DAPHabitat System

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Environmental Product Declaration

[according to ISO 14025, EN 15804:2012+A2:2019 and EN 15942]

Declaration number: DAP 001:2023

COLD-FORMED WELDED STRUCTURAL HOLLOW SECTIONS OF NON-ALLOY AND FINE GRAINS STEELS

Issue date: 02/05/2023 **Valid until: 01/05/2028**

FERPINTA - INDÚSTRIAS DE TUBOS DE AÇO DE FERNANDO PINHO TEIXEIRA, S.A.

FERPINTA

centroHabitat
Plataforma para a Construção Sustentável

VERSION 1.2. EDITION JUNE 2022

FERPINTA

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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Programme operator:	Sustainable Construction Platform www.centrohabitat.net centrohabitat@centrohabitat.net
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Email address:	deptecnico@centrohabitat.net
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Logo:	

1.2. EPD Owner

Name of the owner:	FERPINTA – Indústrias de Tubos de Aço de Fernando Pinho Teixeira, S.A.
Production site:	Rua 13 de Julho, nº295 3720-011 Carregosa, Oliveira de Azeméis
Address (head office):	Rua 13 de Julho, nº295 3720-011 Carregosa, Oliveira de Azeméis
Telephone:	256 411 420
E-mail:	infor@ferpinta.pt ana.amorim.fer@ferpinta.pt
Website:	www.ferpinta.pt
Logo:	
Information concerning the applicable management systems:	NP EN ISO 9001:2015 – Quality Management Systems NP EN ISO 14001:2015 – Environmental Management System NP EN ISO 50001:2019 – Energy Management Systems
Specific aspects regarding the productin:	Main CAE: 24200 – Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
Organization's environmental policy:	FERPINTA aims to build a better future by producing pipes, profiles, shapes, and bands of steel that we want to get further and further. Aware of its mission, FERPINTA seeks to adopt methods and technologies that prevent pollution protect the environment, using natural resources in an effective way, and ensuring that FERPINTA products are developed considering the life cycle perspective. The full Management Policy can be consulted at: www.grupoferpinta.com/imagem/PolíticaGestão_FPT.pdf.

1.3. Information concerning the EPD

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Issue date:	02/05/2023
Registration date:	22/05/2023
Registration number:	DAP 001:2023
Valid until:	01/05/2028
Representativity of the EPD(location, manufacturer, group of manufacturers):	EPD of one (1) product category, produced in one (1) industrial plant from one (1) producer
Where to consult explanatory material:	www.ferpinta.pt
Type of EPD:	Cradle-to-gate EPD (A1-A3) with modules C and D

1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:20**09** and EN 15804:2012+A2:2019	
Certification Body	**Verifier**
(CERTIF – Associação para a Certificação)	(Marisa Almeida)

1.5. EPD Registration

Programme Operator
(Plataforma para a Construção Sustentável)

1.6. Relevante c-PCR (complementary product category rules)

Not applicable.

1.7. Information concerning the product/product class

Identification of the product:	Cold-formed welded structural hollow sections of non-alloy and fine steel grains steels
Ilustration of the product:	
Brief description of the product:	FERPINTA's range of structural hollow sections consists of round, square, and rectangular products, longitudinally welded, cold-formed, and without subsequent heat treatment. Structural hollow sections are produced according to the EN 10219-1 standard, with a diameter range of 16 to 323.9 mm, and with a wall thickness of 1.5 to 12.5 mm. The tube can be supplied in black (rough rolled) or pickled. The entire range of cold-formed welded structural hollow sections produced at FERPINTA is included in the EPD.
Main technical characteristics of the product:	The technical properties of the cold-formed welded structural hollow sections comply with the requirements of the EN 10219-1:2006 and EN 10219-2:2006 standards, as indicated in Table 1. The mechanical properties are presented in Table 2.

Table 1: General properties

Properties	Standard	Section
Tolerances on dimension and shape	EN 10219-2	6
Elongation	EN 10219-1	6.7.1, Tables A.3, B.4 and B.5
Tensile strength and yield strength	EN 10219-1	6.7.1, Tables A.3, B.4 and B.5
Impact strength	EN 10219-1	6.7.2, Tables A.3, B.4 and B.5
Weldability	EN 10219-1	6.6, Tables A.1, B.1, B.2 and 6.8.1
Durability	EN 10219-1	6.8.2

Table 2: Mechanical properties, according to the EN 10219-1:2006 standard

Steel grade	Mechanical properties				Minimum impact energy, KV (J)			
	Minimum yield strength, R_{eH} (MPa)	Tensile strength, R_m (MPa)		Minimum elongation, A (%))				
	Thickness (mm)				At test temperature of			
	≤ 16mm	< 3	≥ 3 ≤ 40	≤ 40	-50 ◦C	-20 ◦C	0 ◦C	20 ◦C
S235JRH	235	360-510	360-510	24	-	-	-	27
S275J0H	275	430-580	410-560	20	-	-	27	-
S275J2H	275	430-580	410-560	20	-	27	-	-
S355J0H	355	510-680	470-630	20	-	-	27	-
S355J2H	355	510-680	470-630	20	-	27	-	-
S355K2H	355	510-680	470-630	20	-	40	-	-
S420MH	420	-	500-660	19	-	40	-	-
S420MLH	420	-	500-660	19	27	-	-	-
S460MH	460	-	530-720	17	-	40	-	-
S460MLH	460	-	530-720	17	27	-	-	-
S460NH	460	-	540-720	17	-	40	-	-
S460NLH	460	-	540-720	17	27	-	-	-

Note: specific information in the technical sheet of the product and/or on the label.

Description of the product's application/use:	For use in metallic structures or mixed structures - metal and concrete.
Placing on the market / Rules of application in the market / Technical rules of the product:	• EN 10219; • Certificate of conformity of the factory production control, according to Regulation 305/2011/EU.
Quality control:	According to EN 10219-1, Section 7.3, Table 2 – Inspection programme for hollow sections of non-alloy steels (specific inspection).
Special delivery conditions:	Not applicable.
Components and substances to declare:	Not applicable.
Other information about the product:	The cold-formed welded structural hollow sections are one of the most versatile and efficient solutions when it comes to metallic and composite construction, or even mechanical applications. With its use, it becomes possible to obtain lightweight, dynamic, and resistant structures, with excellent performance in compression. They allow use in large spans and have a high strength-to-weight ratio. The structural hollow sections produced by FERPINTA can be supplied in special lengths, and may also comply with specific requirements with regard to suitability for hot-dip galvanization, weldability at the corners according to Eurocode 3 (EC3,) and specific carbon equivalent value (CEV)..
History of the LCA studies:	-

1.8. Calculation rules of the LCA

Functional unit:	Not applicable
Declared unit:	1 tonne (t) of cold-formed welded structural hollow sections, with a density of 7,850 kg/m^3, ready for delivery.
System boundaries:	The assessed system includes modules A1-A3 (product stage), C (end of life stage), and D (benefits and loads beyond the system boundary). In module C, the impacts of submodule C1 (deconstructions and demolition) were excluded due to the lack of information. A more detailed description of the system boundary is presented in Section 2.1.
Criteria for the exclusion:	The LCA considered all the production processes of the materials and energy consumed in the system, as well as the management processes of the wastes generated, for which inventory data were available. It should be noted that the flows of materials excluded in the structural hollow sections production process are equal to 0.02% of the total mass of inputs to that process and, therefore, are covered by the cut-off criteria defined in the 'PCR – Basic Model' document. More specifically, their mass contributes less than 1% to the total mass of the inputs and less than 5% to the total mass of inputs to each information module. The consumption of energy and water in the administrative areas, as well as the production of wastewater and wastes from these areas, were excluded. The environmental burdens from the construction and maintenance of infrastructures and equipment (capital goods) were also excluded, except those associated with the maintenance of machinery and equipment used in the production of structural hollow sections.
Assumption and limitations:	The results of the environmental impacts and remaining indicators shown in this EDP refer to the year 2020 and constitute average values for the entire range of cold-formed welded structural hollow sections produced by FERPINTA. The calculation software does not allow quantifying the indicators describing waste categories for all declared modules, from a life cycle perspective.
Quality and other characteristics about the information used in the LCA:	For the production process of cold-formed welded structural hollow sections, real and specific data from the production plant have been used. The only exception is emissions to air resulting from the burning of diesel consumed in internal transport operations, which have been calculated based on emission factors due to the lack of measured values. For the remaining processes, such as steel production and electricity production in the grid, generic data obtained from the Ecoinvent database have been used, which meet the quality criteria defined for generic data (time-related, geographical and technological

	representativeness, plausibility, completeness, consistency, etc.). Whenever possible, the original processes from Ecoinvent were adapted to better represent reality, for example by changing the mix of energy sources of electricity consumed considering the country where processes take place. According to the criteria defined in Table E.1 of Annex E of the EN 15804 standard, defined by "UN Environment Global Guidance on LCA database development", the quality of all relevant data is very good. The quality of the data used in module D is also very good, except for the geographical representativeness of some processes, which is considered good.
Allocation rules:	In addition to cold-formed welded structural hollow sections, FERPINTA also produces other types of tubes, which constitutes a multifunctionality situation. To determine the inputs and outputs associated only with the production of cold-formed welded structural hollow sections, the unit process subdivision procedure was first adopted. Therefore, only operations associated with the production of the product under assessment were considered and the operations associated with the remaining products were excluded. Then, for the included operations, an allocation procedure based on the mass of the different products produced was applied. In the production process of cold-formed welded structural hollow sections, there is also multifunctionality associated with recycling. On the one hand, part of the steel consumed is produced from scrap; the environmental impacts from the production of this steel refer to the operations that take place after the collection and sorting of the scrap. On the other hand, some waste will be subsequently recovered, for which further processing was considered until they reach the end of waste state. The structural hollow sections at the end of life are recycled. Also in this case, their further processing until they reach the end of waste state was considered.
Software used for the assessment:	SimaPro version 9.2.0.2.
Background database used for the LCA:	Ecoinvent version 3.7.1 database published in December 2020; "cut-off" approach.
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.

1.9. Use of average environmental performance

This EPD presents the average environmental performance of the entire range of cold-formed welded structural hollow sections produced by FERPINTA in 2020. The variability of the environmental performance between specific products is not relevant.

1.10. Technical information for Reference Service Life (RSL)

Not applicable.

1.11. Flow diagram of input and output of the processes

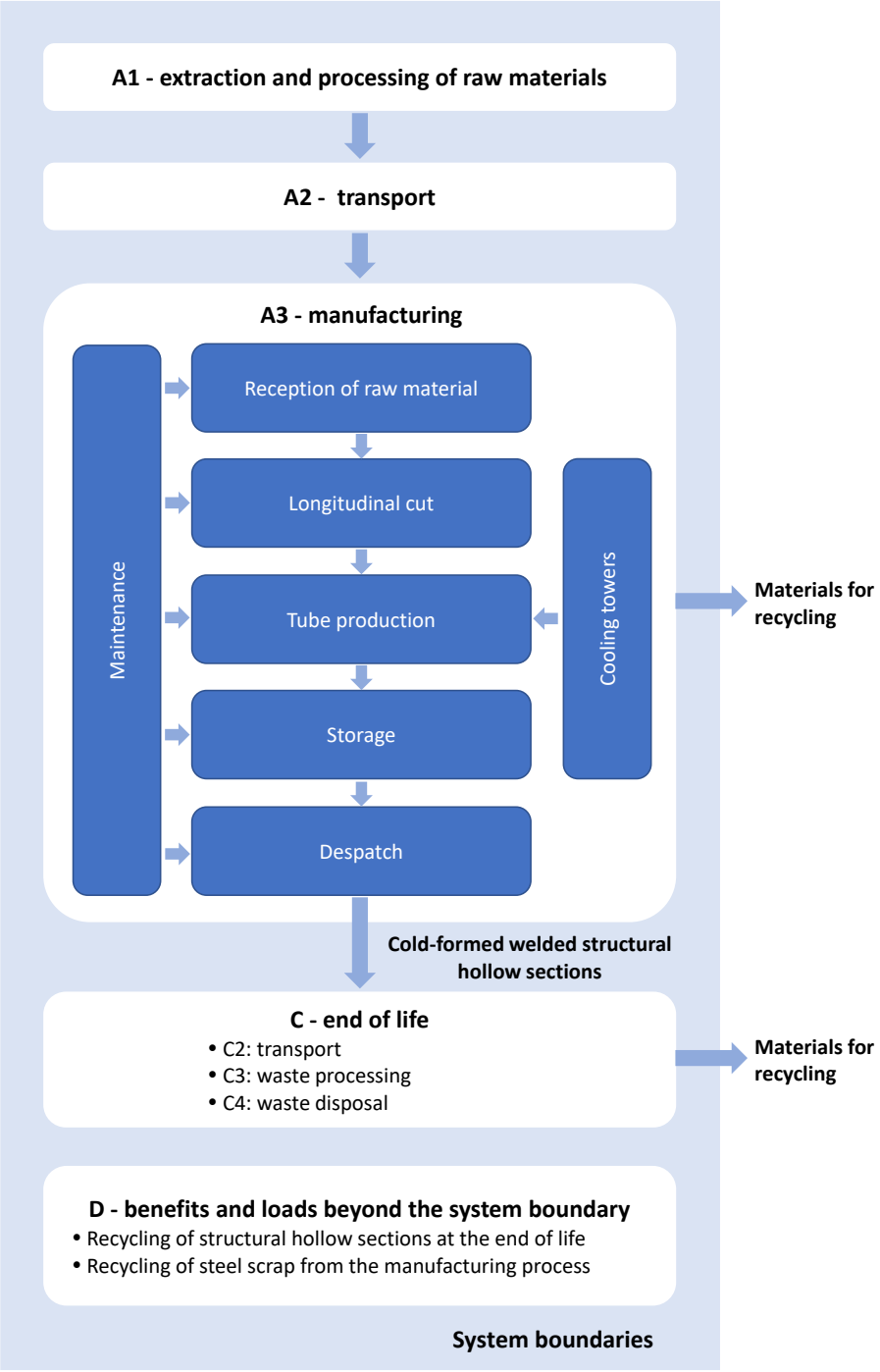

Figure 1: Life cycle stages and unit processes of the product

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	ND	✓	✓	✓	✓

Module A1-A3 (product stage) considers the manufacturing of structural hollow sections, as well as the extraction, processing, and transport of raw material (hot rolled steel coils), ancillary materials, packaging materials, and energy vectors, and also waste processing until the end of waste state is reached or until the end of life.

The manufacturing process of structural hollow sections starts with raw material reception (steel coils) where the properties of the material are confirmed. The next operation is longitudinal cutting where steel coils are cut in strips with width compatible with the diameters/dimensions of the hollow sections to be produced. After this operation, the material enters in the tube production/conformation line.

The strip resulting from the longitudinal cutting operation are unrolled and sent to conformation (when a slit is unrolled, the slits are connected by butt joint welding). In the hollow section conformation is used a set of rollers that gives the strip the configuration near of a circle, lightly open on the edge. The next operation is the longitudinal electric resistance welding, where the outer excesses of the weld are eliminated by rectification. The tube, continuously moving, is cooled and calibrated to achieve the intended cross-section – circular, rectangular or square, according to the normative requirements. Before cutting in the intended length, a protective oil may be applied for protection against corrosion. The next operations are storage and expedition.

- In module C (end of life stage), the impacts from submodule C1 (deconstruction and demolition) were excluded because, although mechanized deconstruction and demolition of structures built with the structural hollow sections may occur, there is no information available allowing the quantification of the respective impacts. The following submodules were considered in module C:
- C2 – includes the transport of the structural hollow sections from the place of deconstruction or demolition until the end of life (recycling);
- C3 – includes the activities taking place before recycling, in particular, sorting and pressing of the hollow sections;
- C4 – corresponds to waste final disposal; the environmental impacts are null as the hollow sections are recycled.

Module D considers the environmental benefits and loads associated with recycling the structural hollow sections at the end of life and of the steel scrap generated in the hollow sections manufacturing process, assuming that steel recycling will avoid the production of steel from primary material.

2.1.1. Justification for the exemption to declare module 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
Unit	**kg CO_2 eq.**	**kg CO_2 eq.**	**kg CO_2 eq.**	**kg CO_2 eq.**	**kg CFC 11 eq.**	**mol H^+ eq.**
Modules A1-A3	2,50E+03	2,47E+03	2,87E+01	1,23E+00	1,22E-04	1,08E+01
Module C2	4,15E+01	4,14E+01	3,31E-02	3,14E-04	9,61E-06	1,43E-01
Module C3	1,29E+01	1,27E+01	1,32E-01	1,72E-02	2,15E-06	1,19E-01
Module C4	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Module D	-1,43E+03	-1,41E+03	-1,87E+01	4,39E-01	-5,06E-05	-5,23E+00

LEGEND:

Product Stage

End-of-life stage

Benefits and loads beyond the system boundary

NOTE:
Values expressed by declared unit (1 t of cold-formed welded structural hollow sections).

	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 World eq. deprived**
Modules A1-A3	1,13E-01	2,26E+00	2,46E+01	1,13E+01	2,65E-02	2,59E+04	7,46E+02
Module C2	2,26E-05	4,60E-02	5,06E-01	1,38E-01	1,76E-06	5,87E+02	-1,24E-01
Module C3	2,09E-04	4,55E-02	5,00E-01	1,36E-01	4,92E-07	1,98E+02	1,10E+00
Module C4	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Module D	-6,99E-02	-1,10E+00	-1,21E+01	-6,70E+00	-2,40E-02	-1,24E+04	-6,48E+01

LEGEND:

Product Stage

End-of-life stage

Benefits and loads beyond the system boundary

NOTES:
P.C.I. – Net calorific value

Values expressed by declared unit (1 t of cold-formed welded structural hollow sections).

The results of the indicators “Abiotic depletion potential for non-fossil resources”, “Abiotic depletion potential for fossil resources potential”, and “Water (user) deprivation potential” shall be used with care as the uncertainties on these results are high or as there is limited experienced 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**	**-**
Modules A1-A3	ND	ND	ND	ND	ND	ND
Module C2	ND	ND	ND	ND	ND	ND
Module C3	ND	ND	ND	ND	ND	ND
Module C4	ND	ND	ND	ND	ND	ND
Module D	ND	ND	ND	ND	ND	ND

LEGEND:

Product Stage

End-of-life stage

Benefits and loads beyond the system boundary

NOTES:
Values expressed by declared unit (1 t of cold-formed welded structural hollow sections).

The impact indicator "POTENTIAL HUMAN EXPOSURE EFFICIENCY RELATIVE TO U235" deals mainly with the eventual impact of low dose ionising radiation on human health resulting 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 ionising radiation from the soil, radon and some building materials is also not measured by this indicator.

The results of the indicators "POTENTIAL COMPARATIVE TOXIC UNIT FOR ECOSYSTEMS", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS, CANCER EFFECTS", "POTENTIAL COMPARATIVE TOXIC UNIT FOR HUMANS, NOT CANCER EFFECTS" and "POTENTIAL SOIL QUALITY INDEX" shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.
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2.4. Indicators describing resource use

	Primary energy						Secondary materials and fuels, and use of water			
	EPR	RR	TRR	EPNR	RNR	TRNR	MS	CSR	CSNR	Net use of fresh water
Unit	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	MJ, P.C.I.	kg	MJ, P.C.I.	MJ, P.C.I.	m³
Modules A1-A3	2,24E+03	6,22E+01	2,31E+03	2,59E+04	5,09E+01	2,59E+04	2,19E+01	0,00E+00	0,00E+00	1,34E+01
Module C2	8,63E-01	0,00E+00	8,63E-01	5,87E+02	0,00E+00	5,87E+02	0,00E+00	0,00E+00	0,00E+00	8,81E-04
Module C3	1,35E+01	0,00E+00	1,35E+01	1,98E+02	0,00E+00	1,98E+02	0,00E+00	0,00E+00	0,00E+00	2,90E-02
Module C4	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Module D	-8,95E+02	0,00E+00	-8,95E+02	-1,24E+04	0,00E+00	-1,24E+04	0,00E+00	0,00E+00	0,00E+00	-5,77E+00

LEGEND:

Product stage

End of life stage

Benefits and loads beyond the system boundary

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.

NOTES:
P.C.I. – Net calorific value
Values expressed by declared unit (1 t of cold-formed welded structural hollow sections).

2.5. Other environmental information describing diferente waste categories

	Hazardous waste disposed	Non-hazardous waste disposed	Radioactive waste disposed
Unit	**kg**	**kg**	**kg**
Modules A1-A3	8,83E-01	0,00E+00	0,00E+00
Module C2	ND	ND	ND
Module C3	ND	ND	ND
Module C4	0,00E+00	0,00E+00	0,00E+00
Module D	ND	ND	ND

LEGEND:
- Product stage
- End of life stage
- Benefits and loads beyond the system boundary

NOTES:
Values expressed by declared unit (1 t of cold-formed welded structural hollow sections).
The characteristics that make waste hazardous are described in the applicable legislation in force, for example in the European Waste Framework Directive.
ND – module not declared

2.6. Environmental information describing output flows

	Components for re-use	Materials for recycling	Materials for energy recovery	Exported energy
Unit	**kg**	**kg**	**kg**	**MJ**
Modules A1-A3	0,00E+00	4,43E+01	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	1,00E+03	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

NOTE:
Values expressed by declared unit (1 t of cold-formed welded structural hollow sections).

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

Biogenic carbon content*	Units*	Modules A1-A3 (results)
Biogenic carbon content in product	kg C	-
Biogenic carbon content in accompanying packaging	kg C	0,831

* 1 kg biogenic carbon is equivalent to 44/12 kg of CO_2.

Values expressed by declared unit (1 t of cold-formed welded structural hollow sections).

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

3.1. C2 Transport – End of life of the product

Parameter	Units	Results expressed per declared unit
Vehicle type	-	Truck 16-32 t, EURO 5
Distance	km	300
Average load of the truck	t	5,79

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

Parameter	Units	Results expressed per declared unit
Material for re-use	kg	0
Material for recycling	kg	1 000
Material for energy recovery	kg	0

3.3. C4 Disposal – End of life of the product

Parameter	Units	Results expressed per declared unit
Material for final deposition	kg	0

3.4. Scenario and technical information for module D

Parameter	Units	Results expressed per declared unit
Net output flow of steel scrap - structural hollow sections at the end of life	kg	976
Net output flow of steel scrap - scrap from the manufacturing process	kg	42,7
Steel avoided production	kg	905
Location of end-of-waste point	-	At the scrap sorting plant.
Point of functional equivalence	-	Steel manufactured from scrap is considered to have the same quality as steel manufactured from primary material.
Assumptions	-	The net output flow of steel scrap is calculated by the difference between the flow of steel scrap that will be recycled and the input flow of steel scrap used in the steel consumed in the manufacturing of the structural hollow sections. The following specific consumptions of scrap during steel manufacturing were considered: 1.13 and 1.04 kg scrap / kg steel, for Europe and the rest of the world, respectively.

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

Not applicable.

REFERENCES

✓ **General Instructions of the DAPHabitat System**, Version 2.0, Edition June 2022 (in www.daphabitat.pt);

✓ **PCR – basic model for construction products and services**. DAPHabitat System. Version 2.2, June 2022 (in www.daphabitat.pt);

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

✓ **EN 15804:2012+A2:2019** Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;

✓ **EN 15942:2021** Sustainability of construction works – Environmental product declarations – Communication format business-to-business.