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Thermo-lacquering of aluminum and steel profiles

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GODILAC II, S.A.



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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:		


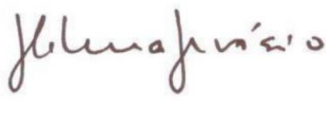
1.2. EPD OWNER

Name of the owner:	GODILAC II, S.A.
Production site:	Rua da Indústria, n.º 80, 4825-272 Monte Córdova – Santo Tirso- Portugal
Address (head office):	Rua da Indústria, n.º 80, 4825-272 Monte Córdova – Santo Tirso- Portugal
Telephone:	Helena Oliveira, Nuno Martins: +351 918611757
E-mail:	Helena.oliveira@godilac.com ; nuno.martins@godilac.com
Website:	http://www.godilac.com
Logo:	
Information concerning the applicable management Systems:	
Specific aspects regarding the production:	CAE (Principal) 25610 - Tratamento e revestimento de metais
Organization's environmental policy:	


1.3. Information concerning the EPD

Authors:	CERIS - Civil Engineering Research and Innovation for Sustainability, José Dinis Silvestre	
Contact of the authors:	Av. Rovisco Pais 1049-001 Lisboa Telephone: +351 218 419 709; E-mail: jose.silvestre@tecnico.ulisboa.pt	
Issue date:	14/12/2021	
Registration date:	27/12/2021	
Registration number:	DAP 004:2021	
Valid until:	13/12/2026	
Representativity of the EPD (location, manufacturer, group of manufacturers):	EPD from cradle-to-gate, for the thermo-lacquering service of aluminum and steel profiles, provided in one (1) industrial unit, belonging to one (1) single company (GODILAC II, S.A.)	
Where to consult explanatory material:	http://www.godilac.com	
Type of EPD:	EPD Cradle-to-gate (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	Verifier (s)
	
(CERTIF – Associação para a Certificação)	(Helena Gervásio University of Coimbra)


1.5. EPD Registration

Program Operator

(Plataforma para a Construção Sustentável)

1.6. PCR of reference

Name:	PCR: base model for construction products and services
Issue date:	September 2015 Edition
Number of registration on the data base:	PCR – mb001
Version:	Version 2.0
Identification and contact of the coordinator (s):	<p>PCR: base model for construction products and services</p> <ul style="list-style-type: none"> • Marisa Almeida marisa@ctcv.pt • Luís Arroja arroja@ua.pt • José Silvestre jds@civil.ist.utl.pt
Identification and contact of the authors:	<p>PCR: base model for construction products and services</p> <ul style="list-style-type: none"> • 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:	January 2022

1.7. Service information

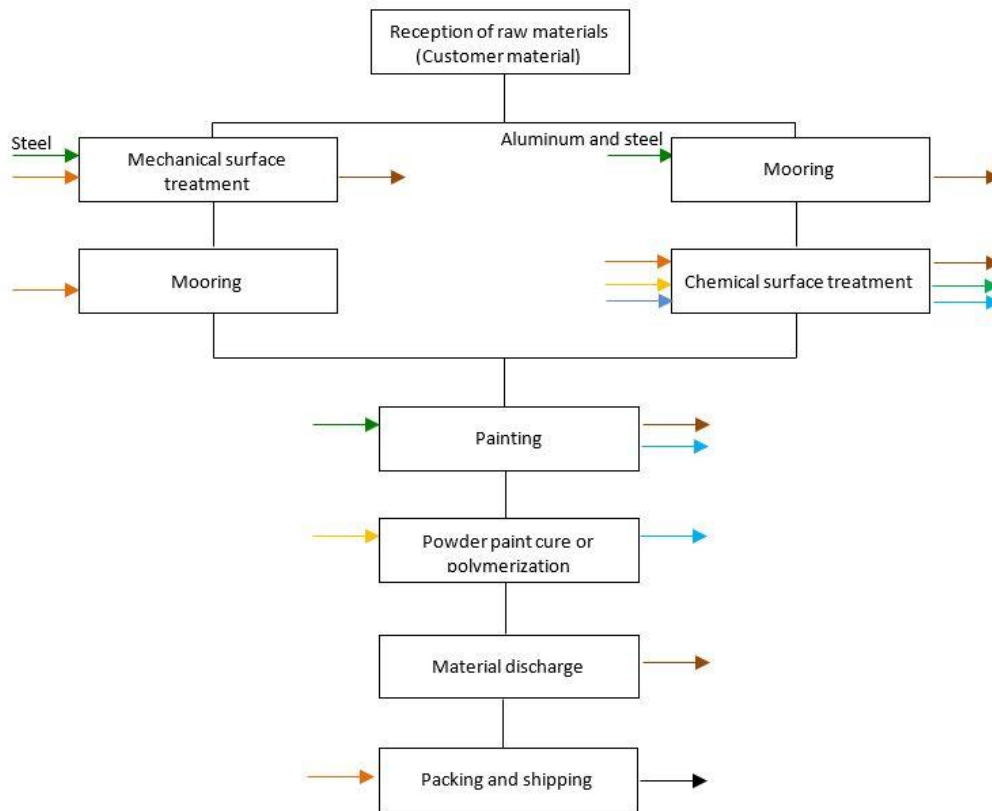
Identification of the product:	Thermo-lacquering of aluminum and steel profiles
Illustration of the product:	
Brief description of the product:	Treatment of aluminum and steel surfaces in chemical baths followed by coating by painting with powder paint (lacquering).
Main technical characteristics of the product:	Production of thermo-lacquered aluminum and steel profiles.
Description of the products application:	These aluminum and steel profiles have as main application the execution of frames for windows and doors and shading elements.
Reference service life:	Not specified.
Placing on the market / Rules of application in the market / Technical rules of the product:	<ul style="list-style-type: none"> • Decision No. 768/2008/EC of the European Parliament and of the Council of 9 July 2008. • Regulation (EC) No 764/2008 of the European Parliament and of the Council of 9 July 2008. • Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008. • Regulation (EU) No. 305/2011 of the European Parliament and of the Council of March 9, 2011 and its rectifications.
Quality control:	Quality control carried out in accordance with the internal Production Control System based on the Production Manual "Constitution of Thermally Improved Profiles" and with the technical product standards.
Special delivery conditions:	Not applicable.
Components and substances to declare:	Not applicable.
History of the LCA studies:	-

2. ENVIRONMENTAL PERFORMANCE OF THE PRODUCT






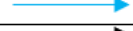
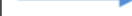

2.1. Calculation rules of the LCA

Declared unit:	Thermo-lacquering of one square meter (1 m ²) of aluminum and steel profiles, packing included.
Functional unit:	-
System boundaries:	EPD Cradle-to-gate (A1-A3)
Criteria for the exclusion:	<p>For this EPD, the following processes were not considered, as they comply with the exclusion criteria of 1% of renewable and non-renewable primary energy use and 1% of the total inputs (by mass) of the unit process in which they occur, not exceeding the 5% mass and energy use of the steps considered (A1-A3):</p> <ul style="list-style-type: none"> • Construction of industrial infrastructure and production and replacement of machines and equipment; • Infrastructure associated with the transport of raw materials and pre-products (production of vehicles, road maintenance); • Water consumption, and production of wastewater and waste in the areas administrative and laboratories of the production unit; • Transport of small consumables to the industrial unit; • Other negligible flows, considering that your contribution is below exclusion criteria.
Assumption and limitations:	This DAP represents the thermo-lacquering of all types of aluminum and steel profiles processed in a single industrial unit, which may have different thicknesses, cross sections, and lengths.
Quality and other characteristics about the information used in the LCA:	<p>Production data were collected for the year 2019 from records official and internal production unit and represent reality.</p> <p>The generic data used belong to the <i>Ecoinvent</i>, <i>ELCD</i> and <i>Simapro</i> industrial database (Industry data 2.0), and meet the quality criteria (age, geographic and technological coverage, plausibility, etc.) of generic data.</p>
Allocation rules:	Since the production process is the same for all aluminum and steel profiles processed at Godilac's industrial unit, regardless of origin and form to calculate average data, a mass allocation was performed between all total flows input and output for the thermo-lacquering of the profiles under study and the area of all aluminum and thermo-lacquered steel profiles in 2019.
Comparability of EPD for construction products:	The EPD of construction products and services cannot be comparable in case they are not produced according to EN 15804 and EN 15948 and according to the comparability conditions determined by ISO 14025.

2.1.1. Flow diagram of input and output of the processes



Color legend:

Entradas		Saídas	
	Raw Material		Waste
	Subsidiary matter		Liquid effluents
	Fuel – Liquefied petroleum gas		Gaseous emissions by fixed source
	Water		Finished product

NOTE: The electric power input is not represented in the flow chart because its use is necessary for all operations.

Figure 1: GODILAC - The life cycle stages of the thermo-lacquering process for aluminum and steel profiles

The following paragraphs briefly describe the life cycle stages studied for the development of the present EPD.

The production process begins with the reception of aluminum and steel profiles (customers material), whose production is outside the border of this EPD. Once received, the raw material is placed in the material reception warehouse. Depending on the type (aluminum or steel) and quantity of material and the desired color, the type of treatment and the production line are selected.

In the Mooring phase, the profiles to be coated are suspended in supports (stenters) using suspensions or steel wire so that they can be immersed in the surface treatment chemical baths and then dried and painted.

This is followed by chemical surface treatment, which corresponds to immersion in chemical baths to protect metal surfaces against corrosion and ensure paint adhesion. The profiles are then coated (painted) using electrostatic powder paint spray guns in the color required by the customer. The process can be carried out in an automatic booth equipped with painting robots or in a booth for manual application in the case of small quantities of material for a specific color. The painting cabins have associated equipment in order to recover the paint that does not adhere to the parts. They also have a final filter to avoid the emission of fine dust that can't be recovered.

After painting, the parts are heated in an oven heated by hot air circulation, which is equipped with a combustion chamber and LPG burner. The working temperatures in this stage of polymerization or curing may vary, depending on the paint supplier's specifications, between 160 and 200°C.

From the mooring until the end of polymerization, the material remains in the supports (stents), being transported by rolling bridges in the chemical surface treatment phase and by conveyor belt from the end of the treatment to the unloading zone. In this area, after cooling down, the material is placed in mobile devices so that it can be transported to the packaging sector. The packaging is carried out with plastic film in an automatic or manual process depending on the geometry and dimensions of the pieces. Some profiles are protected with adhesive film during production. After packaging, the profiles are placed in a storage area until dispatch to the customer.

The transport to the building site or to the customer, the production of window and door frames from these profiles, and the application on site are already outside the scope of this EPD.

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
✓	✓	✓	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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 ₂ H 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	A1	2,40E-03	1,20E-03	4,62E-08	2,69E-04	7,58E-01	5,76E-05	1,38E+01
Transport	A2	9,15E-03	1,85E-11	4,32E-05	9,93E-06	3,11E-06	3,64E-10	1,28E-01
Manufacturing	A3	1,11E+00	5,01E-08	4,38E-03	3,61E-04	2,98E-04	4,61E-06	2,10E+01
Total	Total	1,12E+00	1,20E-03	4,42E-03	6,40E-04	7,59E-01	6,22E-05	3,50E+01

LEGEND:
 Product stage

NOTES: P.C.I. – Net calorific value
Units expressed by functional unit or declared unit (1ml).

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.	EMS kg	CSR MJ, P.C.I.	CSNR MJ, P.C.I.	Net use of fresh water m ³
Raw material supply	A1	1,07E+00	0,00E+00	1,07E+00	1,50E+01	0,00E+00	1,50E+01	0,00E+00	0,00E+00	0,00E+00	3,63E-01
Transport	A2	1,46E-04	0,00E+00	1,46E-04	1,29E-01	0,00E+00	1,29E-01	0,00E+00	0,00E+00	0,00E+00	8,17E-07
Manufacturing	A3	1,42E+00	0,00E+00	1,42E+00	2,07E+01	1,31E+00	2,20E+01	0,00E+00	0,00E+00	0,00E+00	8,46E-02
Total	Total	2,49E+00	0,00E+00	2,49E+00	3,58E+01	1,31E+00	3,71E+01	0,00E+00	0,00E+00	0,00E+00	4,48E-01


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 (EPNR + RNR);
MS = use of secondary material;
CSR = use of renewable secondary fuels;
CSNR = use of non-renewable secondary fuels.

NOTE: Units expressed by functional units or declared units (1ml).

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	A1	1,44E-03	7,80E-01	1,70E-04
Transport	A2	0,00E+00	1,13E-08	0,00E+00
Manufacturing	A3	8,17E-05	2,36E-01	2,00E-05
Total	Total	1,52E-03	1,02E-00	1,90E-04

LEGEND:
 Product stage

NOTE: Units expressed by functional units or declared units (1ml).

2.5. Other environmental information describing output flows

Parameters	Units*	Results
Components for re-use	kg	0,00E+00
Materials for recycling	kg	4,60E-02
Radioactive waste disposed	kg	0,00E+00
Materials for energy recovery	kg	3,43E-02
Exported energy	MJ per energy carrier	0,00E+00

* expressed by functional unit or declared unit (1ml).

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

This EPD represents only the step of thermo-lacquering of aluminum and steel profiles by Godilac, including the modules A1 to A3. Thus, the following scenarios referring to the construction steps (modules A4 and A5), use (B1 to B7) and end-of-life (C1 to C4) are not applicable.

3.1. Additional environmental information regarding the release of dangerous substances

The thermo-lacquered aluminum and steel profiles haven't known toxic effects. Due to your properties, no danger to the environment is expected. Aluminum and steel profiles are considered inert but non-biodegradable products.

3.2. Certifications

GODILAC II, SA has the following certifications, which are renewed annually:

- "Qualicoat Seaside", as audited and verified by QUALICOAT, Switzerland (License No. 819);
- "Qualisteelcoat Quality Mark", as audited and verified by QUALISTEELCOAT, Switzerland

(Certificate of Conformity No. E-800).

REFERENCES

- ✓ CEN/TR 15941:2014 - Sustainability of construction works environmental product declarations. Methodology for selection and use of generic data.
- ✓ General Instructions of the DAPHabitat System, Version 1.0, Edition March 2013 (in www.daphabitat.pt);
- ✓ **PCR – basic module for construction products and services**. DAPHabitat System. Version 1.0, 2013 (in www.daphabitat.pt);
- ✓ **EN ISO 14020:2005** Environmental declarations and labels – General principles;
- ✓ **EN ISO 14021:2016** Environmental declarations and labels– Environmental self-declarations (Environmental labeling type II);
- ✓ **EN ISO 14024:2018** Environmental declarations and labels; Environmental labeling type I; Principles and procedures;
- ✓ **ISO 14025:2009** Environmental declarations and labels – Type III environmental declarations – Principles and procedures;
- ✓ **EN ISO 14050:2010** Environmental management - Vocabulary
- ✓ **EN 15804:2012** 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.
- ✓ **ISO 21930:2017** Sustainability in building construction – Environmental declaration of building products;
- ✓ **NP ISO 14040:2008** Environmental management; Life Cycle evaluation; Principles and framework;
- ✓ **NP ISO 14044:2006/A1:2018** Environmental management; Life Cycle evaluation; requirements and guidelines;
- ✓ Tong, C., *Introduction to materials for advanced energy systems*”, Springer, 2019, doi: 10.1007/978-3-319-98002-7.
- ✓ Tsiamis, D. A.; Castaldi, M. J.. 2016. *Determining accurate heating values of non-recycled plastics (NRP)*. *Earth Engineering Center* | City College City University of New York.
- ✓ Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., and Weidema, B., 2016. *The Ecoinvent database version 3 (part I): overview and methodology*. *The International Journal of Life Cycle Assessment*, [online] 21(9), pp.1218–1230.