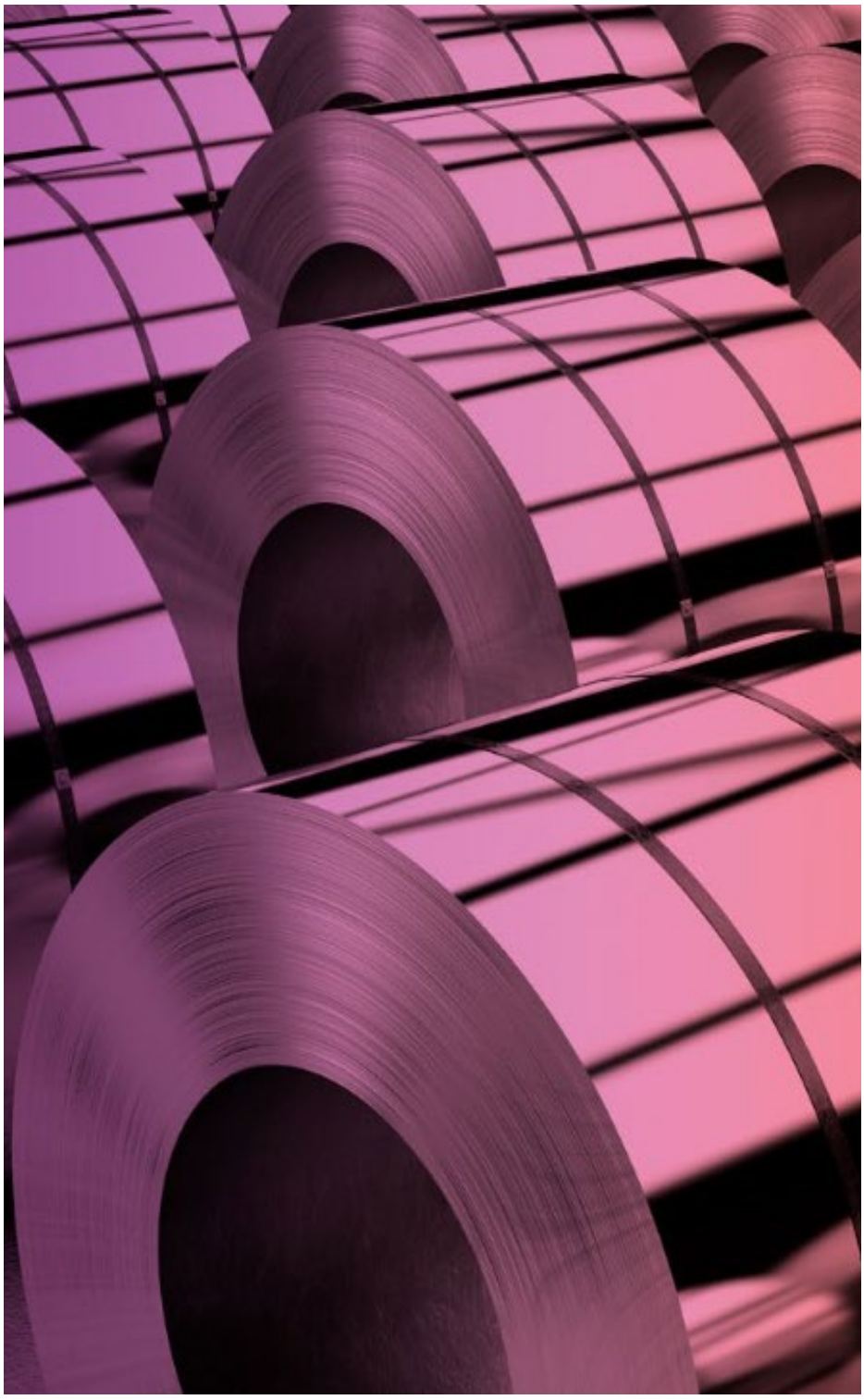
ENVIRONMENTAL PRODUCT DECLARATION

HOT ROLLED AUSTENITIC STAINLESS STEELS - APERAM 316



Aperam is world-leading stainless-steel company with sustainability at its heart. As part of our environmental stewardship efforts, we use Environmental Product Declarations (EPD) to communicate about the environmental impact our products have across their lifecycle – including total carbon footprint and energy use throughout the supply chain.

Based on an independently verified lifecycle assessment that follows ISO 14025, these EPDs allow our customers to make informed decisions about the stainless steel they purchase. It also allows them to calculate the environmental impact of their own application's lifecycle. This last point can be of particular interest to the building and construction sector when working under a 'green building' regulation.

The EPD, together with Aperam being the first stainless steel company to be certified by ResponsibleSteel™, the industry's first global multi-stakeholder standard and certification program, further demonstrates our strong commitment to sustainability.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

aperam

Hot Rolled Austenitic Stainless Steels – Aperam 316

According to ISO 14025.
EN 15804+A1 and ISO21930:2017

EPD Program and Program Operator Name. Address. Logo, and Website	UL Solutions 333 Pfingsten Rd, Northbrook IL 60062 www.ul.com www.spot.ul.com
General Program Instructions and Version Number	Program Operator Rules v 2.7 2022
Manufacturer Name and Address	Aperam 24-26 Boulevard d'Avranches L-1160 Luxembourg LUXEMBOURG
Declaration Number	4790380554.102.1
Declared Product & Functional Unit or Declared Unit	Hot Rolled Austenitic Stainless Steels - Aperam 316; 1 metric ton
Reference PCR and Version Number	PCR - Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. December 2018. UL Environment. PCR - Part B: Designated Steel Construction - Product EPD Requirements, Version 2.0. August 2021. UL Environment.
Description of product application/use	Stainless steel for building construction use
Product RSL Description (if Appl.)	N/A
Markets of Applicability	North America/Global
Date of Issue	December 1, 2023
Period of Validity	5 Years
EPD Type	Product-specific
Range of Dataset Variability	N/A
EPD Scope	Cradle to gate with C and D in options
Year(s) of reported primary data	2020
LCA Software & Version Number	SimaPro 9.5
LCI Database(s) & Version Number	ecoinvent 3.8
LCIA Methodology & Version Number	TRACI 2.1 / IPCC 2013
The PCR review was conducted by:	UL Solutions PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v3.2 (December 2018), serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	EVEA
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

Limitations

The environmental impact results of steel products in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the steel product impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted. See Section 2.8 for additional EPD comparability guidelines.
Environmental declarations from different programs (ISO 14025) may not be comparable.

1. PRODUCT DEFINITION AND INFORMATION

1.1. DESCRIPTION OF ORGANIZATION

Aperam is a global player in stainless, electrical and specialty steel, with customers in over 40 countries. The business is organized in three primary operating segments: Stainless & Electrical Steel, Services & Solutions and Alloys & Specialties.

Aperam has a flat Stainless and Electrical steel capacity of 2.5 million tons in Brazil and Europe and is a leader in high value specialty products. In addition to its industrial network, spread over six production facilities in Brazil, Belgium, and France, Aperam has a highly integrated distribution, processing and services network and a unique capability to produce stainless and special steels from low-cost biomass (charcoal made from its own FSC-certified forestry).

In 2020, Aperam achieved sales of 3.6 billion euros and shipped 1.68 million tons of steel.

1.2. PRODUCT DESCRIPTION

1.2.1 PRODUCT IDENTIFICATION

The principal features of our **316L** grade are:

> Very good resistance to corrosion in acids and chloride-containing media, as well as to pitting, crevice, and intergranular corrosion -even after welding

> Excellent weldability and polishing

> High ductility

> Good drawability

The principal features of our **316T** grade are:

> Very good resistance to corrosion in acids and chloride-containing media, as well as to pitting, crevice, and intergranular corrosion -even after welding

> Excellent weldability and polishing

> High ductility

> Good drawability

> Titanium improves resistance to intergranular corrosion in welds and in thick sections where cooling rates are slow

TABLE 1: DECLARED PRODUCTS IDENTIFICATION

Grade designation	European designation	American designation	Finishing		
			2E (HRC)	1D (HRAP)	1M[1][3][4]
316L	X5CrNiMo17-12-2/ 1.4401[1]	UNS 31600 / Type 316[2]	✓	✓	✓
	X5CrNiMo17-12-2/ 1.4404[1]	UNS 31603 / Type 316L[2]	✓	✓	✓
316T	X6CrNiMoTi17-12-2 / 1.4571[1]	UNS S31635 / Type 316Ti[2]	✓	✓	

[1] According to EN 10088-2; [2]According to ASTM A240; [3]According to German DIN 59220; [4]According to ASTM A793

1.2.2 PRODUCT SPECIFICATION

Product specifications for the average product declared are specified in the following table:

TABLE 2: DECLARED PRODUCTS CHARACTERISTICS

Characteristic	Nominal Value	Unit	Condition
Product Thickness	316L: 2 up to 13 316T: 0.4 up to 14	mm	N/A
Product Width	316L & 316T: up to 2000	mm	N/A
Density	7.9	kg/dm^3	20°C
Melting temperature	1440	°C	Liquidus
Thermal conductivity	15	W/m.K	20°C
Electric resistivity	0.75	Ω mm^2/m	20°C
Magnetic resistivity	1005	at 0.8 kA/m DC or AC	20°C
Young's modulus	200	GPa	20°C

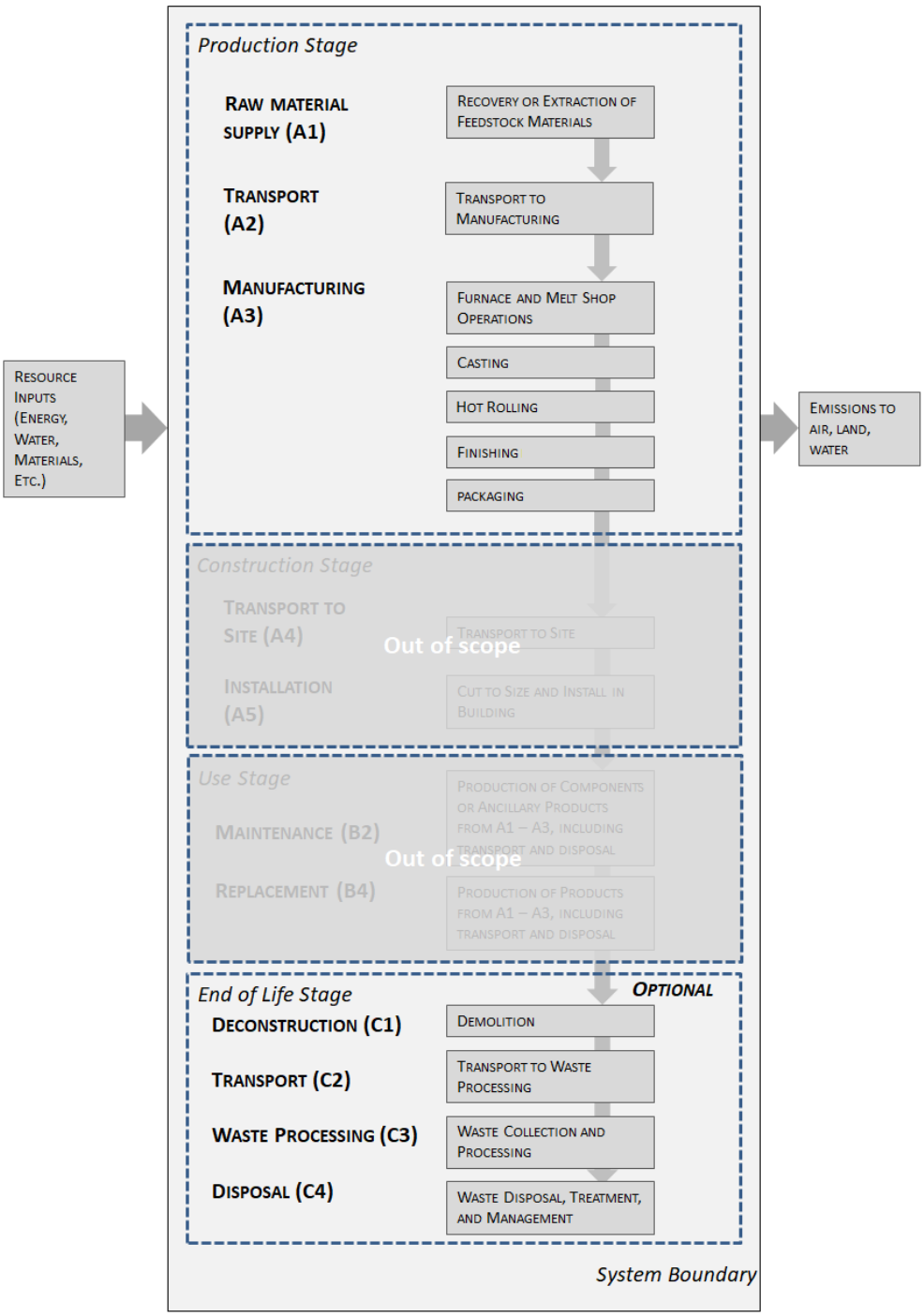
1.2.3 PRODUCT PACKAGING AND BIOGENIC CARBON CONTENT

As the installation module for product is not declared, the following table specifies the types and quantities of packaging materials and the biogenic carbon content, where applicable, to facilitate the development of end-of-life packaging scenarios.

TABLE 3: PRODUCT PACKAGING INFORMATION

Packaging material	Mass (kg)	Corresponding Biogenic Carbon Content (kg C)	Corresponding Biogenic Carbon Removal (kg CO_2 eq.)
N/A	0	0	0

1.3. FLOW DIAGRAM



1.4. PRODUCT AVERAGES

Several products are grouped together and presented in this EPD. The environmental impacts of each were compared and the products were considered homogeneous, with results complying with the rules defined in PCR Part A. Therefore, the impacts declaration is based on an average product. The average product is formed by every element of LCI based on a weighted average of the masses sold.

Products are manufactured in the Belgian and French Aperam factories.

1.5. APPLICATION

316L applications:
> Food industry equipment: tanks, tubes, pumps
> Naval engineering
> Road transport: IMO tanks, swap bodies and trailers
> Building industry: architectural components, roofing, façades
> Water industry
> Chemical and pharmaceutical industries
> Oil & Gas industry
> Paper industry

316T applications:
> Chemical industry
> Oil industry
> Textile industry
> Expansion bellows
> Tanks
> Cryogenics

1.6. MATERIAL COMPOSITION

The austenitic stainless steels in 316 grades are composed as follows:

TABLE 4: DECLARED PRODUCT COMPOSITION

Element	Typical Values for 316L (%)	Typical Values for 316T (%)
C	0.025	0.035
Ti	0	0.35
Si	0.40	0.40
Mn	1.20	1.20
Mo	2.10	2.10
Ni	10.10	10.10
Cr	16.80	16.80

No substances required to be reported as hazardous are associated with the production of this product.

1.7. PROPERTIES OF DECLARED PRODUCT AS DELIVERED

These grades of stainless steels comply with:

> Aperam Stainless Europe - Safety Information Sheet for Stainless Steel
> European Directive 2000/53/EC on end-of-life vehicles and later modifications

> PED (Pressure Equipment Directive) according to EN 10028-7 and AD2000 Merkblatt W2 and W10 (TÜVWB494)

> NFA 36 711 standard “Stainless steel intended for use in contact with foodstuffs, products and beverages for human and animal consumption (non packaging steel)“

> NSF/ANSI 51-2009 edition International Standard for “Food Equipment Materials” and of the FDA. (United States Food and Drug Administration) regarding materials used for food contact

> French Decree No. 92-631, dated 8 July 1992, and Regulation No. 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food (repealing Directives 80/590/EEC and 89/109/ EEC)

> French regulatory paper dated 13 January 1976 relating to materials and articles made of stainless steel in contact with foodstuffs

> Italian Decree of 21 March 1973: a list of stainless steel types appropriate to “Regulations on the hygiene of packaging, receptacles and tools intended to come into contact with substances for food use or with substances for personal use“

2. METHODOLOGICAL FRAMEWORK

2.1. FUNCTIONAL OR DECLARED UNIT

The declared unit is one metric ton of product at the gate of Aperam factories.

TABLE 5: DECLARED UNIT

	Value	Unit
Declared Unit	1	Metric ton

2.2. SYSTEM BOUNDARY

EPD is declared from cradle to gate with options, including the following stages:
A1 – A3: includes the provision of all raw materials and their packaging, transport to the production site and energy consumption during the manufacturing of the product, as well as using production goods and processing of waste and losses generated by the factory.
C1 – C4: includes demolition and transport of all materials, products and services related to the end-of-life phase of the product, including energy consumption, as well as the end-of-life processing of the product.

Module D is declared.

Interpreting the Results in Module D: The values in Module D include a recognition of the benefits or impacts related to steel recycling which occur at the end of the product's service life. The rate of steel recycling and related processes will evolve over time. The results included in Module D attempt to capture future benefits, or impacts, but are based on a methodology that uses current industry-average data reflecting current processes.

2.3. ALLOCATION

The production has been modeled on data supplied by the manufacturer for their factories in Belgium and France. The overall values for the factory's material and energy consumptions during a period of one year have been divided by the annual production of each intermediate product and final product to supply a value per metric ton of stainless steel produced at the gate. It is assumed that the process consumptions are governed by mass rather than any other parameter.
The life cycle inventory of post-consumer scrap used as the main raw material only covers the transportation from the scrap yard to Aperam's facilities.

2.4. CUT-OFF RULES

The cut-off criteria in the PCR, conforms to ISO 21930 and EN15804 standards:
- All known or suspected inputs and outputs to a (unit) process must be included in the calculation when the data is available.
- Any application of the criteria for the exclusion of inputs and outputs shall be documented.
- A maximum of 1% of the total mass per unit process may be omitted.
- A maximum of 1% of the total renewable and 1% of the total non-renewable energy per unit process may be omitted.
- A maximum of 1% of the total environmental impacts per unit process may be omitted.
- A maximum of 5% of the total energy usage, mass and environmental impacts per module may be omitted.

The cut-off rules were not used. All known or suspected mass and energy flows have been considered.

2.5. DATA SOURCES

As a rule, specific data derived from specific production processes or average data derived from specific production processes have been used as the first choice as a basis for calculating an EPD.
To model the life cycle of the product in question, the software SimaPro 9.5, developed by Pré Consultants, has been used in conjunction with the LCA database ecoinvent v3.8.

2.6. DATA QUALITY

The requirements for data quality and LCA data are in accordance with the specifications of the PCR. All generic data has been checked for plausibility both internally and by the manufacturer.

It should be noted that the input/output balances produced during data collection appeared unbalanced, and this situation could not be resolved by the monitoring tools available for the year of collection. A corrective factor of 1.386 was therefore applied to primary and secondary inputs.

Temporal Coverage – producer specific data is averaged over 1 year of production and from within the last 5 years (2020). Generic data is taken from the ecoinvent 3.8 database, which was updated in 2021. Inputs to and outputs from the system are accounted for over a period of 100 years from the year for which the data set is deemed relevant.

Technological Coverage – the technological coverage of the data reflects the physical reality of the declared product.

Geographical Coverage – whenever possible, country specific data reflecting the reality of the Aperam supply chain has been used. If country specific data is unavailable, European regional data is used in preference to global data sources.

2.7. PERIOD UNDER REVIEW

Data has been reviewed for the production year 2020.

2.8. COMPARABILITY

Environmental declarations from different programs based upon differing PCRs may not be comparable.

Comparison of the environmental performance of construction works and construction products using EPD information shall be based on the product's use and impacts at the construction works level. In general, EPDs may not be used for comparability purposes when not considered in a construction works context. Given this PCR ensures products meet the same functional requirements, comparability is permissible provided the information given for such comparison is transparent and the limitations of comparability explained.

When comparing EPDs created using this PCR, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.

3. TECHNICAL INFORMATION AND SCENARIOS

3.1. MANUFACTURING

The production of the declared products is divided into the following stages:

1. MeltShop: Scrap metal is melted in electric furnaces with filler metals to form the desired grade of stainless steel. Steel is then shaped in the form of steel slabs.
2. Hot Rolling Mills: Slabs are heated and passed between cylinders that progressively reduce the thickness of the steel sheet until coils of a few millimeters in thickness are produced.
3. Finishing: Coils undergo physical and chemical finishing treatments.
4. Packaging: Interleaving paper or plastic film is placed to protect the products during storage and transportation.

Manufacturing waste is recycled in production whenever possible, residual wastes are sent to recycling, landfill, or incineration.

3.2. DISPOSAL

For this LCA, it has been considered that 100% of the product is sent to recycling at the end of its useful life. The transport of end-of-life product between the construction site and landfill facility is by truck, with an estimated distance of 130 km.

It has been assumed that 5% of the steel cannot be sorted and therefore recycled and is then landfilled.

TABLE 6: END OF LIFE (C1-C4)

Name		Value	Unit
Assumptions for scenario development (description of deconstruction. Collection. Recovery. Disposal method and transportation)	The product is 100% recyclable, and its high value ensures a high effective recycling rate estimated at 95% for construction use.		
Collection process (specified by type)	Collected separately	-	ton
	Collected with mixed construction waste	1	ton
Recovery (specified by type)	Reuse	-	ton
	Recycling	0.95	ton
	Landfill	-	ton
	Incineration	-	ton
	Incineration with energy recovery	-	ton
	Energy conversion efficiency rate	-	%
Disposal (specified by type) Landfill	Product or material for final deposition	0.05	ton
Removals of biogenic carbon (excluding packaging)		-	kg CO_2

3.3. BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

In Module D, benefits and loads beyond the system boundaries are determined for the net output mass of recycling steel of the system.
Calculation of net output ass is made by adding all the system output mass flows of material for recycling in C module (0.95) and subtracting all input mass flows of secondary material steel in A1 module (0.561) thus calculating a net output mass from the product system.

Benefits and loads beyond the system are then calculated:

- By adding the environmental impacts resulting of the recycling processes of this net mass of stainless-steel up to the point of functional equivalence where primary production can be substituted
- By subtracting the environmental impacts connected to the production of primary stainless-steel production of net mass

The life cycle inventories used to calculate environmental impacts are as follows:

- For the recycling processes ecoinvent data “Steel, chromium steel 18/8 {RER}| steel production, electric, chromium steel 18/8 | Cut-off” is used. Data is modified to replace virgin ferronickel and ferrochromium quantities in the inventory by steel scrap. Steel scrap inventory consists in transport from the stock constituted in C3 module. An average 1000km distance is considered. We therefore only consider the operations required to melt the scrap.
- For primary stainless steel production processes, inventory consists in stainless steel made from virgin ferroalloys. The EPDs carried out in this report concern AISI 316 stainless steel grades, which are more impactful and less common in use than grade 304 for which the ecoinvent data described above is representative. As we do not have access to a representative inventory for European AISI 316 steel production, we use this ecoinvent inventory by default. This assumption is likely to reduce the avoided environmental impacts.

It should be noted that this balance is affected by the corrective factor on input quantities described in the section on data quality.

TABLE 7: BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D), RELEVANT SCENARIO INFORMATION

Name	Value	Unit
Recycling rate of product	95	%
Recycled content of product	56.1	%

4. ENVIRONMENTAL INDICATORS DERIVED FROM LCA

4.1. SYSTEM BOUNDARY MODULES

TABLE 8: DESCRIPTION OF THE SYSTEM BOUNDARY MODULES

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THESYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse. Recovery. Recycling Potential
Declared modules	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

MND: Modules Not Declared.

4.2. CARBON EMISSIONS AND REMOVALS

For transparency, the following indicators on the uptake and emissions of CO_2 are separately reported.

TABLE 9: CARBON EMISSIONS AND REMOVALS VALUES

Parameter [Unit]	A1	A2	A3	C1	C2	C3	C4	D
BCRP [kg CO_2]	0	0	0	0	0	0	0	0
BCEP [kg CO_2]	0	0	0	0	0	0	0	0
BCRK [kg CO_2]	0	0	0	0	0	0	0	0
BCEK [kg CO_2]	0	0	0	0	0	0	0	0
BCEW [kg CO_2]	0	0	0.379	0	0	0	0	0
CCE [kg CO_2]	65.4	0	0	0	0	0	0	0
CCR [kg CO_2]	0	0	0	0	0	0	0	0
CWNR [kg CO_2]	0	0	0.427	0	0	0	0	0

Abbreviations used:
BCRP: Biogenic Carbon Removal from Product, **BCEP**: Biogenic Carbon Emission from Product, **BCRK**: Biogenic Carbon Removal from Packaging, **BCEK**: Biogenic Carbon Emission from Packaging, **BCEW**: Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, **CCE**: Calcination Carbon Emissions, **CCR**: Carbonation Carbon Removals, **CWNR**: Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes.

4.3. LIFE CYCLE IMPACT ASSESSMENT RESULTS

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

TABLE 10: NORTH AMERICAN LIFE CYCLE IMPACT ASSESSMENT RESULTS

Impact category [Unit]	A1	A2	A3	C1	C2	C3	C4	D
GWP 100 [kg CO_2 eq]	2.09E+03	3.52E+01	7.04E+02	3.63E+00	1.35E+01	3.07E+01	2.57E-01	-1.61E+03
ODP [kg CFC-11 eq]	1.57E-04	7.25E-06	9.00E-05	8.29E-07	3.43E-06	1.25E-06	1.12E-07	-7.69E-05
AP [kg SO_2 eq]	2.23E+01	4.67E-01	1.55E+00	3.51E-02	4.95E-02	1.34E-01	2.20E-03	-8.25E+00
EP [kg N eq]	1.26E+00	2.92E-02	2.32E-01	3.08E-03	6.97E-03	1.59E-02	2.61E-04	-7.17E-01
SFP [kg O_3 eq]	1.50E+02	9.00E+00	2.82E+01	1.08E+00	1.09E+00	1.68E+00	5.44E-02	-9.50E+01
ADP_{fossil} [MJ, LHV]	2.57E+04	4.75E+02	8.09E+03	5.01E+01	2.08E+02	3.40E+02	7.28E+00	-1.62E+04

These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

TABLE 11: REST OF WORLD LIFE CYCLE IMPACT ASSESSMENT RESULTS

Impact category [Unit]	A1	A2	A3	C1	C2	C3	C4	D
GWP 100 [kg CO_2 eq]	2.09E+03	3.52E+01	7.04E+02	3.63E+00	1.35E+01	3.07E+01	2.57E-01	-1.61E+03
ODP [kg CFC-11 eq]	1.20E-04	5.45E-06	7.57E-05	6.22E-07	2.57E-06	8.73E-07	8.43E-08	-5.98E-05
EP [kg $(PO_4)^{-3}$ eq]	1.23E+00	5.21E-02	2.15E-01	5.97E-03	7.23E-03	1.47E-02	3.31E-04	-7.62E-01
AP [kg SO_2 eq]	2.22E+01	4.67E-01	1.55E+00	3.51E-02	4.95E-02	1.34E-01	2.20E-03	-8.26E+00
POCP [kg ethane eq]	1.06E+00	1.30E-02	1.12E-01	5.95E-04	1.73E-03	5.21E-03	7.83E-05	-3.82E-01

Abbreviations used:
GWP 100: Global Warming Potential, **ODP**: Ozone Depletion Potential, **AP**: Acidification Potential, **EP**: Eutrophication Potential, **SFP**: Smog Formation Potential, **ADP_{fossil}**: Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources.

GWP 100: Global Warming Potential, **ODP**: Depletion potential of the stratospheric ozone layer, **EP**: Eutrophication Potential, **AP**: Acidification Potential of soil and water, **POCP**: Photochemical Oxidant Creation Potential.

Comparability: Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate and could lead to erroneous selection of materials or products which are higher impact, at least in some impact categories.

4.4. LIFE CYCLE INVENTORY RESULTS

TABLE 12: LIFE CYCLE INVENTORY RESULTS: RESOURCE USE

Parameter [Unit]	A1	A2	A3	C1	C2	C3	C4	D
RPR_E [MJ]	6.32E+03	1.17E+01	9.64E+02	2.84E-01	2.70E+00	4.74E+01	6.27E-02	-4.79E+03
RPR_M [MJ]	0.00E+00	0.00E+00	1.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T [MJ]	6.32E+03	1.17E+01	9.79E+02	2.84E-01	2.70E+00	4.74E+01	6.27E-02	-4.79E+03
$NRPR_E$ [MJ]	2.87E+04	4.95E+02	1.34E+04	5.04E+01	2.12E+02	4.13E+02	7.36E+00	-1.80E+04
$NRPR_M$ [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_T$ [MJ]	2.87E+04	4.95E+02	1.34E+04	5.04E+01	2.12E+02	4.13E+02	7.36E+00	-1.80E+04
SM [kg]	1.13E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.30E+02
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m^3]	2.44E+01	9.41E-02	4.59E+00	2.47E-03	2.47E-02	2.30E-01	7.81E-03	-1.48E+01

TABLE 13: LIFE CYCLE INVENTORY RESULTS: OUTPUT FLOWS AND WASTE CATEGORIES

Parameter [Unit]	A1	A2	A3	C1	C2	C3	C4	D
HWD [kg]	1.59E+03	6.15E-01	7.83E+01	4.00E-02	1.47E-01	1.37E+00	4.98E-03	-1.82E+03
NHWD [kg]	2.03E+03	1.53E+01	1.26E+02	2.10E-01	2.09E+01	2.03E+01	5.00E+01	-1.84E+03
HLRW [kg]	1.67E-02	7.56E-05	1.55E-02	1.28E-06	1.47E-05	2.97E-04	2.69E-07	-8.38E-03
ILLRW [kg]	7.44E-02	3.15E-03	6.62E-02	3.47E-04	1.42E-03	9.84E-04	4.79E-05	-3.55E-02
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	2.05E+02	0.00E+00	5.36E+02	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

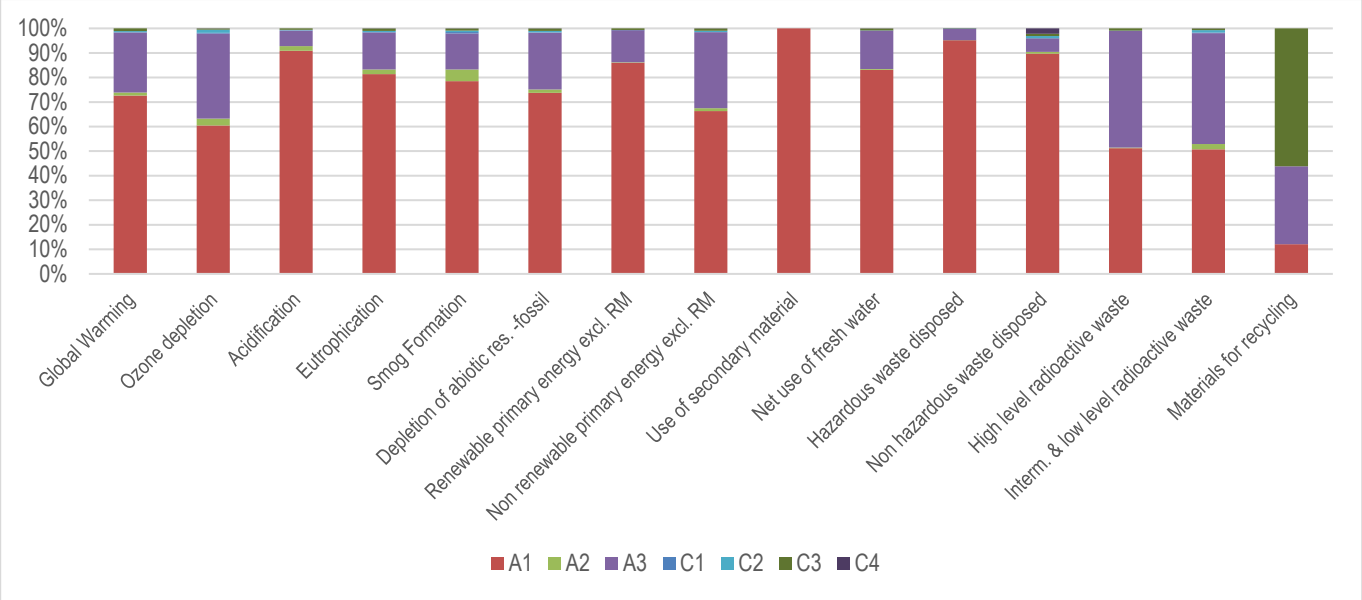
Abbreviations used:
RPR_E: Renewable primary resources used as energy carrier (fuel), **RPR_M**: Renewable primary resources with energy content used as material, **RPR_T**: Renewable primary resources, total **$NRPR_E$**: Non-renewable primary resources used as an energy carrier (fuel), **$NRPR_M$**: Non-renewable primary resources with energy content used as material, **$NRPR_T$**: Non-renewable primary resources total, **SM**: Secondary materials, **RSF**: Renewable secondary fuels, **NRSF**: Non-renewable secondary fuels, **RE**: Recovered energy, **FW**: Use of net fresh water resources.

HWD: Hazardous waste disposed, **NHWD**: Non-hazardous waste disposed, **HLRW**: High-level radioactive waste, conditioned, to final repository, **ILLRW**: Intermediate- and low-level radioactive waste, conditioned, to final repository, **CRU**: Components for re-use, **MR**: Materials for recycling, **MER**: Materials for energy recovery, **EE**: Recovered energy exported from the product system.

5. LCA INTERPRETATION

The following graph shows for the non-zero indicators the distribution between the contributions of the different stages of the life cycle.

FIGURE 1: DISTRIBUTION BETWEEN THE CONTRIBUTIONS OF THE DIFFERENT STAGES OF THE LIFE CYCLE FOR NON-ZERO INDICATORS



Interpretation:

- The main contributor to environmental impacts is the manufacture of raw materials (A1), especially specific filler metals such as chromium or nickel.
- The significant energy consumption for melting scrap and filler metals and shaping steel coils is the second largest contributor (A3).
- The transport of raw materials is a minority contributor, although a significant portion of the materials come from all over the world.
- The indicative end-of-life scenario for this cradle-to-gate EPD highlights the low environmental impacts of preparing steel for recycling and the substantial gains outside the system boundaries (D).

The following table presents the weighted coefficient of variation of the LCIA results for all products included in the weighted average declaration:

TABLE 14: NORTH AMERICAN LIFE CYCLE IMPACT ASSESSMENT RESULTS: WEIGHTED COEFFICIENTS OF VARIATION

Impact category	Weighted coefficient of variation
GWP 100 [kg CO_2 eq]	0.01%
ODP [kg CFC-11 eq]	0.04%
AP [kg SO_2 eq]	0.00%
EP [kg N eq]	0.07%
SFP [kg O_3 eq]	0.02%
ADP_{fossil} [MJ, LHV]	0.02%

6. ADDITIONAL ENVIRONMENTAL INFORMATION

6.1. ENVIRONMENT AND HEALTH DURING MANUFACTURING

All Aperam factories conform to the ISO 9001 Quality Management Systems, ISO 14001 Environmental Management System and ISO 45001 Occupational Health and Safety Management System (or OHSAS 180001, some sites are still in transition).

6.2. ENVIRONMENT AND HEALTH DURING INSTALLATION

The manufacturer's guidelines should be adhered to during the installation of this product.

Fire: The product obtained the reaction to fire classification by the EN 13501-01 rated as non-flammable according to the safety class A1.
Water: Even if unexpected flooding exposes the product to water, there are no risks to the environment or human health.
Mechanical Destruction: Mechanical destruction of the product is neither expected to alter chemically the product nor pose any risks to the environment or human health.

6.3. ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

Aperam became the first stainless steel company to earn ResponsibleSteel™ certification. Indeed, September 23, 2021 Aperam announces that its Stainless Europe operations have been successfully certified to be operating at the ResponsibleSteel™ Standard by the independent auditors AFNOR. The ResponsibleSteel™ initiative is the first global sustainability certification program for the steel sector and its certification follows a stringent audit of the company's practices.
The ResponsibleSteel™ Standard, which was designed together by business partners and NGOs with the aim of promoting steel as a responsible material of choice, contains 12 principles with more than 200 requirements that set the benchmark for responsible steel production. The audit of Aperam's facilities, which took place in June and included Aperam's Châtelet, Genk, Gueugnon, Isbergues and Saint-Denis sites in Belgium and France, examined such sustainability topics as: Governance and ethics; Health & Safety and other labor and human rights; Climate change, greenhouse gas emissions and biodiversity; Water stewardship and other environmental impacts; and Stakeholder engagement and local community relations.
In accordance with the standard process, Aperam's sites were screened based on written documentation, and underwent on-site audits by third-party auditors from AFNOR Certification. The analysis was completed by more than 40 exchanges with our external stakeholders, including officials, neighbors, associations, subcontractors, employees, and unions. An independent Assurance Panel reviewed the final audit report and agreed with the audit team's conclusion that Aperam meets the ResponsibleSteel™ criteria.

6.4. FURTHER INFORMATION

Further information concerning the product may be found at the company website: https://www.aperam.com

7. SUPPORTING DOCUMENTATION

All documentation necessary to confirm the data provided in this EPD has been submitted to the critical reviewer.

8. REFERENCES

UL ENVIRONMENT
- UL Environment General Program Instructions March 2020, version 2.5
- Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL Environment (December 2018, version 3.2)
- Part B: Designated Steel Construction - Product EPD Requirements (August 2020, version 2)

SUSTAINABILITY REPORTING STANDARDS
- EN 15804:2012+A1:2013 - Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction product.
- ISO 14025:2006 - Environmental labels and declarations – Type III environmental declarations – Principles and Procedures
- ISO 14040:2006 - Environmental management – Life cycle assessment – Principles and framework
- ISO 14044:2006 - Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 21930:2017 - Sustainability in building construction – Environmental declaration of building products
- Product Category Rule Guidance Development Initiative. Guidance for Product Category Rule Development. (August 28, 2014, version 1.0).

RELEVANT FEDERAL STANDARDS AND SOPS
- Environment Canada, National Pollutant Release Inventory (NPRI) (http://www.ec.gc.ca/inrp-npri/)
- EPCRA 313 Toxic Release Inventory Reporting (U.S.) (https://www.epa.gov/toxics-release-inventory-tri-program) Accessed 08 December 2017.
- US EPA, ORD/NRMRL/Sustainable Technology Division, Systems Analysis Branch, SOP No. S-10637-OP-1-0- Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI), Software Name and Version Number: TRACI version 2.1, USER'S MANUAL, 24 July, 2012

RELEVANT PCRS
PCR Guidance-Text for Building Related Products and Services. Part B: Requirements on the EPD for Structural Steel. IBU. version 1.6, November 2017.

LCI DATABASE
Life Cycle Inventory ecoinvent database, version 3.8, September 2021. http://www.ecoinvent.org

AISC, ASTM AND AISI STANDARDS
- AISC 303-10, Code of Standard Practice for Steel Buildings and Bridges. American Institute of Steel Construction,
- Chicago, IL. 2010.
- ANSI/AISC 360-16, Specification for Structural Steel Buildings. ANSI. (2016).
- AISI S100-16, North American Specification for the Design of Cold-Formed Steel Structural Members. American Iron and Steel Institute, Washington DC. (2016).
- AISI S201-12, North American Standard for Cold-Formed Steel Framing – Product Data 2012 Edition. AISI. (2012).
- AISI S220-15, North American Standard for Cold-Formed Steel Framing - Nonstructural Members. American Iron and Steel Institute, Washington DC, Standard. 2015.
- AISI S240-15, North American Standard for Cold-Formed Steel Structural Framing. American Iron and Steel Institute, Washington DC, Standard 2015
- ASTM A615/A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, ASTM International, West Conshohocken, PA, (2014).
- ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, ASTM International, West Conshohocken, PA, (2015).
- ASTM A706/A706M, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement, ASTM International, West Conshohocken, PA, (2014).
- ASTM A1003 / A1003M, Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members, ASTM International, West Conshohocken, PA, (2013).
- ASTM C1047, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base, ASTM International, West Conshohocken, PA, (2014a).

9. CONTACT INFORMATION

	Publisher UL Environment 333 Pfingsten Road, Northbrook IL 60611 US	Tel Fax Mail Web	+49 (0)221 931 245 30 +49 (0)221 931 245 33 environment@ul.com www.ul.com
	Author of the Life Cycle Assessment EVEA Conseil 11 Rue Arthur III 44200 Nantes FRANCE	Tel Fax Mail Web	+33 (0)2 28 07 87 00 +33 (0)2 40 71 97 41 info@evea-conseil.com www.evea-conseil.com
	Owner of the Declaration 24-26 Boulevard d'Avranches L-1160 Luxembourg LUXEMBOURG	Tel Fax Mail Web	+352 27 36 27 00 +352 27 36 27 159 stainless@aperam.com www.aperam.com