DAPHabitat System

www.daphabitat.pt

ENVIRONMENTAL PRODUCT DECLARATION

[according to ISO 14025, EN 15804:2012+A1:2013 and EN 15942]

DECLARATION NUMBER: DAP 005:2019

ISAC[1] – INERT STEEL AGGREGATES FOR CONSTRUCTION

ISSUE DATE: 2019-04-24

VALID UNTIL: 2024-10-23
(extension 6 months)

MEGASA – SIDERURGIA NACIONAL – EPL, S.A.

ISAC 0-40

ISAC 40-100

[1] **Note**: ASIC in Portuguese (Agregado Siderúrgico Inerte para a Construção)

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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Program operator:	Sustainable Construction Platform 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:	Megasa – Siderurgia Nacional – EPL, S.A.
Production site:	Maia Unit: Rua da Siderurgia, 4425-514 S. Pedro Fins, Maia, Portugal Seixal Unit: Avenida da Siderurgia Nacional, 2840-075 Aldeia de Paio Pires, Seixal, Portugal
Address (head office):	Seixal Unit: Apartado 3, 2840-996 Aldeia de Paio Pires, Seixal, Portugal
Telephone:	Maia Unit: (+351) 229 699 000 Seixal Unit: (+351) 212 278 500
E-mail:	efraguela@megasa.pt; acanelas@megasa.pt
Website:	www.megasa.com
Logo:	
Information concerning the applicable management Systems:	Both production premises have Environmental License and Management Systems implemented according to ISO 9001, ISO 14001, OHSAS 18001 and Steel Sustainability.
Specific aspects regarding the production:	Main CAE 24100 – Steelmaking and elaboration of ferro-alloys Secondary CAE 38322 – Valorisation of non-metallic wastes
Organization's environmental policy:	Megasa – Siderurgia Nacional – EPL, S.A. is aware that the activity must be performed in a way that guarantees the achievement of the highest levels of protection for the people working in the premises, the sustainability and continuous growth of the company, the highest levels of quality in products and services and the maximisation of eco-efficiency, through the continual improvement of management and performance in the fields of Health and Safety, Sustainability, Quality, Environment and Major Risk Prevention involving dangerous substances. The complete integrated policies of both Maia and Seixal units are available on the website www.megasa.com.

1.3. Information concerning the EPD

Authors:	Ana Cláudia Dias
Contact of the authors:	Address: University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal Phone number: +351 234 370 200 E-mail: acdias@ua.pt
Issue date:	2019-04-24
Registration date:	2019-07-11
Registration number:	DAP 005:2019
ECOPlatform registration number:	00000954
Valid until:	2024-10-23 (extension 6 months)
Representativity of the EPD (location, manufacturer, group of manufacturers):	EDP of one (1) product prepared in two (2) industrial units, pertaining to two (2) producers.
Where to consult explanatory material:	www.ecoasic.com
Type of EPD:	Cradle-to-Gate EDP (A1-A3)

1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:2009 and EN 15804:2012+A1:2013

Certification Body	**Verifiers**
(CERTIF – Associação para a Certificação)	(Marisa Almeida | Cristina Rocha)

1.5. EPD Registration

Program Operator
(Plataforma para a Construção Sustentável)

1.6. PCR of reference

Name:	PCR – Basic model for construction products and services
Issue date:	September 2015
Number of registration on the data base:	RCP-MB001
Version:	Version 2.0
Identification and contact of the coordinator (s):	Luís Arroja | arroja@ua.pt Marisa Almeida | marisa@ctcv.pt José Silvestre | jose.silvestre@tecnico.ulisboa.pt
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Composition of the Sectorial Panel:	-
Consultation period:	18/11/2015 - 18/01/2016
Valid until:	18/01/2021

1.7. Information concerning the product/product class

Identification of the product:

ISAC - Inert Steel Aggregates for Construction

Illustration of the product:

ISAC 0-40

ISAC 40-100

Brief description of the product:

ISAC is a product obtained after treating the slag that result from EAF (electric arc furnace) steelmaking. ISAC is sold in two particle sizes whose aggregate dimensions are 0-40 mm (ISAC 0-40) and 40-100 mm (ISAC 40-100).

Main technical characteristics of the product:

Table 1: Technical characteristics for ISAC 0-40

Designation	Value		Units
	Seixal	Maia	
Aggregate dimensions	0 - 40	0 - 40	mm
Particle size	G_A 75 GT_A 20	G_A 75 GT_A 10	
Particle shape	SI_{20}	SI_{20}	
Flakiness index	FI20	FI20	
Impermeable particle density	3.48 - 3.74	3.48 - 3.74	t/m³
Dry particle density	3.10 - 3.71	3.10 - 3.71	t/m³
Saturated particle density	3.20 - 3.72	3.20 - 3.72	t/m³
Fine particles' content	F4	F5	
Resistance to fragmentation	LA25	LA25	LA
Total sulphur	S1	S1	
Water absorption	0.9 - 3.8	0.9 - 3.8	WA_{24} %

Table 2: Technical characteristics for ISAC 40-100

Designation	Value		Units
	Seixal	Maia	
Aggregate dimensions	40 - 100	40 - 100	mm
Particle size	G_C 80-20 GT_C 25/15	G_C 80-20 GT_C 25/15	
Particle shape	SI_{20}	SI_{20}	
Flakiness index	FI20	FI20	
Impermeable particle density	3.40	3.40	t/m³
Dry particle density	3.24	3.24	t/m³
Saturated particle density	3.28	3.28	t/m³
Fine particles' content	F5	F5	
Resistance to fragmentation	LA35	LA35	LA
Total sulphur	S1	S1	
Water absorption	2	2	WA_{24} %

Description of the product's application:

- Basic layers, sub-layer, road surface and landfilling for roads;
- Landfilling layers, upper layer and sub-ballast for railway lines;
- Drainage layers;
- Accesses, machine parks and building site pavement.

Reference service life:

Unspecified (cradle-to-gate EDP).

Placing on the market / Rules of application in the market / Technical rules of the product:

ISAC is marketed in bulk and subject to CE-marking according to EN 13242 Standard – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.

Quality control:	ISAC is subject to a Certificate of Conformity for the factory production control, thus to external quality control regarding the compliance of NP EN 13242 Standard, ANNEX C.
Special delivery conditions:	In bulk.
Components and substances to declare:	N/A.
History of the LCA studies:	No LCA study identified for similar products.

2. ENVIRONMENTAL PERFORMANCE OF THE PRODUCT

2.1. Calculation rules of the LCA

Declared unit:	1 t of ISAC (0-40 or 40-100).
Functional unit:	N/A.
System boundaries:	Cradle-to-gate EDP. The raw material of ISAC is EAF slag produced during the steelmaking process. This slag is a waste and, thus, all processes upstream its valorisation are excluded from the system boundaries. During slag processing, the metallic fraction is separated and reintroduced in the steelmaking process. This is considered as a closed-cycle valorisation system of metallic fraction and, thus, this valorisation process has been excluded from the system boundaries but the transportation of metallic fraction up to the valorisation site is considered. All water consumed during ISAC production process comes from industrial purges; thus, its collection and treatment have not been considered.
Criteria for the exclusion:	The LCA considered the production processes of materials and energy consumed during ISAC production, as well as the management processes of the wastes produced, for which inventory data are available. It should be noted that the excluded processes are covered by the cut-off criteria as defined in the 'PCR – Basic Model' document, as namely their mass is inferior to 1% of the total mass of the inputs. The following processes have been excluded: • production of packaging, lead accumulators, oil filters and absorbent rags; • valorisation of oil residues from motors and lubrication, metal packaging, contaminated packaging, tyres, oil filters, lead accumulators, ferrous metals, absorbent rags and other unspecified wastes; • treatment of sludge from oil/water separators, water with oil from oil/water separators and other fractions of unspecified waste; to be underlined: the last category of waste has been considered in the parameter 'non hazardous waste disposed' indicated in section 2.4 of this EDP; • consumptions of energy and water in the administrative areas and workshops, as well as the production of wastewater and wastes proceeding from these areas; • construction and maintenance of infrastructures and equipment (capital goods). However, it is noticeable that the environmental impacts associated with the maintenance of machinery and vehicles used in ISAC production have been considered in the LCA.
Assumption and limitations:	The results of the environmental impacts and remaining indicators shown in this EDP refer to the year 2015 and constitute weighted average values based on the amount of ISAC produced by each production unit that year (57% of ISAC production happened in Seixal and 43% in Maia). ISAC production represents a process of waste valorisation, thus avoiding environmental impacts associated with final disposal of the waste. On the other hand, it contributes to reduce the consumption of virgin raw materials, and consequently, to preserve natural resources. However, avoided impacts are outside the sphere of the EDP.
Quality and other characteristics about the information used in the LCA:	In the case of processes on which the producer has influence (slag preparation and processing), real and specific data have been used, collected in both production units. The exception are emissions to air resulting from fuel-oil combustion in lorries and machines used during internal operations of transport and transference, which have been calculated with emission factors due to the lack of measured values. For the remaining processes, generic data obtained in the Ecoinvent – version 3.4 database have been used, that meet the quality criteria as defined for generic data (time-related, geographical and technological representativeness, plausibility, completeness, consistency, etc.).

Allocation rules:	ISAC 0-40 and ISAC 40-100 productions are simultaneous and their environmental impacts cannot be obtained individually. Thus, the results obtained are valid for both particle sizes, considering mass allocation.
Comparability of EPD for construction products:	The EPDs of construction products and services cannot be comparable in case they are not produced according to EN 15804 and EN 15942 and according to the comparability conditions determined by ISO 14025.

2.1.1. Flow diagram of input and output of the processes

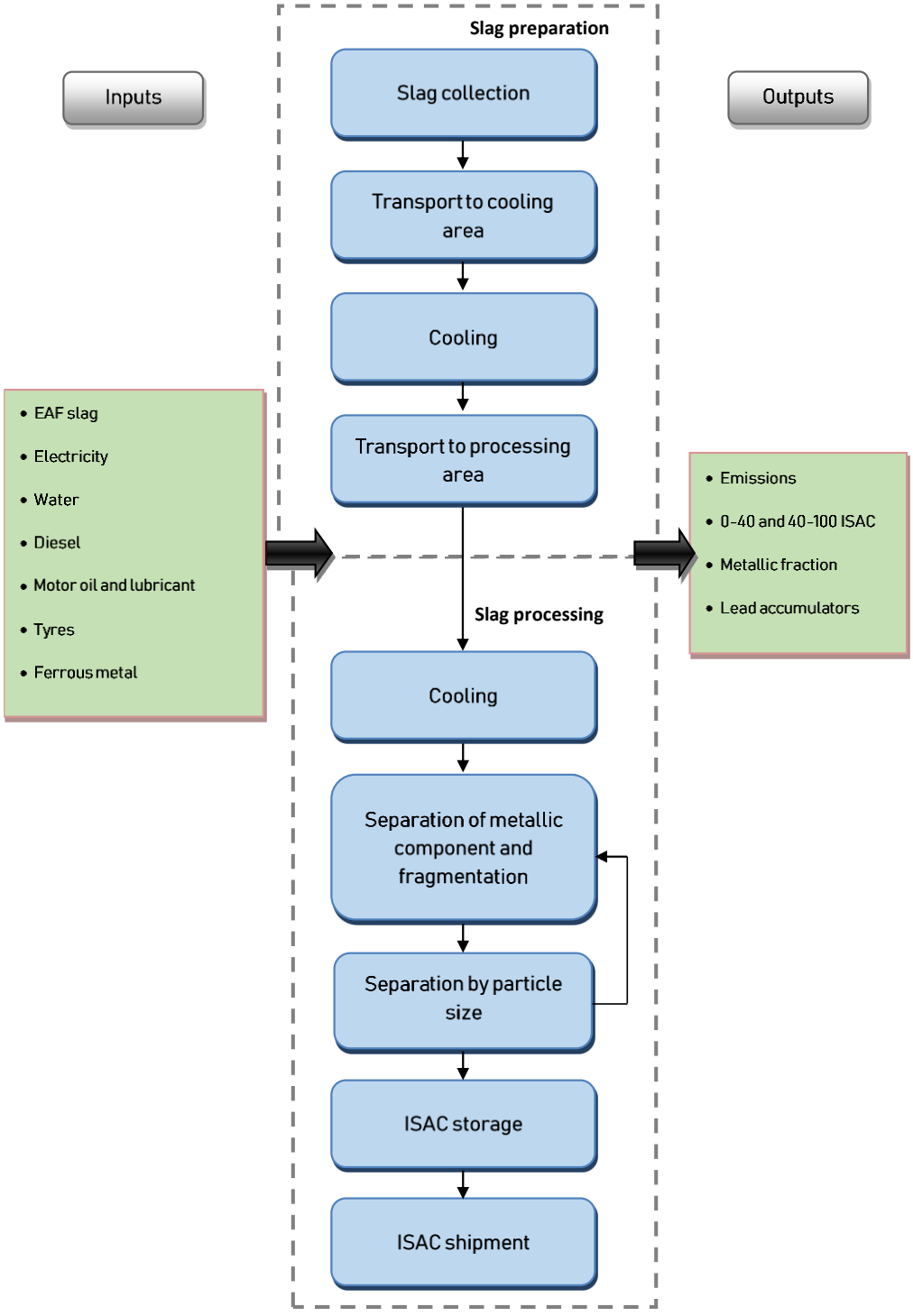

Figure 1: ISAC production stages

2.1.2. Description of the system boundaries

(✓= included; ✖= 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
✓	✓	✓	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖

ISAC production is divided into two processes, especially slag preparation and slag processing. Slag preparation starts with EAF slag collection for its solidification in the specific area so-called slag pit. Then, slag is transported to the water-cooling area, to be transported to the processing area after cooling.

During slag processing, it is cooled with water, with the further separation of metallic components and slag fragmentation. Slag is submitted to the following operations: (1) separation by sieving/calibration in particle size fractions appropriate for the different applications; (2) new mechanical fragmentation, eventually with a grinding operation for a better inclusion of fine particles and the increase of smaller particle sizes; (3) elimination of the smallest metallic chips which were not eliminated before. Then ISAC is stored outdoors. Finally, lorries are loaded for dispatch.

MEGASA

2.2. Parameters describing environmental impacts

		Global warming potential; GWP kg CO_2 equiv.	Depletion potential of the stratospheric ozone layer; ODP kg CFC 11 equiv.	Acidification potential of soil and water, AP kg SO_2 equiv.	Eutrophication potential, EP kg $(PO_4)^{3-}$ equiv.	Formation potential of tropospheric ozone, POCP kg C_2H_4 equiv.	Abiotic depletion potential for non-fossil resources kg Sb equiv.	Abiotic depletion potential for fossil resources MJ, P.C.I.
Raw material supply **Transport** **Manufacturing**	**A1-A3**	6.92	1.12E-06	4.12E-02	7.79E-03	1.41E-03	2.68E-06	104

LEGEND:

Product stage

NOTES:
P.C.I. – Net calorific value
Values expressed per declared unit (1 t of ISAC).

2.3. Parameters describing resource use

		Primary energy						Secondary materials and fuels, and use of water			
		EPR MJ, P.C.I.	RR MJ, P.C.I.	TRR MJ, P.C.I.	EPNR MJ, P.C.I.	RNR MJ, P.C.I.	TRNR MJ, P.C.I.	MS kg	CSR MJ, P.C.I.	CSNR MJ, P.C.I.	Net use of fresh water m^3
Raw material supply **Transport** **Manufacturing**	**A1-A3**	5.92	0	5.92	105	0	105	1016	0	0	0.940

LEGEND:

Product stage

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);
MS = use of secondary material;
CSR = use of renewable secondary fuels;
CSNR = use of non-renewable secondary fuels.

NOTE: Values expressed per declared unit (1 t of ISAC).

2.4. Other environmental information describing different waste categories

		Hazardous waste disposed kg	Non-hazardous waste disposed kg	Radioactive waste disposed kg
Raw material supply **Transport** **Manufacturing**	**A1-A3**	4.94E-05	4.71E-02	6.20E-04

LEGEND:

Product stage

NOTE: Values expressed per declared unit (1 t of ISAC).

2.5. Other environmental information describing output flows

Parameters	Units*	Results
Components for re-use	kg	0
Materials for recycling	kg	16.3
Radioactive waste disposed	kg	0
Materials for energy recovery	kg	0
Exported energy	MJ per energy carrier	0

* expressed per declared unit (1 t of ISAC).

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

3.1. Additional information on release of dangerous substances during the use stage

Scenario title	Parameters	Methods of analysis	Units*	Results
Water release scenario Test of lixiviation followed by the analysis of the eluate obtained, performed by the Chemical and Metallurgic Analysis Lab of the Minho University.	Arsenic	US EPA 200.8, CSN EN ISO 17294-2	g	< 0.500
	Barium			1.94
	Cadmium			< 0.0500
	Total chromium			< 0.050
	Copper			< 0.100
	Mercury			0.00016
	Molybdenum			< 0.200
	Nickel			0.428
	Lead			< 0.500
	Antimony			< 0.50
	Selenium			< 0.25
	Zinc			0.244
	Chloride	CSN EN ISO 10304-1		< 10.0
	Fluoride			7.53
	Sulphate			< 50.0
	Chemical oxygen demand	CSN EN 1484		< 5.0
	Total dissolved solids	CSN 757346		1220
	Content of phenol	CSN ISO 6439		< 0.05

* expressed per declared unit (1 t of ISAC)

These results confirm ISAC inert character since they are far below the legal limits regarding disposal at inert waste landfills (Decree-law No. 183/2009).

REFERENCES

✓ **General Instructions of the DAPHabitat System**, Version 1.0, March 2013 (www.daphabitat.pt);

✓ **PCR – basic model for construction products and services,** DAPHabitat system. Version 2.0, 2015 (www.daphabitat.pt);

✓ **ISO 14025:2009** Environmental labels and declarations – Environmental Declarations Type III – Principles and procedures;

✓ **EN 15804:2012+A1:2013** Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;

✓ **EN 15942:2011** Sustainability of construction works – Environmental product declarations – Communication format business-to-business;

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

✓ **ISO 14040:2006** Environmental management – Life cycle assessment – Principles and framework;

✓ **ISO 14040:2006** Environmental management – Life cycle assessment – Requirements and guidelines;

✓ **EMEP/EEA Air Pollutant Emission Inventory Guidebook 2016,** European Environment Agency, 2016.