DAPHABITAT SYSTEM ENVIRONMENTAL PRODUCT DECLARATION

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[ACCORDING TO ISO 14025, EN 15804:2012+A2:2019 AND EN 15942]

Declaration number: DAP 005:2024

VERDI ZERO CONCRETE – LEIRIA PLANT

ISSUE DATE: 2025-02-10 **VALID UNTIL: 2029-05-30**

SECIL BETÃO S.A. .

Cluster Habitat Sustentável

Version 1.4.1 Ed. March 2024

INDEX

1. GENERAL INFORMATION

1.1. The DAPHAbitat System

Program operator:	Platform for Sustainable Construction Association www.centrohabitat.net centrohabitat@centrohabitat.net
Address:	Departamento Engenharia Civil Universidade de Aveiro 3810-193 Aveiro
Email address:	deptecnico@centrohabitat.net
Telephone number:	(+351) 234 401576
Website:	www.daphabitat.pt
Logo	

1.2. EPD owner

Name of the owner:	SECIL Betão, S.A.
Production site:	Rua da Sismaria, 16, Zona Industrial 2415-809 Marrazes
Address (head office):	Av. Eng. Duarte Pacheco 19 - 7º 1070-100 Lisboa
Telephone:	(+351) 217 927 100
E-mail:	apoiotecnico@secil.pt
Website:	www.secil.pt
Logo:	
Information concerning the applicable management Systems:	NP EN ISO 9001 - Quality Management System
Specific aspects regarding the production:	CAE (economic activity code) 23630 - Manufacture of ready-mixed concrete
Organization's environmental policy:	Commitments made by SECIL as part of its Environmental Responsibility and Protection policy: • To ensure a responsible performance standard that makes using natural resources compatible with the maintenance and development of the ecosystems in which the company operates. • To mitigate the impacts of its actions, through adopting the best technologies and best practices available and the appropriate training of its employees. • To promote biodiversity in the territories under its management. To reduce the carbon impact of its activity, including by promoting the use of secondary raw materials and alternative fuels. • To provide the public with regular data on its environmental performance.

1.3. Information concerning the EPD

Authors:	Paula Quinteiro Secil – Companhia Geral de Cal e Cimento, S.A.
Contact of the authors:	Address: Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal Telephone: 234 370 200 E-mail: p.sofia@ua.pt Address: Av. Eng. Duarte Pacheco 19-7º, 1070-100 Lisboa, Portugal E-mail: info.pssg@secil.pt
Issue date:	31/05/2024
Registration date:	24/06/2024
Revision date:	10/02/2025
Registration number:	DAP 005:2024
Valid until:	30/05/2029
Representativity of the EPD (location, manufacturer, group of manufacturers):	EPD for the Verdi concrete family, produced in one (1) industrial unit, belonging to one (1) single producer (Secil Betão S.A.)
Where to consult explanatory material:	www.secil.pt
Type of EPD:	EPD from cradle-to-gate (A1-A3) with modules C and D

1.4. Demonstration of the verification

External independent verification, accordingly, with the standard ISO 14025:2010 and EN 15804:2012+A2:2019	
Certification Body	Verifier (s)
(CERTIF – Associação para a Certificação)	(Marisa Almeida | José Dinis Silvestre)

1.5. EPD Registration

Programme operator
(Plataforma para a Construção Sustentável)

1.6. PCR (product category rules) basic model

Name:	PCR: Basic module for construction products and services
Issue date:	Edition June 2024
Number of registration on the database:	RCP-mb001
Version:	Version 3.0
Identification and contact of the coordinator (s):	Marisa Almeida | marisa@ctcv.pt Luís Arroja | arroja@ua.pt José Dinis Silvestre | jose.silvestre@ist.utl.pt
Identification and contact of the authors:	Marisa Almeida | marisa@ctcv.pt Luís Arroja | arroja@ua.pt José Silvestre | jds@civil.ist.utl.pt Fausto Freire Cristina Rocha Ana Paula Duarte Ana Cláudia Dias Helena Gervásio Victor Ferreira Ricardo Mateus António Baio Dias
Composition of the Sectorial Panel:	-
Consultation period:	18/11/2015 - 18/01/2016
Valid until:	01/06/2027

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

1.7. Relevant c-PCR (Complementary product category rules)

Name:	EN 16757 -Sustainability of construction works – Environmental product declarations – Product Category Rules for concrete and concrete elements
Issue date:	October 2022
Number of registration on the database:	EN 16757
Version:	EN 16757, October 2022
Identification and contact of the coordinator (s):	European Committee for Standardisation (CEN)
Identification and contact of the authors:	(…)
Composition of the Sectorial Panel:	(…)
Consultation period:	(…)
Valid until:	(…)

1.8. Information concerning the product/product class

Identification of the product:	Betão Verdi Zero
Illustration of the product:	
Brief description of the product:	Verdi Zero concrete, produced mainly from composite CEM II/B-M (V-L) 42.5R Portland cement, aggregates (gravel and sand), is a highly versatile product and can be used in any structural element in new or refurbishment work. The Verdi Zero concrete range comprises concrete of different strength, consistency, environmental exposure and chloride classes as set out in NP EN 206:2013+A2:2021 "Concrete - Specification, performance, production and conformity". Verdi Zero concrete does not contain any substance included on the Candidate List of Substances of Very High Concern (SVHC) above the limit for registration with the European Chemicals Agency, i.e. above 0.1% (m/m).
Main technical characteristics of the product:	Table 1: Categories defined for the Verdi Zero concrete family

Designation	Units	Verdi Zero concrete production	Observations
A - Standard and paving concrete from the classes: C25/30 X0 and XC2 Cl0.4 D22 S3 C30/37 XC2 Cl0.4 D22 S3 UniPiso C25/30 X0 and XC2 Cl0.4 D22 S3	%	63	▪ Standard ready-mixed concrete and paving concrete from the indicated classes
B – Standard concrete of the class: C20/25 X0 Cl0.4 D22 S3	%	5	▪ Standard ready-made concrete of the indicated class
C - Concrete for paving from the class: UniPiso C25/30 XC2 Cl 0.4 D22 S4	%	4	▪ Ready-made paving concrete from the indicated class
D - Paving concrete from classes: UniPiso C20/25 X0 Cl0.4 D12.5 and D22 S3 UniPiso C25/30 X0 and XC2 Cl0.4 D12.5 S3 UniPiso C25/30 X0 Cl0.4 D22 S4 UniPiso C25/30 XC1 Cl0.4 D22 S3 UniPiso C30/37 X0 Cl0.4 D22 S3 and S4 UniPiso C30/37 XC1 and XC2 Cl0.4 D12.5 S3 UniPiso C30/37 XC1 and XC4 Cl0.4 D22 S4 UniPiso C30/37 XC2 and XC4 Cl0.4 D12.5 S4 UniPiso C30/37 XC2 and XF1 Cl0.4 D22 S3 UniPiso C35/45 XC1 Cl0.4 D22 S4 UniPiso C35/45 XS3/XD3 Cl0.2 D12.5 and D22 S4 UniPiso C40/50 XA2 Cl0.4 D22 S4 UniPiso C40/50 XS1 Cl0.2 D22 S4 UniPiso Fibra P0,6 C25/30 X0 Cl0.4 D22 S3 UniDécor Impresso C25/30 X0 and XC2 Cl0.4 D12.5 S3	%	10	▪ Ready-made concrete for paving (UNIPISO®) + Decorative concrete for paving (UNIDÉCOR® IMPRESSO) + Ready-made concrete for paving with added fiber (UNIPISO® Fibra)
E - Standard concrete, range C12/15 to C25/30: C12/15 X0 Cl0.4 D22 S2 and S3 C16/20 X0 Cl0.4 D12.5 S2 and S3 C16/20 X0 Cl0.4 D22 S3 C20/25 X0 Cl0.4 D12.5 S3 C25/30 X0 Cl0.4 D12.5 S3 and S4 C25/30 X0 Cl0.4 D22 S2 C25/30 XC1 Cl0.4 D12.5 and D22 S3 C25/30 XC2 Cl0.4 D6.3 S5 C25/30 XC2 Cl0.4 D12.5 S3 and S4 C25/30 XC2 Cl0.4 D22 S2 C25/30 XC2 Cl0.2 D22 S3	%	9	Standard ready-made concrete up to class C25/30
F - Standard concrete, range ≥ C30/37: C30/37 X0 Cl0.4 D12.5 and D22 S3 C30/37 XC1 Cl0.2 D12.5 S4 C30/37 XC1 Cl0.4 D12.5 and D22 S3 C30/37 XC2 Cl0.4 D12.5 S3, S4 and S5 C30/37 XC3 Cl0.4 D12.5 S3 C30/37 XC3 Cl0.4 D22 S3 and S4 C30/37 XC4 Cl0.4 D22 S3	%	9	Standard ready-made concrete ≥ class C30/37 Technical specifications in Tables 2 and 3

<table>
<tr><td></td><td>
<table>
<tr><td>C30/37 XS1, XS2 and XS2/XD2 Cl0.2 D22 S3
C35/45 XC2 and XA1 Cl0.4 D22 S3
C35/45 XS3/XD3 Cl0.2 D22 S4
C35/45 XA2 Cl0.4 D22 S4
C40/50 XA2 Cl0.4 D12.5 and D22 S4
C40/50 XS1 Cl0.2 D22 S4
C50/60 XC2 Cl0.4 D12.5 S4</td><td></td><td></td><td></td></tr>
</table>
The resistance class, consistency and environmental exposure identified in Table 1 are defined in the NP EN 206:2013+A2:2021 standard.
</td></tr>
<tr><td>Description of the product's application/use:</td><td>Verdi Zero concrete can be used in:
Interior and exterior flooring
Building façades
Viaducts
Portal frames
Structural elements in view
Street furniture
Churches, museums and other monuments
Decorative pieces
Repair and reinforcement of structures or to retain walls, slopes and tunnels, among others.</td></tr>
<tr><td>Placing on the market / Rules of application in the market / Technical rules of the product:</td><td>NP EN 206:2013+A2:2021 "Concrete –Specification, performance, production and conformity"
LNEC E 464 Specification</td></tr>
<tr><td>Quality control:</td><td>As per the product's technical standards.</td></tr>
<tr><td>Special delivery conditions:</td><td>The concrete on order will be delivered to the site indicated by the Client, who must ensure that it is ready and in a condition to receive it.
Before the concrete is unloaded, the client or its representative must check the delivery note to ensure that the concrete corresponds to the type requested.
Concrete is transported in full loads, with a minimum of 6m^3, using concrete mixer vehicles with different capacities based on the supply's needs and the fleet's availability.
It is the Client's responsibility to guarantee suitable access for concrete mixers and pumps on their construction sites, and Secil Betão will not be held liable for any material or bodily damage caused by the manoeuvring of its vehicles if these conditions are not provided.
Should the police be necessary to be present during the concreting or pumping operation, it is the Client's responsibility to ensure their presence. Without this, Secil Betão will not proceed to lay the concrete and may charge the Client for the inherent costs.</td></tr>
<tr><td>Components and substances to declare:</td><td>Table 4: Verdi Zero concrete chemical components and substances.
 
<table>
<tr><td colspan="2">HAZARD</td></tr>
<tr><td>Contains:</td><td>Portland Cement</td></tr>
<tr><td>H319</td><td>Causes eye irritation; Hazard category 2</td></tr>
<tr><td>H315</td><td>Causes skin irritation; Hazard category 2</td></tr>
<tr><td>H318</td><td>Causes serious eye damage; Hazard category 1</td></tr>
<tr><td>H317</td><td>May cause an allergic skin reaction; Hazard category 1</td></tr>
<tr><td>P264+P280</td><td>Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection</td></tr>
<tr><td>P261+P272+P280</td><td>Contaminated clothing should not be taken outside the workplace. Wear protective gloves/protective clothing/eye protection/face protection</td></tr>
<tr><td>P280</td><td>Wear protective gloves/protective clothing/eye protection/face protection</td></tr>
</table>
Other Hazards:
Direct contact of fresh concrete with the skin and eyes can irritate. The humidity, alkalinity and abrasiveness of concrete can lead to irritating dermatitis. Allergic contact dermatitis may occur due to greater or lesser sensitivity to the chromium compounds found in cement. Inhaling breathable dust containing free crystalline silica from mechanical surface treatments on concrete and mortar in</td></tr>
</table>

	the hardened state can lead to respiratory problems.
Where explanatory material may be obtained:	The production of Verdi Zero concrete requires the composite CEM II/B-M (V-L) 42.5R Portland cement and aggregates (gravel and sand) as its main raw materials. The gravel and sand come from external quarries. The composite CEM II/B-M (V-L) 42.5R Portland cement comes from SECIL's Maceira-Liz plant, using clinker, gypsum, limestone filler and limestone as raw materials. The limestone comes from quarries. Mining is carried out above ground, on plateaus, starting at the highest level. The plaster comes from external production. As provided for in NP EN 206:2013+A2:2021, Verdi Zero concrete can be supplied in different classes of strength, consistency, and environmental exposure. For more information, please visit https://www.secil.pt/
History of the LCA studies:	-

1.9. Calculation rules of the LCA

Functional unit:	Not applicable
Declared unit:	1 m^3 of Verdi Zero concrete
System boundaries:	The system assessed includes modules A1-A3 (product stage), C (end-of-life stage) and D (environmental benefits and burdens beyond the system boundary). A more detailed description of the system boundary is given in Section 2.1
Criteria for the exclusion:	In carrying out the LCA, the processes of extraction and processing of natural raw materials were considered - sands and gravels, production of auxiliary materials and composite CEM II/B-M (V-L) 42.5R Portland cement, water and energy consumed in the manufacture of Verdi Zero concrete for which inventory data is available. Furthermore, solid waste management processes generated in the system (until the end of waste status is reached) for which inventory data is available were considered. The lubricant mass used in the maintenance of 'moving parts' was excluded from the system boundary, which individually corresponds to a mass of less than 1% of the total mass of the inputs of each information module. It is, therefore, covered by the exclusion criteria defined in EN 16908:2017+A1 - Cement and building lime - Environmental product declarations - Product category rules, namely its mass is less than 1% of the total mass of the inputs and does not exceed 5% of the total mass of the inputs of each information module. In the LCA of Verdi Zero concrete, it should be noted that the administrative areas' energy and water consumption, as well as the production of wastewater and waste from these areas, were not included. In addition, environmental loads associated with the construction and maintenance of infrastructure and equipment (capital goods) were excluded.
Assumption and limitations	The results of environmental impacts and other indicators presented in this DAP refer to the period between June 2022 and May 2023.
Quality and other characteristics about the information used in the LCA:	The quality of the inventory data was assessed taking into account the criteria of the PEF (Product Environmental Footprint) category rules (Section 5.6 of the guide, Menfredi et al., 2012), as indicated in Table E.2 (Data quality and criteria from the Product Environmental Footprint Category Rules) of EN 15804:2012+A2:2019+AC and in the guide to the software used, the GCCA EPD Tool for Cement and Concrete (V 4.0), and based on the recommendations of the PCR documents - Base Model. The data quality was broadly classified between reasonable and good on a 5-level qualitative scale from very bad to very good, in line with the data quality requirements - temporal, geographical and technological. The information on the production of Portland Clinker is less than 5 years old, mostly using primary data collected directly from SECIL Betão - Leiria Plant. For operations associated with the manufacturing process of the Verdi Zero concrete family, real and specific data from the production unit were used. The information for background processes not provided by SECIL and over which SECIL has no influence was obtained from generic data in the Ecoinvent database v3.5. These were selected to provide geographical and technological coverage that fulfils the data quality criteria stipulated in Annex E of EN 15804:2012+A2:2019. Electricity production was modelled in the GCCA considering the mix of energy sources for the electricity consumed at Secil Betão.
Allocation rules:	To determine the inputs and outputs associated only with the production of Verdi Zero concrete, firstly, the procedure of subdividing the unit process was adopted, following the recommendations of the PCR document - Base Model. Thus, only the operations associated with the production of the product being analysed were considered, and operations exclusive to other products were excluded. Following this, for some of the

	operations included energy consumption, diesel consumption for internal transport, and waste generation, an allocation procedure was applied based on the volume of concrete produced. In the case of the recovery of waste generated (concrete sludge), the "Cut-off" approach was adopted, which is compatible with EN 16757:2022 and the PCR document - Base Model.
Software used for the assessment:	GCCA EPD Tool for Cement and Concrete (V 4.0), International version
Background database used for the LCA:	Ecoinvent database version 3.5 published in December 2018; cut-off approach. Data from the European Federation of Concrete Admixtures Association and, available in the GCCA EPD Tool for Cement and Concrete (V 4.0) software, International version. Global Cement and Concrete Association (GCCA). Quantis, Switzerland.
Variability of the results of LCA:	The main factor affecting the variability of LCIA results will be the content of composite Portland cement CEM II/B-M (V-L) 42.5R used, which can vary from 10% (for current Verdi Zero concrete, single composition) to 15% (for current Verdi Zero concrete, range ≥ C30/37). The percentages indicated refer to the final volume of the product. As this is a constituent with a significant environmental impact, mainly associated with the clinker production activity (constituent of the composite CEM II/B-M (V-L) 42.5R) Portland cement, the cement content could affect the variability of the LCIA results. Other parameters, such as the use of adjuvants - plasticisers and superplasticisers and fibres, can also affect the results of the LCIA.
Comparability of EPD for construction products:	EPD for construction products and services may not be comparable if they are not produced in accordance with EN 15804 and EN 15942 and with the comparability conditions determined by ISO 14025.

1.10. Use of average environmental performance

This average EPD reflects the average environmental performance of the entire Verdi Zero concrete range produced by Secil Betão from June 2022 to May 2023. Environmental performance variability between specific products is not relevant.

1.11. Technical information for Reference Service Life (RSL)

Since the LCA study does not include the utilisation stage, specifying the reference useful life is irrelevant.

1.12. Flow diagram of input and output of the processes

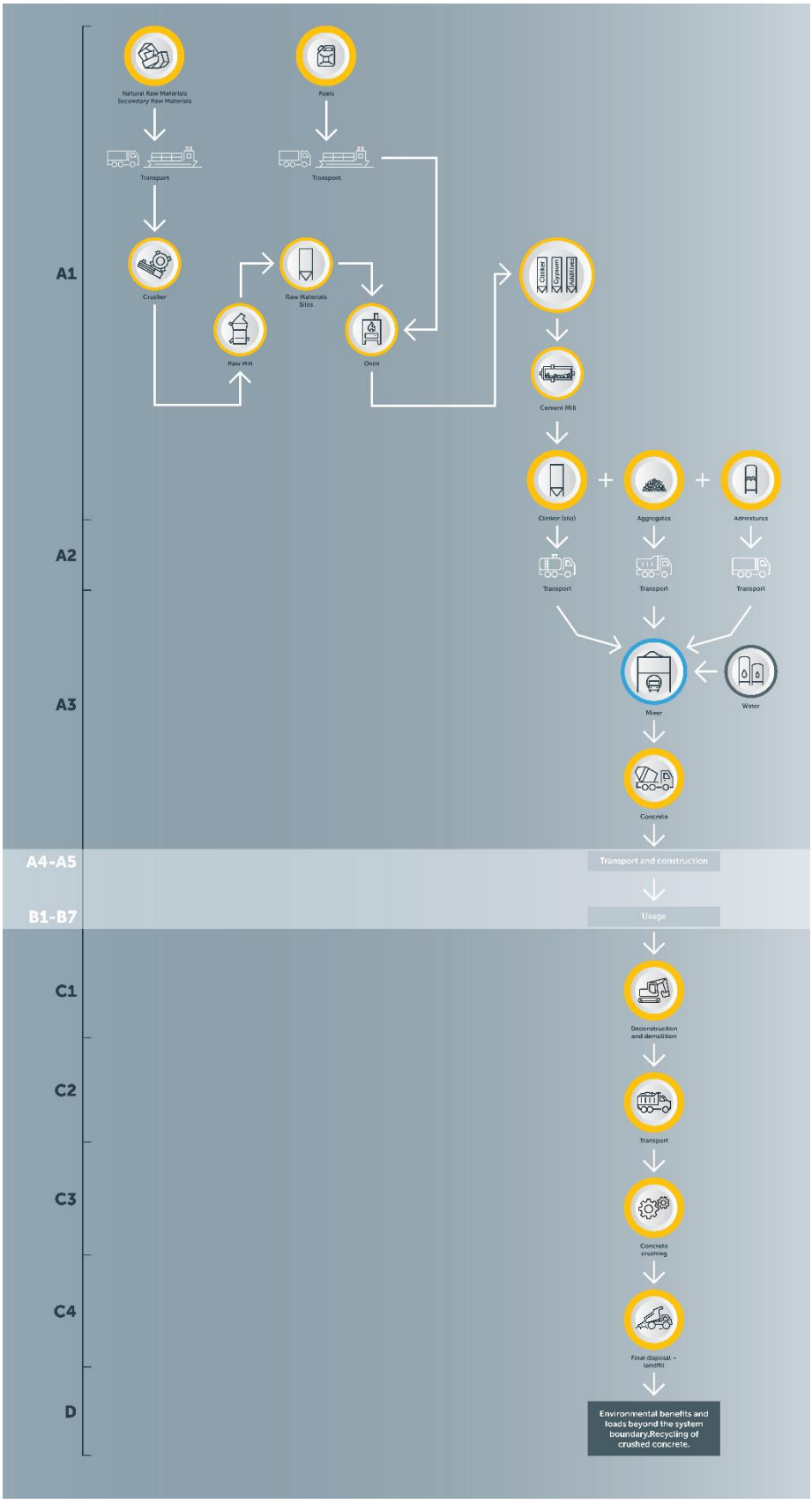

Figure 1: Flowchart of the Verdi Zero concrete manufacturing process.

2. CORE ENVIRONMENTAL IMPACT INDICATORS

2.1. Description of the system boundaries

(✓= included; ND = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-constructions, demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	ND	ND	ND	ND	ND	ND	ND	ND	ND	✓	✓	✓	✓	✓

The A1-A3 module (production stage) of Verdi Zero concrete includes extracting and processing primary (natural) raw materials, transporting raw materials, additives, fuels and electricity to the concrete plant.

The production of Verdi Zero concrete at Secil Betão requires as its main raw materials the composite CEM II/B-M (V-L) 42.5R Portland cement, coarse and fine aggregates (gravel and sand) and water, with or without the incorporation of adjuvants and fibres. The gravel and sand come from quarries. The composite CEM II/B-M (V-L) 42.5R Portland cement comes mainly from SECIL at the Maceira-Liz plant, using clinker, gypsum, limestone filler and limestone as raw materials. After reception, the aggregates are stored in bays or directly in the direct unloading hopper, with the material being handled by wheel loaders when the material is unloaded into the bays. The material is transported to the hopper by wheel loader, being carried by a conveyor screen to the storage/waiting hoppers (gravel and sand).

The coarse and fine aggregates are weighed on a scale and transported by a conveyor screen to the mixer. The composite CEM II/B-M (V-L) 42.5R Portland cement, stored in silos, is transported via augers to a scale and then unloaded into the mixer (unloaded by gravity). The adjuvants are added to the mixture, transported to the scales and then unloaded by gravity into the mixer. In the mixer, the concrete is kneaded, where, in addition to the cement, aggregates, adjuvants and moisture present in the aggregates, there is also added clean water (from its own borehole and decanted rainwater) and recycling water (water from washing the trucks + water from washing the drum in which the concrete is transported).

After the kneading process, the fresh Verdi Zero concrete is unloaded from the mixer and put into the trucks. During the production of Verdi Zero concrete, diesel is used to move the aggregates at Secil Betão internally. This diesel comes from a diesel refuelling station at the plant. The treated liquid effluent from the hydrocarbon separator, i.e. recovered oily water, is then used in the concrete manufacturing process. This water fulfils the

requirements of NP EN 1008:2003 - Kneading water for concrete: specifications for sampling, testing and assessing the suitability of water, including reclaimed water from concrete industry processes, for manufacturing concrete.

The transport and treatment of waste resulting from the Verdi Zero concrete production process, such as concrete sludge and water containing oil from the oil/water separators, have been considered.

In module C (end-of-life stage) the following modules were considered:

C1 - includes concrete deconstruction or demolition activities;

C2 - includes the transport of concrete from the deconstruction or demolition site to the final destination, which consists of recycling and landfill, considering an average distance of 50 km; According to the GCCA model, a mix of means of transport is considered: 63% of the material is transported by Euro 6 truck; 37% of the material is transported by freight train.

C3 - includes the activities that precede recycling, namely the sorting and crushing of concrete waste;

C4 - corresponds to the final disposal of concrete waste; according to statistical data on CDW (construction and demolition waste) from the Portuguese Environment Agency (APA), 32% of concrete waste is recycled and the remaining 68% goes to landfill. Therefore, the impacts associated with recycling are null, while the impact associated with landfill has been considered.

In module D, the environmental benefits and burdens associated with reusing end-of-life crushed concrete in road construction according to EN 16757:2022 were considered, thus avoiding the processing and use of natural aggregate, i.e. gravel, in the said construction.

2.1.1. Justification for the exemption to declare modules C1, C2, C3, C4 and D

Not applicable

2.2. Core environmental impact indicators

	Global warming potential total; GWP-total	Global warming potential fossil; GWP-fossil	Global warming potential biogenic; GWP-biogenic	Global warming potential land use and land use change; GWP-luluc	Depletion potential of the stratospheric ozone layer; ODP	Acidification potential; AP
Units	kg CO_2 eq.	kg CO_2 eq.	kg CO_2 eq.	kg CO_2 eq.	kg CFC 11 eq.	mol H^+ eq.
Module A1-A3	2.02E+02	2.02E+02	5.08E-02	3.01E-02	7.38E-06	5.79E-01
Module C1	8.99E+00	8.99E+00	1.60E-03	1.11E-03	1.62E-06	9.42E-02
Module C2	8.92E+00	8.91E+00	6.53E-03	5.31E-03	1.54E-06	4.16E-02
Module C3	1.70E+00	1.69E+00	8.01E-03	6.10E-03	1.54E-07	1.63E-02
Module C4	-8.02E+00	-8.03E+00	5.90E-03	4.78E-03	2.90E-06	8.54E-02
Module D	-5.85E+00	-5.82E+00	-2.35E-02	-1.02E-02	-3.98E-07	-4.13E-02

LEGEND:

Product stage

End - of - life stage

Benefits and loads beyond the system boundary

Units expressed per declared unit (1 m^3 Verdi Zero concrete).

	Eutrophication potential aquatic freshwater; EP-freshwater	Eutrophication potential aquatic marine; EP-marine	Eutrophication potential terrestrial; EP-terrestrial	Formation potential of tropospheric ozone; POCP	Abiotic depletion potential for non-fossil resources ADP-minerals&metals	Abiotic depletion potential for fossil resources potential; ADP-fossil	Water (user) deprivation potential; WDP
Units	kg P eq.	kg N eq.	mol N eq.	Kg COVNM eq.	kg Sb eq.	MJ, P.C.I	m^3 eq. de água globalmente indisponível
Modules A1-A3	1.05E-02	7.92E-04	1.84E+00	4,36E-01	2.51E-04	1.04E+03	1.67E+01
Module C1	4.02E-04	3.34E-05	4.44E-01	1.22E-01	2.66E-06	1.30E+02	7.67E-01
Module C2	1.22E-03	9.04E-05	1.16E-01	3.84E-02	1.61E-05	1.25E+02	1.18E+00
Module C3	1.27E-03	8.81E-05	3.06E-02	8.61E-03	1.90E-06	2.66E+01	4.45E-01
Module C4	1.04E-03	9.98E-05	3.06E-01	8.99E-02	9.72E-06	4.60E+02	1.20E+01
Module D	-2.44E-03	-1.58E-04	-1.03E-01	-1.98E-02	-6.66E-05	-2.56E+02	-1.13E+01

LEGEND:

Product stage

End - of - life stage

Benefits and loads beyond the system boundary

Units expressed per declared unit (1 m^3 Verdi Zero concrete).

The results obtained for the indicators "Non-fossil Abiotic Depletion Potential (ADP-minerals&metals)", "Fossil Abiotic Depletion Potential (ADP-fossil)" and "Water Deprivation Potential (user) (WDP)" should be used with caution as the uncertainties associated with them are high or there is little experience with the indicator.

2.3. Additional environmental impact indicators

	Potential incidence of disease due to PM emissions PM	Potential Human exposure efficiency relative to U235 IRP	Potential Comparative Toxic Unit for ecosystems ETP-fw	Potential Comparative Toxic Unit for humans, cancer effects HTP-c	Potential Comparative Toxic Unit for humans, not cancer effects HTP-nc	Potential soil quality index SQP
Units	Disease incidence	kBq U 235 eq.	CTUe	CTUh	CTUh	-
Module A1-A3	1.10E-05	2.70E+03	4.90E+01	9.32E-07	1.30E-05	7.72E+02
Module C1	2.45E-06	6.08E-01	1.76E+00	6.36E-08	2.46E-07	7.71E+00
Module C2	7.96E-07	7.82E-01	2.43E+01	1.03E-07	1.43E-06	2.22E+02
Module C3	1.47E-07	3.40E-01	6.66E-01	2.64E-08	1.21E-07	6.95E+01
Module C4	1.59E-06	1.14E+00	4.86E+00	7.88E-08	5.03E-07	4.62E+02
Module D	-4.85E-07	-5.47E-01	-2.83E+00	-1.39E-07	-8.31E-07	-8.77E+01

LEGEND:

Product stage

End - of - life stage

Benefits and loads beyond the system boundary

Units expressed per declared unit (1 m^3 Verdi Zero concrete).

The impact indicator “Potential Human Exposure Efficiency in relation to U235 (IRP)” focuses mainly on the possible impact of a low dose of ionising radiation on human health resulting from the nuclear fuel cycle. It does not consider effects resulting from possible nuclear accidents, occupational exposure or the disposal of radioactive waste in underground installations. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

The results obtained for the indicators "Potential Comparative Toxic Unit for Ecosystems (ETP-fw)", “Potential Comparative Human Toxicity Unit, Carcinogenic (HTP-c)", “Potential Comparative Human Toxicity Unit, Non-Carcinogenic (HTP-nc)" and "Soil Quality Potential Index (SQP)" should be used with caution as the uncertainties associated with them are high or there is little experience with the indicator.

2.4. Indicators describing resource use

	Primary energy					
	EPR	RR	TRR	EPNR	RNR	TRNR
Units	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.
Module A1-A3	8.07E+01	0.00E+00	8.07E+01	1.04E+03	2.02E+00	1.04E+03
Module C1	7.59E-01	0.00E+00	7.59E-01	1.30E+02	0.00E+00	1.30E+02
Module C2	3.42E+00	0.00E+00	3.42E+00	1.25E+02	0.00E+00	1.25E+02
Module C3	3.47E+00	0.00E+00	3.47E+00	8.27E+01	0.00E+00	8.27E+01
Module C4	6.44E+00	0.00E+00	6.44E+00	2.28E+02	0.00E+00	2.28E+02
Module D	-5.49E+00	0.00E+00	-5.49E+00	-2.56E+02	0.00E+00	-2.56E+02

LEGEND:

Product stage

End - of - life stage

Benefits and loads beyond the system boundary

Units expressed per declared unit (1 m^3 Verdi Zero concrete).

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials; RR = use of renewable primary energy resources used as raw materials; TRR = total use of renewable primary energy resources (EPR + RR); EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; RNR = use of non-renewable primary energy resources used as raw materials; TRNR = total use of non-renewable primary energy resources (EPRN + RNR)

	Secondary materials and fuels, and use of water			
	MS	CSR	CSNR	Net use of fresh water
Units	kg	MJ, P.C.I.	MJ, P.C.I.	m^3
Module A1-A3	6.10E+01	1.30E+02	1.73E+02	1.08E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	1.99E-02
Module C2	0.00E+00	0.00E+00	0.00E+00	3.65E-02
Module C3	0.00E+00	0.00E+00	0.00E+00	1.81E-02
Module C4	0.00E+00	0.00E+00	0.00E+00	2.80E-01
Module D	0.00E+00	0.00E+00	0.00E+00	-2.71E-01

LEGEND:

Product stage

End - of - life stage

Benefits and loads beyond the system boundary

Units expressed per declared unit (1 m^3 Verdi Zero concrete).

SM = use of secondary material; RSF= use of renewable secondary fuels; NRSF = use of non-renewable secondary fuels; Fresh water = use of the net value of fresh water.

2.5. Other environmental information describing different waste categories

	Hazardous waste disposed	Non-hazardous waste disposed	Radioactive waste disposed
Units	kg	kg	kg
Module A1-A3	1.12E-01	3.50E-03	0.00+00
Module C1	0.00E+00	0.00E+00	0.00E+00
Module C2	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	0.00E+00	0.00E+00
Module C4	0.00E+00	1.50E+03	0.00E+00
Module D	0.00E+00	0.00E+00	0.00E+00

LEGEND:

Product stage

End - of - life stage

Benefits and loads beyond the system boundary

Units expressed per declared unit (1 m^3 Verdi Zero concrete).
The characteristics that make waste hazardous are described in the applicable legislation in force, for example, in the European Waste Framework Directive.

2.6. Environmental information describing output flows

	Components for re-use	Materials for recycling	Materials for energy recovery	Exported energy
Units	kg	kg	kg	MJ
Module A1-A3	0.00E+00	1.02E+01	8.04E-02	0,00E+00
Module C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module C3	0.00E+00	7.68E+02	0.00E+00	0.00E+00
Module C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Module D	0.00E+00	0.00E+00	0.00E+00	0.00E+00

LEGEND:

Product stage

End - of - life stage

Benefits and loads beyond the system boundary

Units expressed per declared unit (1 m^3 Verdi Zero concrete).

The characteristics that make waste hazardous are described in the applicable legislation in force, for example in the European Waste Framework Directive.

2.7. Information describing the biogenic carbon content at the factory gate

Biogenic carbon content*	Units **	Module A1-A3 (results)
Biogenic carbon content in the product	Kg C	Not applicable
Biogenic carbon content in accompanying packaging	Kg C	Not applicable

* 1 kg biogenic carbon is equivalent to 44/12 kg of CO2.

** This information can be omitted whenever the content of biogenic carbon in the product, or in the respective packaging, is less than 5% of the mass of the product, or the respective packaging.

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

3.1. C1 de-construction, demolition – End - of - life of the product

Parameter	Units	Results expressed per functional or declared unit
Type of equipment	-	Machines for cutting/demolition
Material collected	kg	2381.0

3.2. C2 Transport – End of life of the product

Parameter	Units/comments	Results expressed per functional or declared unit
Type of vehicle	-	Transport mix: 63% of the material is transported by Euro 6 truck; 37% of the material is transported by freight train
Distance	km	50
Container capacity	t	5.96
Bulk density of transported products	kg/m^3	2381.0

3.3. C3 Waste processing for reuse, recovery and/or recycling – End of life of the product

Parameter	Units/comments	Results expressed per functional or declared unit
Material for re-use	kg	0.00
Material for recycling	kg	767.88
Material for final disposal	kg	1613.22
Material for energy recovery	kg	0.00

3.4. C4 Disposal – End of life of the product

Parameter	Units/comments	Results expressed per functional or declared unit
Scenario	-	68% to landfill
Material for final disposal	kg	1613.22

3.5. Scenario and technical information for module D

Parameter	Units/comments	Results expressed per functional or declared unit
Scenario	-	According to EN 16757:2022, crushed concrete can substitute gravel in road construction after the demolition/deconstruction stage. It was considered that 32% of concrete waste is recovered at its end-of-life after crushing and as a substitute for gravel used in road construction, according to data statistics on CDW (Construction and demolition waste) from the Portuguese Environment Agency (APA)
Net output flow of concrete waste	kg	767.88
Avoid production of gravel	kg	767.88
Location of end-of-waste point	Not applicable	
Point of functional equivalence	-	It is considered that the quality of crushed concrete is similar to that of the gravel used in road construction

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

Not applicable.

4. REFERENCES

- ✓ GCCA (2023). GCCA Industry EPD Tool for cement and concrete (V4.0). Global Cement and Concrete Association (GCCA). Quantis, Switzerland.
- ✓ **DAPHabitat System General Instructions**, Version 3.0, June 2024 (at www.daphabitat.pt);
- ✓ **NP ISO 14025:2009** Environmental labelling and declarations - Type III environmental declarations - Principles and procedures.
- ✓ **EN 15804:2012+A2:2019+AC** Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
- ✓ EN 16757 – Sustainability of construction works – Environmental product declaration -Product Category Rules of concrete and concrete elements. Comité Européen de Normalisation.
- ✓ **EN 15942:2021** Sustainability of construction works – Environmental product declarations – Communication format business-to-business.
- ✓ Manfredi S., Allacker K., Chomkhamsri K., Pelletier N., Maia de Souza D. (2012). Product Environmental Footprint (PEF) Guide. European Commission (EC), Joint Research Centre (JRC), Ispra, Italy.
- ✓ **PCR - Base model for construction products and services.** DAPHabitat System. Version 3.0, 2024 (at www.daphabitat.pt).
- ✓ Secil (2023). Secil CO_2 Manual. Monitoring, calculating and reporting CO_2 emissions. Period 2021-2025. Version 06.