Environmental Product Declaration for Reinforcement Steel Products for Concrete

According to EN 15804:2012+A1:2013, ISO 14025, ISO 14040 and ISO 14044

Program operator: International EPD® System
EPD owner: Hercules Grundläggning AB
Address, production site: Blixholmsvägen 6, 60268 Norrköping, Sweden

First publication date 2021-05-26	Last revision date: -	Valid until 2026-05-25	Version 2021-05-26
Reg. no. S-P-02143	UN CPC 4126		

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product, its production process or its supply chain.

This is a “cradle-to-gate with options” EPD based on an LCA model described in the LCA background report. The EPD considers reinforcement steel made from hot rolled products as coils, rebars, and mesh, transformed into straight, cut and bend rebars, and mesh and special welded products. The products are manufactured at Hercules Armering / Hercules Grundläggning AB´s site in Norrköping, located in Sweden.

In 2020, about 17 354 tonnes of reinforcing products were produced at the site.

The declared products are intended to be used to reinforce concrete and masonry structures.

EPD INFORMATION	
Declared unit:	1000 kg of average reinforcement steel product
RSL:	Not specified
PCR:	Product Category Rules PCR 2012:01. Construction products and construction services. Version 2.33 of 2020-09-18.
Program operator:	The International EPD® System operated by EPD International AB Box 210 60 SE-100 31 Stockholm Sweden info@environdec.com

DESCRIPTION OF THE PRODUCT

Hercules Armering is a reseller of reinforcement mesh and rebars, and cuts, bends, and assembles various reinforcement products as custom-made prefabricated cages. Hercules' products range from cut and bend, straight bars, and mesh to an extensive production of prefabricated reinforcement elements as special welded products. The dimensions of the products may vary according to the particular specifications of the construction project. Hercules´ site in Norrköping provides reinforcement of different lengths up to 18 m and diameters of 8-32 mm.

Four types of products are produced at the site; *cut to length (25%)*, *cut & bend 33%)*, *stock length (24%)* and *mesh (18%)* (product type distribution in 2020 within parenthesis).

The products declared are certified by GlobeCert AB according to following technical standards for steel products:

- BS 6744:2016
- EN 10 080:2005 + NS 3576 – 2:2012
- NS 3576 – 3:2012 + SS212540:2014
- Steelgrades according to EC2

Performance data of the products declared are presented in Table 1. These are based on average data from a test report, see reference list.

Table 1: Performance data of products declared.

Property	Value and Unit
Density	7800 kg/m^3
Nominal diameter	8 mm
Yield strength (Re_H)	553 MPa
Tensile strength (R_M)	673 MPa
Ratio R_M/Re_H	1.22
Elongation	9.6 %

The delivered steel bars are first cut to the required length. The bars are then bent into the final shape according to specifications. For cages, individual bars are welded together. At the end of the process, textile lifting slings are wrapped around the reinforcing products or fixed on pallets and are thus ready for delivery. Depending on the type of product, euro pallets are also equipped with collars. All packaging materials are usually reused afterwards. The manufacturing process is presented in Figure 1 below.

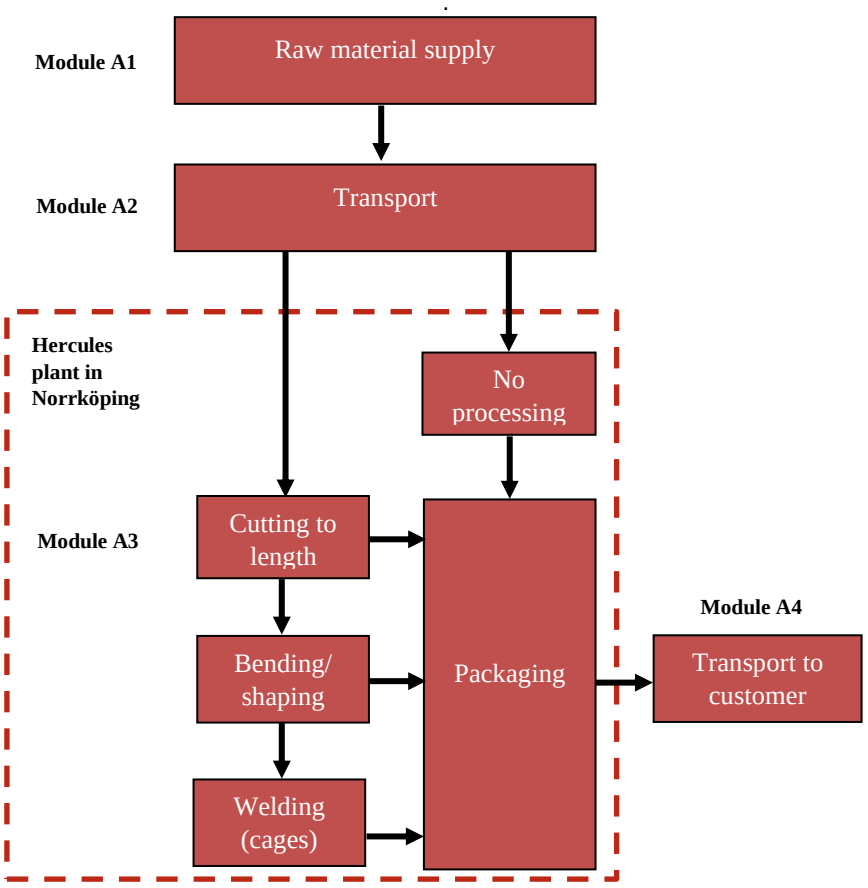

Figure 1: Process set-up for the production of reinforcement steel at the declared site.

The base material of structural steel sections and merchant bars is iron. Alloying elements are added in the form of ferroalloys or metals (most common elements are manganese and chromium). Other elements such as nitrogen or copper may be present in the steel, depending on the steel designation/grade.

The products declared are classified according to the United Nations Central Product Classification (UN CPC) 4126. The products declared do not contain any substances of very high concern (SVHC) according to REACH.

The geographical location of the declared site is shown in Figure 2. It also shows that the products are delivered to customers within Sweden.

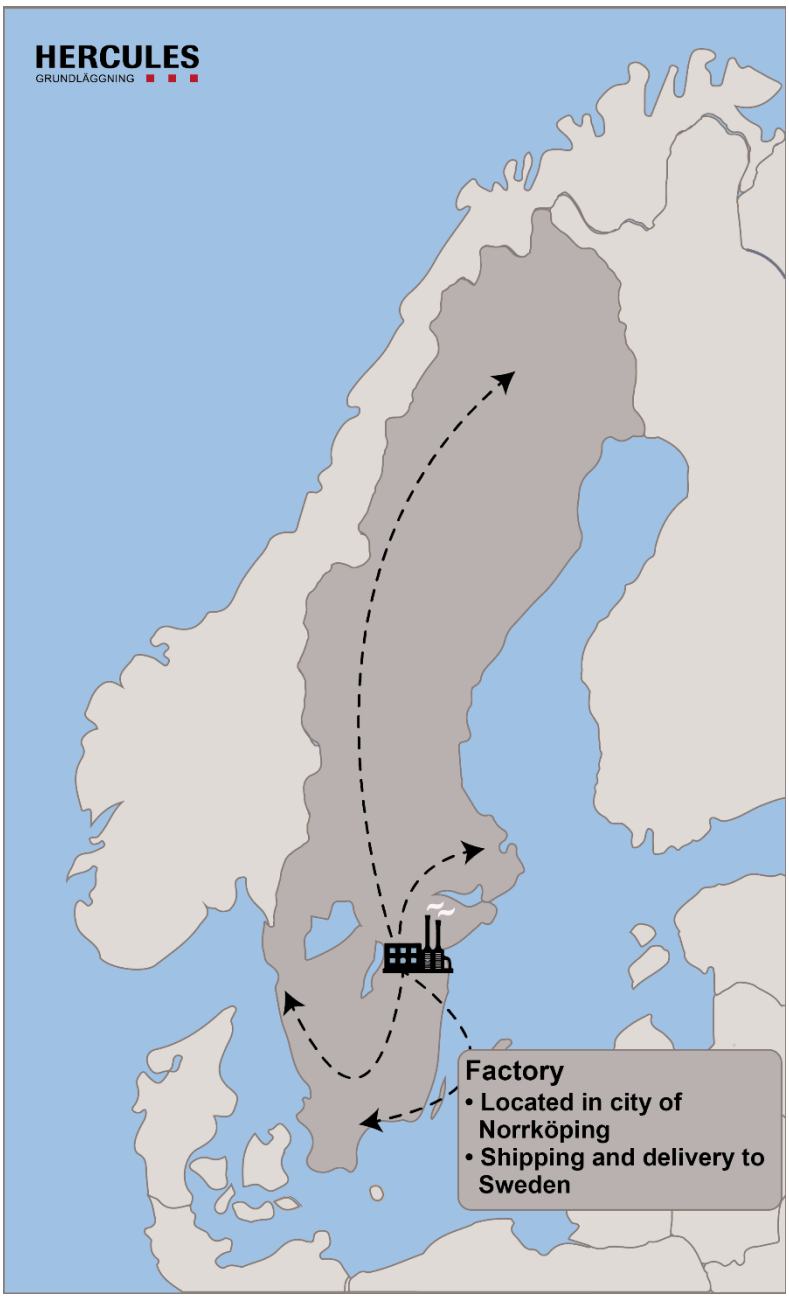

Figure 2: Map showing the geographical location of the declared site and delivery routes.

1. Declared unit and reference flow

The declared unit is 1 metric tonne (1000 kg) of average reinforcement steel product, representing the products manufactured at the declared site in Norrköping. The result is based on a weighted average of the products produced at the site.

2. System boundary

The system boundaries cover several aspects such as temporal, geographical and which unit processes to include in the system model. The setting of system boundaries follows two principles according to EN 15804: The "modularity principle" and the "polluter pays principle".

This EPD is a cradle-to-gate EPD with options, declaring the modules A1-A3 and A4, see Figure 3.

Data that represent the current production process at the plant is used. All input data for the core module and for raw materials that Hercules has influence over are site specific data for the production year 2020.

The environmental impact from infrastructure, construction, production equipment and tools that are not directly consumed in the production process are not accounted for in the LCI. Personnel-related impacts, such as transportation to and from work, are neither accounted for in the LCI.

	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	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
Modules declared	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 3: The system boundaries of the LCA. Modules of the production life cycle included in the EPD (X = declared module; MND = module not declared)

3. Assumptions and approximations

The EPD declares a weighted average of the products from Hercules´ site in Norrköping. This means that some products have lower and some products have higher actual environmental impact than what is declared. This variation is due to the various electricity consumption in the different steps in the manufacturing. The variation is however expected to be low between different products manufactured at the site. The electricity´s contribution from Hercules production is less than 1.5% of all impact categories and parameters, except for "Radioactive waste disposed", where it is 12% of the total impact.

Hercules´ site delivers to all of Sweden. The weighted mean transport is used as an estimation of the most plausible scenario.

For reinforcement steel from suppliers that do not have an EPD available, a generic conservative dataset is used: "EU: Steel wire rod" from the GaBi database.

97.0% of the steel used in the products comes from recycled sources. The remaining 3.0% is produced from virgin steel. These figures are based on information in EPDs from the suppliers.

4. Allocation

The production does not deliver any co-products.

Upstream allocations are handled within the raw material EPDs used. These EPDs are conducted in accordance with EN 15804+A1. All EPDs used are presented in the reference list.

The EPD represents an average product from Hercules´ site in Norrköping. All inventory data is therefore separately independent of the specific product produced. Each inventory data (e.g. all electricity consumed) is then divided by the total amount of products manufactured at the site. This is based on a weighted mass allocation where high volume products have a larger influence on the result. No other allocations are conducted.

5. Release of dangerous substances during the use phase

According to EN 15804, the EPD does not need to include this information if the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available. This criterion is fulfilled for reinforcement steel products.

6. Cut-offs

The cut-off criteria is 1% of the renewable and non-renewable primary energy usage, 1% of the total mass input of the manufacture process (according to the EN 15804 standard).

In the assessment, all available data from the production process is considered, i.e. all raw materials used, utilised ancillary materials, and energy consumption using the best available LCI GaBi datasets.

All inventories specified and known have been included in the LCA, except for packaging material. Packaging material for raw material supplied and packaging material for products delivered to customers are omitted. These are estimated to constitute less than 0.1 % of the total product weight.

7. Software and database

The LCA software GaBi Professional and its integrated database from Sphera has been used in the LCA modelling. See the list of references.

8. Data quality

The primary data collected by the manufacturer are based on the required materials and energy used by the manufacturer. The data of the raw materials are collected per declared unit. All necessary life cycle inventories for the basic materials are available in the GaBi database or via EPDs. No generic selected datasets (secondary data) used are older than ten years and no specific data collected is older than five years and represent a period of about one year.

The representativeness, completeness, reliability, and consistency are judged as good.

9. Comparability

EPDs of construction products may not be comparable if they do not comply with applicable EN 15804. Neither may EPDs within the same product category from different programs be comparable.

A comparison among EPDs is only possible if all the data sets to be compared are created according to ISO 14025 and EN 15804, and the building context, particularly the product-specific characteristics of performance, is taken into account.

10. Electricity at manufacturing

The energy source behind the electricity in module A3 (i.e. the manufacturing at Hercules) is shown in Table 2, including the LCA data in grams CO_2-eq./kWh.

Table 2: Electricity in manufacturing (A3)

Energy source	LCA data (g CO_2 eq./kWh)
Nuclear power	4.0

11. Scenario information

For modules other than A1-A3, scenario-based information shall be declared for the products, see Table 3. One scenario is declared for module A4. The transport data is based on weighted average data.

Table 3: Scenario for the transport to customer (construction site) (A4).

Parameter	Unit (per declared unit)	Value
Vehicle type used for transport	-	Truck for regional transport, Euro 6
Vehicle load capacity	tonne	Payload capacity 28-40 tonnes
Fuel type and consumption	Litre of fuel type per distance	Diesel (6.4% biobased assumed), about 4 liters per 10 km
Distance to central warehouse or storage, if relevant	km	Not relevant
Distance to construction site	km	384
Capacity utilization	%	81
Bulk density of transported products	kg/m^3	7 800
Volume capacity utilization factor (factor: = 1 or < 1 or ≥ 1 for compressed or nested packaged products)	Not applicable	-

ENVIRONMENTAL PERFORMANCE-RELATED INFORMATION

The results of the life cycle assessment (modules A1-A3, A4), based on the declared unit, can be found in Table 4 (potential environmental impact), Table 5 (resource use) and Table 6 (waste categories and output flows).

Table 4: Results of the LCA – Potential environmental impact for 1 tonne (1000 kg) of steel reinforcement.

Potential environmental impact		A1-A3	A4
Impact category	Unit		
Global warming potential (GWP100)	kg CO_2 eq.	478	23
Ozone depletion potential (ODP)	kg CFC 11 eq.	3.9E-06	4.0E-15
Acidification potential of land and water (AP)	kg SO_2 eq.	1.9	0.02
Eutrophication potential (EP)	kg $PO4^{3-}$ eq.	0.26	3.1E-03
Photochemical ozone creation potential (POCP)	kg C_2H_2 eq.	0.19	5.4E-05
Depletion of abiotic resources (elements) (ADPE)	kg Sb eq.	3.1E-04	1.8E-06
Depletion of abiotic resources (fossil) (ADPF)	MJ, net calorific value	5356	311

Table 5: Results of the LCA - Resource use for 1 tonne (1000 kg) of steel reinforcement.

Use of resources		A1-A3	A4
Parameter	Unit		
Use of renewable primary energy (PERE)	MJ, net calorific value	2956	17
Use of renewable primary energy resources used as raw materials (PERM)	MJ, net calorific value	2.1	0
Total use of renewable primary energy resources (PERT)	MJ, net calorific value	2958	17
Use of non-renewable primary energy (PENRE)	MJ, net calorific value	6008	313
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ, net calorific value	20	0
Total use of non-renewable primary energy resources (PENRT)	MJ, net calorific value	6028	313
Use of secondary material (SM)	kg	1139	0
Use of renewable secondary fuels (RSF)	MJ, net calorific value	6.7	0
Use of non-renewable secondary fuels (NRSF)	MJ, net calorific value	297	0
Use of net fresh water (FW)	m^3	237	0.02

Table 6: Results of the LCA - Waste categories and output flows for 1 tonne (1000 kg) of steel reinforcement.

Output flows & waste categories		A1-A3	A4
Parameter	Unit		
Hazardous waste disposed (HWD)	kg	13	1.6E-08
Non-hazardous waste disposed (NHWD)	kg	607	0.05
Radioactive waste disposed (RWD)	kg	0.28	3.8E-04
Components for re-use	kg	0	0
Materials for recycling	kg	40	0
Materials for energy recovery	kg	0.85	0
Exported energy	MJ per energy carrier	0	0

ADDITIONAL ENVIRONMENTAL INFORMATION

To read more about Hercules and NCC:s general sustainability work, please refer to our webpages;
https://hercules.se/hallbarhet/ and https://www.ncc.group/sustainability/

VERIFICATION DETAILS

Table 7: Verification details.

CEN standard EN 15804 served as the core PCR	
PCR:	Product Category Rules PCR 2012:01. Construction products and construction services. Version 2.33 of 2020-09-18
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com.
Independent verification of the declaration and data, according to ISO 14025:	☐ EPD process certification (Internal) ☒ EPD verification (External)
External independent verifier:	Håkan Stripple, IVL Swedish Environmental Research Institute Hakan.Stripple@IVL.se
Accredited or approved by:	The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier:	☒ Yes ☐ No

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SS-EN ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework (ISO 14040:2006)

SS-EN ISO 14044:2006/A1:2018 Environmental management - Life cycle assessment - Requirements and guidelines – Amendment 1 (ISO 14044:2006 / Amd 1:2018)

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United Nations Statistics Division (2015). Central Product Classification, version 2.1. https://unstats.un.org/unsd/classifications/unsdclassifications/cpcv21.pdf.

ABOUT THE EPD

This environmental product declaration (EPD) describes, from a life cycle perspective, the environmental impact of reinforcement steel products from Hercules site in Norrköping.

The EPD is drawn up in accordance with Product Category Rules (PCR) PCR 2012:01. Construction products and construction services. Version 2.33 of 2020-09-18. The program operator is the International EPD® System (see www.environdec.com for more information).

The aim of this EPD is that it should provide objective and reliable information on the environmental impact of the production of the declared product.

This EPD is developed by Hercules Armering. The EPD is valid for five years (after which it can be revised and reissued). Hercules Grundläggning AB is the declaration owner.

ABOUT HERCULES GRUNDLÄGGNING AB

Hercules Armering is a part of Hercules Grundläggning AB, which in turn is a business area within Nordic Construction Company, NCC AB. Hercules Armering is one of the leading Rebar companies in the Nordic market.

Using our network in steel business and our factory in Norrköping, we help our customers to lay the foundation for future buildings, bridges, tunnels and facilities all over Sweden. A competence that makes us unique is our production department that assists in any upcoming challenges and optimization of building projects. Hercules proudly fulfils market requirements regarding quality, environment, and health and safety.

Hercules Armering is certified through GlobeCert AB and fulfils the requirements according to BS 6744:2016, EN 10 080:2005 + NS 3576 – 2: 2012 and NS3576 – 3:2012 + SS212540:2014 + Steelgrades according to EC2, for the process: Cutting and Bending 5-40mm, from coils 8-20mm for the Swedish, Norwegian and Danish market, certificate number 0914. Hercules Armering fulfils the requirements for the Welding Process according to SS-EN ISO 17660-2:2006 and has been assigned certificate number 1510.

For more information, visit www.hercules.se/armering.

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