Table E.2 Data quality level and criteria from the Product Environmental Footprint Category Rules, and EN 15941:2024, covering the geographical, technical, and temporal representativeness of the data, and accounting for the precision, completeness, consistency, and sources of the data, and classifying the assessed data as primary data, representative secondary data, and proxy data.

The collected foreground data cover the year 2024-2025.
EPDs of suppliers are not used.

For the background data unit processes, the data quality of ecoinvent 3.11 applies.

Data quality of processes that contribute to >10% of the GWP-GHG results for modules A1-A3 are electricity use and production of granulated blast-furnace slag.
For electricity use in A3, a proxy of the Vietnamese residual grid mix is constructed (see below), lacking these data in ecoinvent. The technical representativeness of this data is assessed as 'fair'. Different proxies may be applicable. Geographical and time representativeness are assessed as 'very good' and 'good'.

Primary data

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.
The total share of primary data contributing to the declared GWP-GHG results of modules A1-A3 is 69%.

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Manufacturing of product (A3)	Collected data	EPD owner	2024-2025	Primary data	0%
Generation of electricity used in manufacturing of product (A3)	Database	Ecoinvent 3.11	2024-2025	Primary data	67%
Transport of ingredients to manufacturing site (A2)	Database + Collected data	Ecoinvent 3.11	2024-2025	Primary data	1.6%
Total share of primary data, of GWP-GHG results for A1-A3					69%

Electricity

Climate impact of electricity as kg CO_2-eq./kWh (using the GWP-GHG indicator) used in manufacturing process: 1.09 CO_2-eq/kWh for adapted Vietnamese grid mix low voltage residual mix. Solar, hydro, biomass and wind energy are removed from the market mix in ecoinvent.
Note that this is a proxy, with fair data quality for technical representativeness.

Cut-off criteria

1% of renewable and non-renewable primary energy usage and 1 % of the total mass input of unit process; total of neglected input flows per module maximum of 5 % of energy usage and mass:

- Materials contributing <1% have been omitted.
- No auxiliary materials for production have been identified, but some very minor flows may have been omitted.
- Personnel-related impacts, use of offices etc. are excluded.

Allocations

No allocations are applied for the data used in A3, since it is a specific process and equipment. Internal waste heat (recovered from another kiln's cooling system) is used for drying incoming slag. This heat is allocated as free of burden. The drying process utilizes residual heat from kiln flue gases. This heat is recovered from another kiln's cooling system, and its associated environmental burdens are already accounted for within that process. As no additional energy is generated specifically for slag drying, assigning zero burden to this heat is consistent and avoids double counting.

The incoming granulated blast furnace slag for the ground granulated blast-furnace slag is a co-product of steel production. However, the economic value is very low compared to the main products (<1%). As a conservative approach, 1% of the production of pig iron is allocated to the incoming slag.
Note that this seems to be a methodological discussion which is handled differently in different standards and EPD-programs.

Modules declared, geographical scope, share of primary data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Distribution/ installation stage		Use stage							End-of-life stage				Beyond product life cycle
	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
Geography	Global	VN	VN														
Share of primary data	69%																

ENVIRONMENTAL PERFORMANCE

LCA results of the product - main environmental performance results

1 ton ground granulated blast-furnace slag

NOTE: Comma notation.

Mandatory impact category indicators according to EN 15804

Results per declared unit (t)		
Indicator	**Unit**	**A1-A3**
GWP-total	kg CO_2 eq.	5,93E+01
GWP-fossil	kg CO_2 eq.	5,93E+01
GWP-biogenic	kg CO_2 eq.	8,45E-03
GWP-luluc	kg CO_2 eq.	8,05E-03
ODP	kg CFC 11 eq.	2,21E-07
AP	mol H^+ eq.	4,47E-01
EP-freshwater	kg P eq.	3,08E-03
EP-marine	kg N eq.	6,42E-02
EP-terrestrial	mol N eq.	7,25E-01
POCP	kg NMVOC eq.	2,16E-01
ADP-minerals&metals*	kg Sb eq.	1,40E-04
ADP-fossil*	MJ	6,13E+02
WDP*	m^3	3,65E+00
Acronyms	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 Exceedance; 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 Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption	

** Disclaimer: 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.*

" The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks."

Additional mandatory and voluntary impact category indicators

Results per declared unit (t)		
Indicator	**Unit**	**A1-A3**
GWP-GHG*	kg CO_2 eq.	5,93E+01
PM	Disease incidence	2,42E-06
IRP**	kBq U235 eq.	1,06E-01
ETP-fw***	CTUe	1,36E+02
HTP-c***	CTUh	2,75E-08
HTP-nc***	CTUh	3,23E-07
SQP***	dimensionless	1,12E+02

** This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.*
*** 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: 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.*

Additional voluntary indicators from EN 15804

ACRONYMS: PM = particulate matter emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity – freshwater, HTP-c = Human toxicity, cancer effect, HTP-nc = Human toxicity, non-cancer effects, SQP = Land use related impacts/Soil quality (SQP)

Resource use indicators

Results per declared unit (t)		
Indicator	**Unit**	**A1-A3**
PERE	MJ	9,64E+00
PERM	MJ	0,00E+00
PERT	MJ	9,64E+00
PENRE	MJ	6,13E+02
PENRM	MJ	0,00E+00
PENRT	MJ	6,13E+02
SM	kg	0,00E+00
RSF	MJ	0,00E+00

NRSF	MJ	0,00E+00
FW	m^3	1,04E-01
Explanation	To separate the use of primary energy into energy used as raw material and energy used as energy carrier, option A from Annex 3 of PCR 2019:14 2.0.1 annex 3 has been applied	
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water	

Waste indicators

Results per declared unit (t)		
Indicator	**Unit**	**A1-A3**
Hazardous waste disposed	kg	3,27E-03
Non-hazardous waste disposed	kg	1,73E+00
Radioactive waste disposed	kg	6,04E-05

Output flow indicators

Results per declared unit (t)		
Indicator	**Unit**	**A1-A3**
Components for re-use	kg	0,00E+00
Material for recycling	kg	0,00E+00
Materials for energy recovery	kg	0,00E+00
Exported energy, electricity	MJ	0,00E+00
Exported energy, thermal	MJ	0,00E+00

ABBREVIATIONS

Abbreviation	Definition
General Abbreviations	
ASTM	American Society for Testing and Materials
CEN	European Committee for Standardization
CPC	Central product classification
EN	European Norm (Standard)
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
ND	Not Declared
PCR	Product Category Rules
SEA	Southeast Asia
SVHC	Substances of Very High Concern
VN	Vietnam

REFERENCES

a) PCR 2019:14. Construction products (EN 15804+A2). Version 2.0.1.
b) EPD International, 2024a. General Programme Instructions for the International EPD System. Version 5.0.1, dated 2024-06-19. Available on www.environdec.com.
c) EN 15804:2012+A2:2019/AC:2021, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
d) EN 15941:2024, Sustainability of construction works – Data quality for environmental assessment of products and construction work – Selection and use of data.
e) ECO Platform, 2024. ECO Platform standards, versions published 2024-12-20.108 Available on https://www.eco-platform.org/our-relevant-documents.html, accessed December 2024.
f) ISO, 2006b. ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework.
g) ISO, 2020. ISO 14044: 2006/Amd 2:2020, Environmental management – Life cycle assessment – Requirements and guidelines.

VERSION HISTORY

Original Version of the EPD, 2026-05-04

CONTACT INFORMATION

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