

ENVIRONMENTAL PRODUCT DECLARATION

HOT-ROLLED REINFORCING STEEL FOR CONCRETE IN BARS AND COILS



Based on:

PCR ICMQ-001/15 v3

EN:15804:2012+A2:2019

UNI EN ISO 14025:2010

Certification N°:

EPDITALY0004

Product CPC code:

41

Date of issue:

2016/04/12

Revision date:

2023/07/28

Valid until:

2026/08/03

Declaration number:

AA_EPD_001

GENERAL INFORMATION

EPD REFERENCES

EPD OWNER: ALFA ACCIAI, VIA SAN POLO 152, 25134, BRESCIA – ITALY; MANUFACTURING PLANT IS LCOATED IN THE SAME SITE

PROGRAM OPERATOR: EPDITALY, VIA GAETANO DE CASTILLIA 10, 20124 MILANO - ITALY

INDEPENDENT VERIFICATION

This declaration has been developed referring to the EPDItaly, following the last version of "Regolamento di EPDItaly"; further information and the document itself are available at: www.epditaly.it. EPD document valid within the following geographical area: Italy and other countries worldwide according to sales market conditions.

CEN standard EN 15804 served as the core PCR (PCR ICMQ-001/15 v3)
PCR review conducted by Daniele Pace, contact via info@epditaly.it

Independent verification of the declaration and data, according to UNI EN ISO 14025:2010

Third party verifier: ICMQ SpA, via De Castilia, 10 20124 Milano (www.icmq.it)

EPD process certification (Internal)

EPD verification (External)

Accredited by: Accredia

Environmental declarations published within the same product category, though originating from different programs, may not be comparable. In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804.

CONTACTS

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Technical support to Alfa Acciai was provided by Life Cycle Engineering, Italy.
(info@studiolce.it, www.lcengineering.eu).



1. ALFA ACCIAI GROUP



For almost 70 years, the Alfa Acciai Group has been one of the leading Italian and European producers of reinforced concrete steel and wire rod, with 1,200 employees and with a total production capacity of 2.5 million tons per year and today represents a technologically advanced reality, attentive to the environment and present throughout the steel supply chain.

The Group is characterized by a marked industrial flexibility and maximum operational efficiency upstream and downstream of the smelting process, responds successfully to the continuous changes in the national and foreign steel market and to the growing attention of citizens towards environmental issues and always maintains high attention to its collaborators and customers.

ALFA ACCIAI, the Brescia-based parent company, is one of the leader and major producer of steel for reinforced concrete and wire rod in Italy and Europe. The production process in the EAF (electric arc furnace) steel mill sites involves two EAF (electric arc furnaces) followed by 2 LF (ladle furnaces), 2 continuous casting machines (10 lines) and a shredder for proler production. Hot rolling is equipped with two bars and spool mills and a wire rod mill. The production cycle is completed by cold rolling mills that produce welded wire mesh and recoiled wire.

ACCIAIERIA DI SICILIA located in the industrial area of Catania, has been part of the Alfa Acciai Group since 1998, is the only steel mill in Sicily and is located in the heart of the Mediterranean. It is one of the main industrial centers of the Region and is characterized by a strong export vocation thanks to its proximity to significant port infrastructures. The company stands out for its constant technological innovation and steel know-how, factors that guarantee increasingly high-quality standards, respecting the environment and the health and safety of its employees. The production process includes an EAF (electric arc furnace), a continuous casting machine (4 lines) and a hot rolling mill to produce bars and spool.

TECNOFIL, located in Gottolengo (BS), has been part of the Alfa Acciai Group since September 2016. The company is a drawing mill that has the largest galvanizing plant in Italy and among the largest in Europe and completes the production chain of wire rod downstream. It produces galvanized wires and tapes, , alu-zinc and bright wire fzinc aluminum and polished wires for use in construction, household appliances, automotive and numerous other applications of everyday life. Over the years the company has significantly expanded its overall production capacity (currently over 100,000 tons / year) and the range of products to be offered on the market.

FERRO BERICA has been part of the Alfa Acciai Group since September 2016 and has 4 operational sites located in: Vicenza, Montirone (BS), Catania and Sedegliano (UD). The company is the largest Italian player (second in Europe) in the pre-shaping and assembly of reinforced concrete bars destinates to the main construction companies for use in structural works. Ferroberica thanks to the know-how acquired, reliability in supplies, competitiveness on the market and attention to quality and customer care, represents a cutting-edge production reality, equipped with latest generation machinery and with an annual production capacity of more than 300,000 tons.

SCOPE AND TYPE OF EPD

THE APPROACH USED IN THIS EPD IS "CRADLE TO GATE WITH OPTIONS" ONE

TABLE OF MODULES																	
	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
	Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De- construction demolition	Transport	Waste processing	Disposal	Reuse - Recovery - Recycling potential
MODULE	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	IT	IT	IT	WLD	-	-	-	-	-	-	-	-	WLD	WLD	WLD	WLD	WLD
Specific data used	> 90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	NOT RELEVANT			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-sites	NOT RELEVANT			-	-	-	-	-	-	-	-	-	-	-	-	-	-

SOFTWARE: SimaPro ver. 9.5

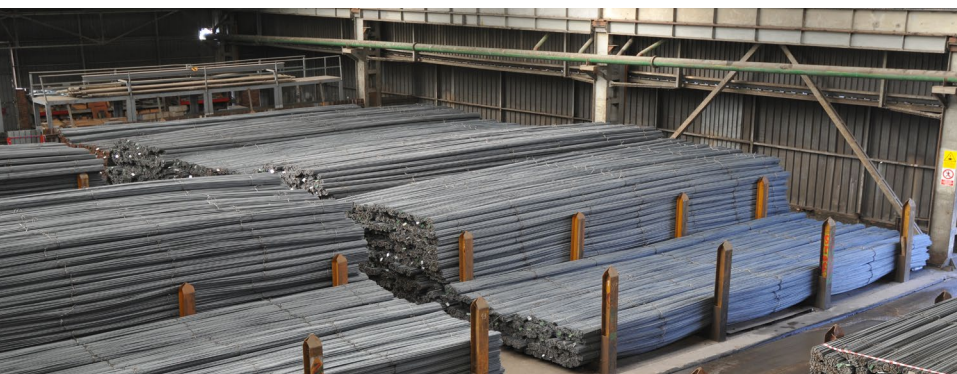
MAIN DATABASE: Ecoinvent 3.9.1

REPORT LCA: Life Cycle Assessment (LCA) for hot and cold rolled structural steel and for Sinstone recycled aggregate produced by Alfa Acciai for EPD® purposes - Final Report

GEOGRAPHICAL SCOPE OF THE EPD: World according to sales market conditions

TYPE OF EPD: specific for hot rolled steel products

2. THE PRODUCT



HOT-ROLLED REINFORCING STEEL FOR CONCRETE IN BARS

This EPD refers to construction products, hot rolled structural steel bars, produced at Alfa Acciai plant placed in Brescia (Italy), with electric arc furnace technology, starting from post and pre consumer steel scraps. The homogeneous and repeatable mechanical features of steel guarantee excellent performance in any type of construction and geographical area, since they have high ductility.

EPD reference products have a chemical composition in compliance with national regulation of destination countries where they are sent. In general, the main materials of the final product are: *iron > 96%*; *alloy elements* (e.g. manganese, silicon, carbon) *2% c.a.*; *other elements* (e.g.. copper, nickel, chromium), *complementary to 100%*.










DECLARED UNIT

According to EN:15804, the declared unit is **1 ton of hot rolled product in bars**

INFORMATION	DESCRIPTION
Product identification	Hot-rolled reinforcing steel for concrete in bars and coils
Product features	<p>Bars: Diameters from 8 mm to 32 mm Length up to 18 m Weight: 2 300 kg per bundle</p> <p>Coils: Diameters from 6 to 16 mm Weight from 2 500 to 5 000 kg according to the diameter</p>
Product properties (under EN10080:2005)	<p>Steel coming from post and pre consumer steel scraps produced in electric arc furnace route (EAF) and further hot rolling process.</p> <p>Adherence and surface geometry f_R or f_p :</p> <ul style="list-style-type: none"> - for $5 \leq \varnothing \leq 6$ mm f_R or f_p 0.035; - for $6 < \varnothing \leq 12$ mm f_R or f_p 0.040; - for $\varnothing > 12$ mm f_R or f_p 0.056. <p>Weldability: $C_{eq} < 0.52$</p> <p>Typical yield stress: $400 \text{ MPa} \leq C_v \leq 600 \text{ MPa}$</p> <p>Elongation: $A_{gt} > 5\%$</p> <p>Successful in bend and rebend test</p> <p>Successful in strength test and oligocyclic strength test</p>
Plant features	<p>Products covered by this EPD, year 2022: 682 804 t</p> <p>Total production, for selling purpose, year 2022: 1 168 521 t</p> <p>On-site air emission control system</p> <p>On-site waste water control system</p> <p>On-site system to recycle water used in process</p> <p>In/out materials/products and melting process monitored to prevent nuclear radiation</p> <p>Plant air emissions accounted under ETS (Emission Trading System)</p>

ENVIRONMENTAL PERFORMANCE

The detailed environmental performance (in terms of use of resources, pollutant emissions and waste generation) is presented for the three phases, Upstream, Core and Downstream and related sub-phases (A1-A2-A3-A4-C1-C2-C3-C4-D). The numbers reported in the following tables are the outcome of rounding. For this reason total results could slightly differ from the sum of contributions of the different phases. The energy sources behind the electricity grid used in manufacturing is the Italian residual mix 0,457 kg CO₂ eq./kWh (AIB report May 2023) to which LCE adds emissions related to network losses and transformation

ENVIRONMENTAL IMPACTS											
 TABLE OF MODULES POTENTIAL ENVIRONMENTAL IMPACTS	UNITS / D.U.	UPSTREAM		CORE PROCESS		DOWNSTREAM					
		A1 	A2 	A3 	A1:A3	A4 	C1 	C2 	C3 	C4 	D 
GWP	kg CO ₂ eq	5,26E+02	2,65E+01	1,36E+02	6,89E+02	3,45E+01	5,38E+01	1,82E+01	2,36E+00	2,78E-01	1,54E+02
GWP,f	kg CO ₂ eq	5,25E+02	2,65E+01	1,36E+02	6,88E+02	3,45E+01	5,38E+01	1,82E+01	2,35E+00	2,78E-01	1,54E+02
GWP,b	kg CO ₂ eq	3,38E-01	1,94E-03	1,80E-01	5,20E-01	2,53E-03	3,94E-03	1,34E-03	7,09E-03	3,59E-05	1,44E-02
GWP,luluc	kg CO ₂ eq	1,51E-01	5,12E-04	6,67E-02	2,18E-01	6,71E-04	2,16E-03	3,52E-04	5,79E-03	1,36E-05	1,41E-02
GWP,ghg	kg CO ₂ eq	5,26E+02	2,65E+01	1,36E+02	6,89E+02	3,45E+01	5,38E+01	1,82E+01	2,36E+00	2,78E-01	1,54E+02
ODP	kg CFC11 eq	1,26E-05	5,64E-07	5,16E-07	1,37E-05	7,34E-07	8,29E-07	3,88E-07	1,44E-08	4,02E-09	2,77E-06
AP	mol H+ eq	1,81E+00	5,25E-02	2,74E-01	2,14E+00	7,67E-02	5,04E-01	3,59E-02	1,12E-02	2,51E-03	5,73E-01
EP,f	kg P eq	1,05E-02	2,05E-05	2,66E-03	1,32E-02	2,67E-05	4,50E-05	1,41E-05	1,16E-04	9,54E-07	6,48E-03
EP,m	kg N eq	3,56E-01	1,84E-02	9,83E-02	4,73E-01	2,60E-02	2,37E-01	1,26E-02	2,16E-03	1,14E-03	1,13E-01
EP,t	mol N eq	3,97E+00	1,91E-01	1,01E+00	5,17E+00	2,72E-01	2,57E+00	1,31E-01	2,38E-02	1,24E-02	1,31E+00
POCP	kg NMVOC eq	1,70E+00	8,82E-02	2,71E-01	2,06E+00	1,21E-01	7,57E-01	6,06E-02	7,15E-03	3,71E-03	7,00E-01
ADPE*	kg Sb eq	1,39E-04	8,97E-07	2,22E-06	1,43E-04	1,16E-06	2,21E-06	6,18E-07	6,57E-08	1,07E-08	1,30E-03
ADPF*	MJ	9,39E+03	3,41E+02	7,76E+02	1,05E+04	4,44E+02	6,80E+02	2,35E+02	3,96E+01	3,48E+00	1,88E+03
WDP*	m ³	3,36E+01	3,19E-01	1,52E+02	1,86E+02	4,16E-01	8,92E-01	2,20E-01	4,19E-01	4,82E-03	1,80E+01

Additional environmental impact indicators are computed in the LCA report but not reported in the EPD.

*The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

GWP Global warming potential, total

GWP,f Global warming potential, fossil

GWP,b Global warming potential, biogenic

GWP,luluc Global warming potential, land use & land use change

ODP Ozone depletion potential

AP Acidification Potential

EP,f Eutrophication potential, freshwater

EP,m Eutrophication potential, marine

EP,t Eutrophication potential, terrestrial









POCP Photochemical ozone creation potential

ADPE Abiotic depletion potential minerals & metals

ADPF Abiotic depletion potential fossil fuels











WDP Water use deprivation potential

RESOURCE USE PER DECLARED UNIT

 USE OF RENEWABLE MATERIAL RESOURCES	UNITS / D.U.	UPSTREAM		CORE PROCESS			DOWNSTREAM				
		A1 	A2 	A3 	A1:A3	A4 	C1 	C2 	C3 	C4 	D 
PERE	[MJ]	4,68E+02	9,13E-01	1,20E+02	5,89E+02	1,19E+00	1,35E+00	6,28E-01	4,34E+00	1,55E-02	1,06E+02
PERM	[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	0,00E+00	0,00E+00
PERT	[MJ]	4,68E+02	9,13E-01	1,20E+02	5,89E+02	1,19E+00	1,35E+00	6,28E-01	4,34E+00	1,55E-02	1,06E+02
PENRE	[MJ]	9,01E+03	3,51E+02	7,73E+02	1,01E+04	4,57E+02	7,00E+02	2,42E+02	4,01E+01	3,57E+00	1,89E+03
PENRM	[MJ]	4,26E+02	0,00E+00	1,45E+01	4,41E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	9,44E+03	3,51E+02	7,87E+02	1,06E+04	4,57E+02	7,00E+02	2,42E+02	4,01E+01	3,57E+00	1,89E+03
SM	[kg]	1,46E+03	0,00E+00	0,00E+00	1,46E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
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	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	0,00E+00	0,00E+00
FW	[m ³]	1,13E+00	1,45E-02	3,83E+00	4,98E+00	1,89E-02	3,44E-02	1,00E-02	1,76E-02	1,82E-04	3,60E-01

- PERE** Use of renewable primary energy excluding renewable primary energy resources used as raw materials
- PERM** Use of renewable primary energy resources used as raw materials
- PERT** Total use of renewable primary energy resources
- PENRE** Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
- PENRM** Use of non-renewable primary energy resources used as raw materials
- PENRT** Total use of non-renewable primary energy resources
- SM** Use of secondary raw materials
- RSF** Use of renewable secondary fuels
- NRSF** Use of non-renewable secondary fuels
- FW** Use of net fresh water

OUTPUT FLOWS AND WASTE CATEGORIES

 WASTE GENERATION AND TREATMENT	UNITS / D.U.	UPSTREAM		CORE PROCESS		DOWNSTREAM					
		A1 	A2 	A3 	A1:A3	A4 	C1 	C2 	C3 	C4 	D 
HWD	[kg]	0,00E+00	0,00E+00	2,72E+00	2,72E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NHWD	[kg]	0,00E+00	0,00E+00	7,98E+01	7,98E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,00E+02	0,00E+00
RWD	[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	0,00E+00	0,00E+00
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	0,00E+00	0,00E+00
MFR	[kg]	0,00E+00	0,00E+00	2,12E+02	2,12E+02	0,00E+00	0,00E+00	0,00E+00	9,00E+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	0,00E+00	0,00E+00
EE	[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	0,00E+00	0,00E+00

- HWD** Hazardous waste disposed
- NHWD** Non-hazardous waste disposed
- RWD** Radioactive waste disposed
- CRU** Components for re-use
- MFR** Materials for recycling
- MER** Materials for energy recovery
- EE** Exported energy



3. CALCULATION RULES

The environmental burden of the product has been calculated according to EN 15804:2012+A2:2019¹ and PCR ICMQ-001/15 v3. This declaration is a cradle to gate with options EPD type, based on the application of Life Cycle Assessment² (LCA) methodology to the whole life-cycle system.

In the whole LCA model, infrastructures and production equipments are not taken into account.

Hot rolled steel products at plant level, were described by using specific data from manufacturing facility (Brescia, Italy) for year 2022.

Customized LCA questionnaires were used to gather in-depth information about all aspects of the production system (for example, raw materials contents and specifications, pre treatments, process efficiencies, air and water emissions, waste management), in order to provide a complete picture of the environmental burden of the system from raw materials supply (A1) to Transport (A2) and Manufacturing (A3).

The use phase was not considered according to EN:15804 and PCR ICMQ-001/15 v3, while transport to final destination (A4) and end of life (C1-C2-C3-C4-D) were considered. The product is designed for being incorporated into concrete structures. Therefore, in nominal installation and operating conditions, no emissions to air nor to water shall occur.

According to ISO 14040 and 14044, allocation is avoided whenever possible by dividing the system into sub-systems. When allocation cannot be avoided physical properties are used to drive flow analysis.

Data quality has been assessed and validated during data collection process.

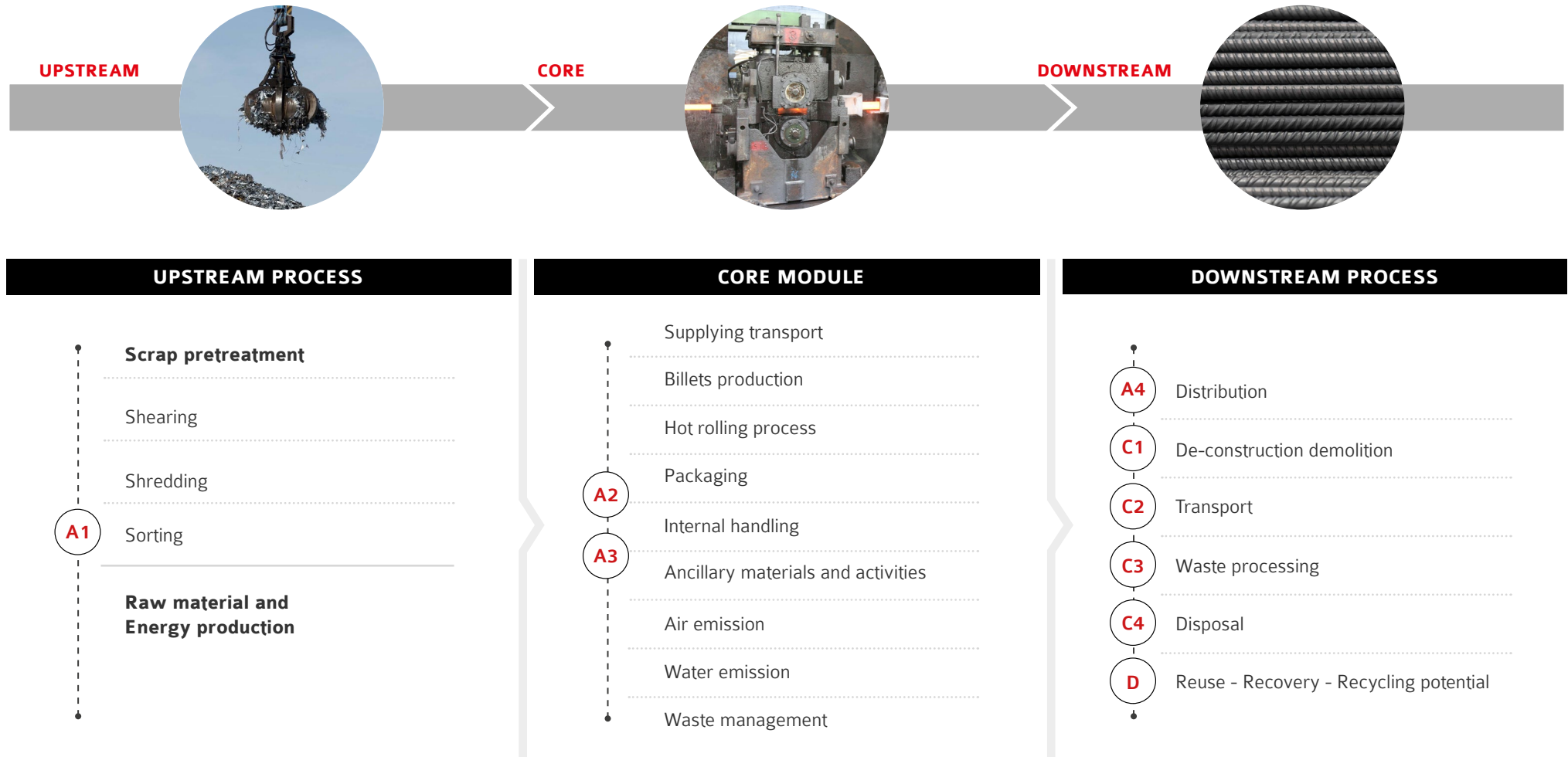
According to EN:15804 the applied cut-off criterion for mass and energy flows is 1%.

¹EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations
Core rules for the product category of construction products.

²The LCA methodology is standardized at international level by ISO 14040 and ISO 14044.

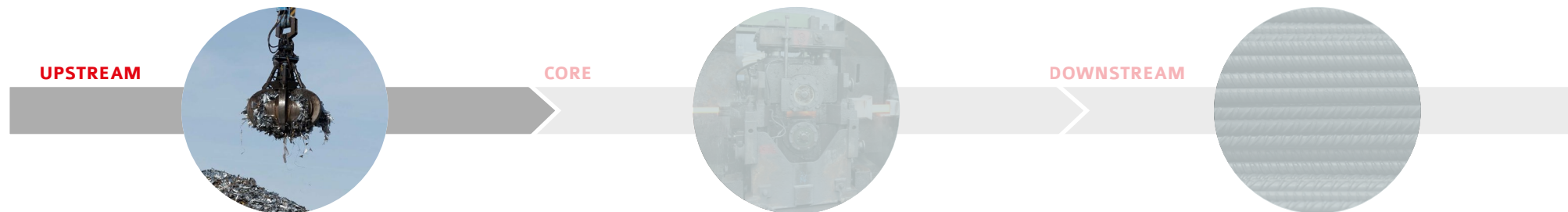


4. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

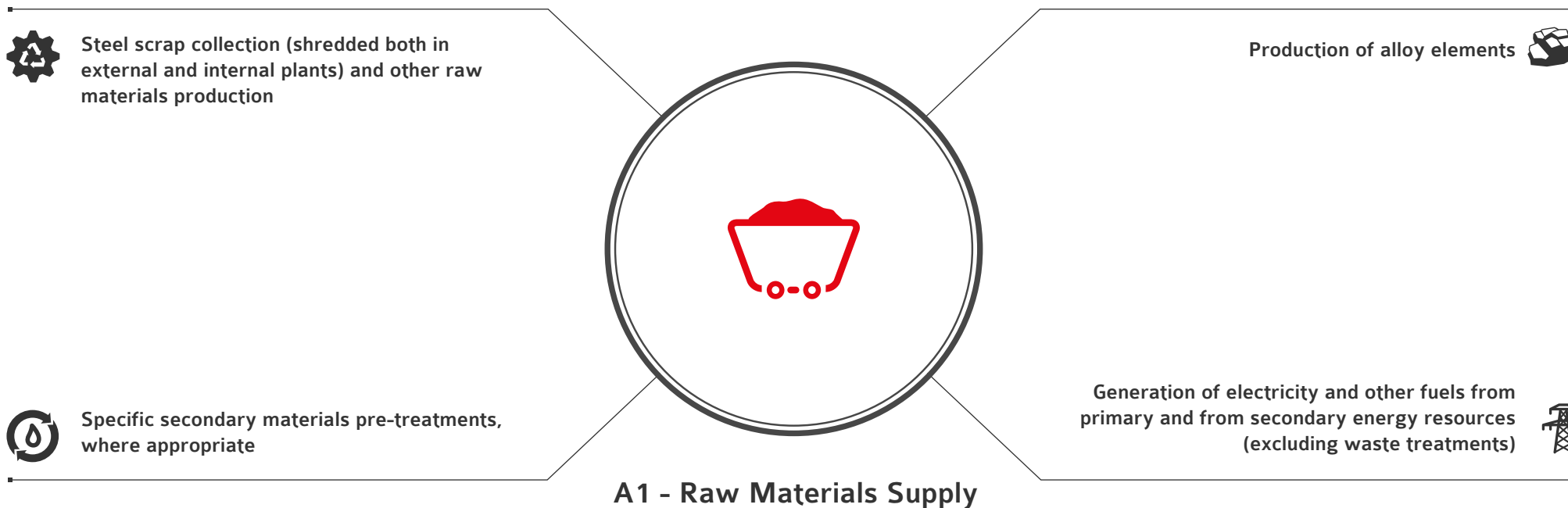


Broad scheme of hot-rolled reinforcing steel for concrete production, in which the main activities included in the system boundaries, are listed and divided in the three subsystems: **UP-STREAM** Process, **CORE** Module and **DOWNSTREAM** Process.

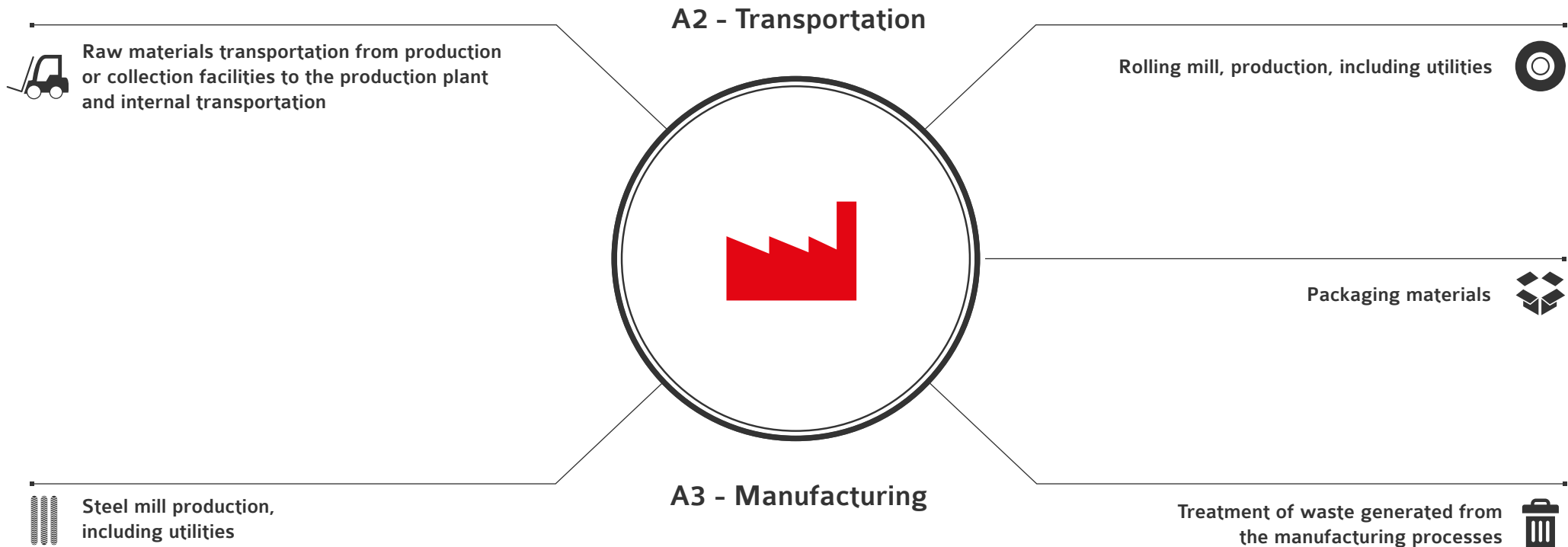
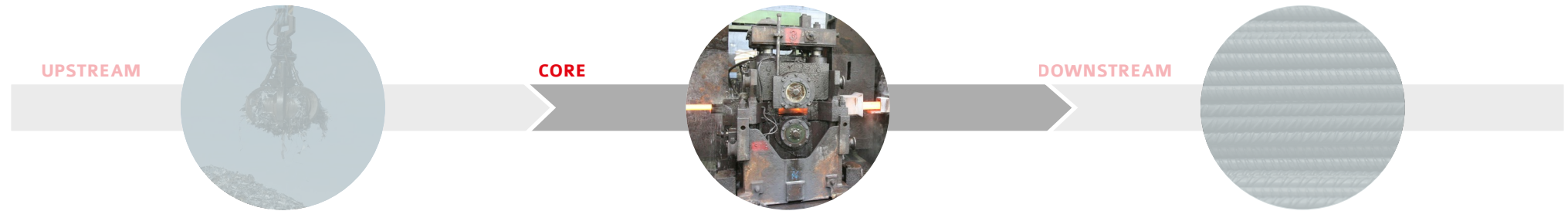
UPSTREAM PROCESS



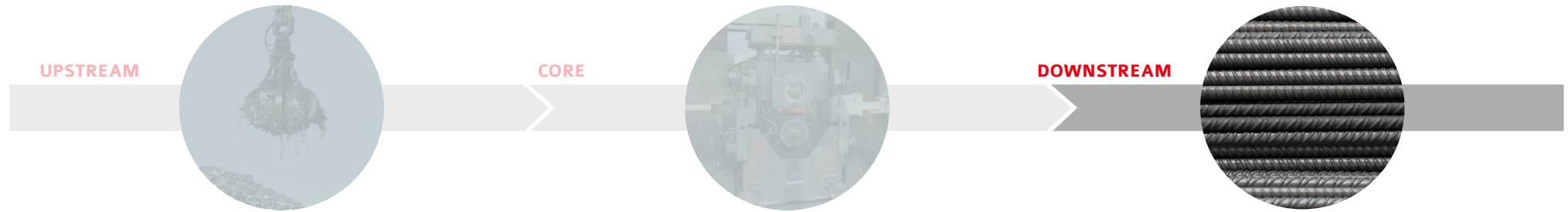
Scheme of the considered system boundaries (upstream processes).



CORE PROCESS



DOWNSTREAM PROCESS



A4 Distribution

Transport to the customers (general market average). Distances estimated considering the transported quantities and the distances from Brescia plant to the client. From Brescia (in the North of Italy) final products are delivered to many national (65% of the total sold product) and international areas such as Germany, France and Austria, mentioning the main countries.

The means of transport used to deliver steel bars are truck and freight ship.

C1 De-construction demolition

Dismantling and demolition operations required to remove the product from the building. Initial onsite sorting of the materials is included as well.

C2 Transport

Transportation of the discarded product as part of the waste processing (to recycling site or to a final disposal site).

C3 Waste processing

Waste processing, including collection of waste fraction from deconstruction and waste processing of material flows intended for reuse, recycling and energy recovery.

C4 Disposal

Waste disposal including physical pre-treatment and management of the disposal site.

D Reuse - Recovery - Recycling potential

Environmental impacts associated to waste use after the investigated system (including recycling).

In this module impacts arising from steel recycling are accounted, including avoided impacts associated to primary steel production. The result is expressed as net value between direct impact (i.e. recycling steel in EAF furnace) and avoided impact (i.e. producing steel from iron ore in BOF furnace).

5. OTHER OPTIONAL ADDITIONAL ENVIRONMENTAL INFORMATION

6. REFERENCES

- EN 15804:2012+A2:2019
- ISO 14040:2021
- ISO 14044:2021
- Life Cycle Assessment (LCA) for hot and cold rolled structural steel and for Sinstone recycled industrial aggregate produced by Alfa Acciai for EPD® purposes - Final Report
- EPDIItaly General Programme Information v5.2
- PCR ICMQ-001/15 v3

OTHER ENVIRONMENTAL CHARACTERISTICS OF ALFA ACCIAI PLANT

The production process involves scrap melting in the two electric arc furnaces (EAFs) with a total annual production capacity of about 2,000,000 tonnes, liquid steel tapping and secondary metallurgical processing in the two ladle furnaces, and finally casting in the two 5-line continuous casting machines. Alfa Acciai plant is equipped with powerful off-gas filtering system for both furnaces with active carbons injection to prevent and reduce the organic micro pollutants in air emissions (PCDD /F and PCB). Alfa Acciai in Brescia is a model of circular economy as through the rational consumption of materials and recycling strategies it minimizes the use of raw natural resources and enhances the residues produced. In recent years, environmental issues have assumed increasing importance worldwide, Alfa Acciai has shown itself to be sensitive to these aspects, undertaking actions aimed at reducing its impact. Among the main projects the following stand out:

- SmartGrid Pilot Project recovers heat from the offgas plant cooling system serving the furnaces at the steel mill and through an highly energy-efficient heat exchange system connects the Alfa Acciai process and the A2A district heating network. Thanks to this plant more than 6,000 residential units should be heated and at the same time reduces heat loss into the atmosphere and make-up water consumption;
- Decarbonisation, achieved among other, through the partial replacement of the coal and its derivatives, in the EAF process, with recycled polymers reach in biomass carbon with the aim of reduce CO₂ emissions;
- Energy efficiency, through the implementation of initiatives geared towards optimising the use of energy resources and reducing consumption, e.g., through energy optimisation processes based on the recovery of heat generated by industrial facilities and increased use of energy from renewable sources.

Content of recycled materials \geq 99,0%
(Certified by ICMQ SpA following UNI/PdR 88:2020)