Environmental Product Declaration

according to ISO 14025 and EN 15804

MRPI
milieu relevante product informatie

This declaration is for:

HRC 100, 200, 400 and 700 Series: Headed reinforcement, Rebar with mechanical couplers, Cast-in connections

Provided by:

HRC Europe NL B.V.

HRC®

program operator
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ECO PLATFORM
EPD
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COMPANY INFORMATION

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MRPI® REGISTRATION

1.1.00193.2021

DATE OF ISSUE

23-02-2021

EXPIRY DATE

23-02-2026

PRODUCT

HRC 100, 200, 400 and 700 Series: Headed reinforcement, Rebar with mechanical couplers, Cast-in connections

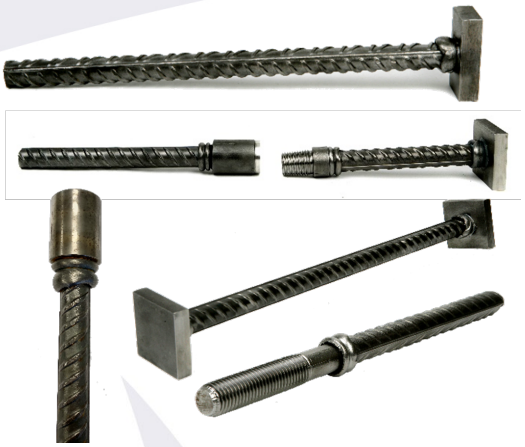
DECLARED UNIT/FUNCTIONAL UNIT

1 kg

DESCRIPTION OF PRODUCT

Reinforcing steel bars with a component attached to one or both ends.

VISUAL PRODUCT



MORE INFORMATION

www.hrc-europe.com

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Gert Jan van Beijnum, NIBE BV.**
The LCA study has been done by **Anne Kees Jeeninga, Advieslab v.o.f..**
The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2 (incl. A1). It is verified according to the <u>'MRPI®-EPD verification protocol November 2020.v4.0'</u>. EPDs of construction products may not be comparable if they do not comply with EN15804+A2 (incl. A1). Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

Stichting MRPI®
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ir. J-P den Hollander, Managing director MRPI®

DEMONSTRATION OF VERIFICATION
CEN standard EN15804 serves as the core PCR[a]
Independent verification of the declaration and data, according to EN ISO 14025:2010: internal: external: X
Third party verifier: Gert Jan van Beijnum, NIBE B.V.
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Reinforcing steel bars with a component attached to one or both ends. End components are made of steel and connected to the rebar by a thermo-mechanical process, in the solid phase - without any additives. Various HRC components can be combined. The finished product is cut and bend according to project specification. This EPD covers:

- HRC 100 Series, HRC 200 Series: Headed reinforcement bars, providing mechanical anchorage and replacing anchorage lengths, bends and hooks;
- HRC 400 Series: Rebar with couplers for mechanical splicing of reinforcement bars;
- HRC 700 Series: Rebar with a threaded component for connection of steel components to a concrete structure.

Technical data:
All products are certified according to national provisions and international standards:
• HRC 100: ISO 15698, ETA-08/0035
• HRC 200: ISO 15698
• HRC 400: ISO 15835
• HRC 700: SINTEF TG 20072

All products are tailor made. There is (usually) no construction waste in stage A-5.
Reference service life: 100 years

Hazardous substances:
The product does not contain any substance from the REACH candidates list.

COMPONENT (> 1%)	[kg / %]
The average composition includes:	
Rebars:	88.10%
HRC 100 series:	11.80%
HRC 200,400 series and 710, 720:	0.04%
HRC 720ss:	0.07%

(*) > 1% of total mass

SCOPE AND TYPE

The purpose of this LCA is to compile environmental data of materials and products used in the built environment. So that the environmental data can be used in calculations of buildings and / or civil works.

Product stage (A1-A3)
The production stage consists of the extraction of raw materials, transportation of the raw materials, processing the raw materials into materials and the production of the product. The required energy for production, external treatments, ancillary materials, packaging material and production emissions are included.

Construction process stage (A4-A5)
Stage A-4 is 150 km according tot the SBK Determination Method. Stage A-5 is not considerd.

Use stage (B1-B3)
Stage B is not considered.

End of life stage (C1-C4)
When the end of the life stage of the building is reached, the de-construction/demolition begins. This EPD includes the necessary transport (C2) from the demolition site to the sorting location and distance to final disposal. The end of life stage includes the final disposal to landfill (C4), incineration (C3) and needed recycling processes up to the end-of-waste point (C3). Loads and benefits of recycling, re-use and exported energy are part of module D. The prescribed waste scenarios from the SBK Determination method v3.0 incl. amendments July 2019, Jan 2020 have been used for the various materials in the product. Stage C-1 is not considered.

Supplementary information outside the building life cycle (D)
This stage contains the potential loads and benefits of recycling and re-use of raw materials/products. The loads contain the needed recycling processes from end-of-waste-point up to the point-of-equivalence of the substituted primary raw material and a load for secondary material that will be lost at the end-of-life stage. The loads and benefits of recycling and reuse are included in this module. The benefits are calculated based on the primary content and the primary equivalent.

The products are being produced at HRC, location Lelystad (NL). the product is mainly produced for the Dutch market. Module D is according to the Dutch Determination Method. All calculations are made in Ecoinvent version 3.5 in combination with the use of Sima Pro version 9.0.0.49. This EPD represents the average production at HRC Europe NL B.V. All calculations have been made in accordance with company-specific data.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
x	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x	x	x

X = Modules Assessed

ND = Not Declared

LCA process diagram

A1: raw material	Material, Energy →	Rebar material	Material for HRC-end components	→ Emission
A2: transport to HRC	Fuel →	⇩	⇩	→ Emission
A3: manufacturing	Energy, Fuel →	Preparation/machining Attaching of components to the rebar		→ Scrap to recycling
A4: transport to site	Fuel →	⇩		→ Emission
A5: installation (stage not declared)				
B1-B7: use stage (not declared)				
C1: demolition (stage not declared)				
C2: transport to sorting location	Fuel →	⇩		→ Emission
C3: waste processing		Rebar steel	Material for HRC-end components	→ Scrap to recycling
C4: final disposal	Fuel →	⇩		→ Emission
D: Recycling potential		⇩		→ Benefits and loads of recycling and re-use

Figure: LCA process diagram according to EN 15804(7.2.1)

REPRESENTATIVENESS

This LCA covers an average composition of parts (% mass per kg composition):

Rebars: 88,1%;
HRC 100 series: 11,8%;
HRC 200,400 series and 710, 720: 0,04%;
HRC 720ss: 0,07%.

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	UNIT	A1	A2	A3	A1-A3	A4	C2	C3	C4	D
ADPE	[kg Sb eq.]	3.52 E-6	3.10 E-7	2.34 E-7	4.06 E-6	5.58 E-8	1.95 E-8	0.00	2.97 E-10	-1.09 E-8
ADPF	[MJ]	1.30 E+1	2.23 E+0	1.04 E+0	1.63 E+1	3.05 E-1	1.07 E-1	0.00	8.03 E-3	-5.68 E-1
GWP	[kg CO2 eq.]	8.12 E-1	1.46 E-1	6.42 E-2	1.02 E+0	1.96 E-2	6.86 E-3	0.00	2.64 E-4	-3.79 E-2
ODP	[kg CFC11 eq.]	7.52 E-8	2.62 E-8	7.22 E-9	1.09 E-7	3.66 E-9	1.28 E-9	0.00	9.52 E-11	-2.04 E-9
POCP	[kg ethene eq.]	8.30 E-4	1.07 E-4	4.81 E-5	9.85 E-4	1.16 E-5	4.07 E-6	0.00	2.88 E-7	-6.85 E-5
AP	[kg SO2 eq.]	3.91 E-3	1.31 E-3	2.95 E-4	5.51 E-3	8.49 E-5	2.97 E-5	0.00	1.99 E-6	-1.58 E-4
EP	[kg (PO4)3- eq.]	6.85 E-4	1.69 E-4	5.19 E-5	9.06 E-4	1.71 E-5	5.99 E-6	0.00	3.77 E-7	-1.86 E-5

Toxicity indicators and ECI (Dutch market)

HTP	[kg DCB-Eq]	5.93 E-1	6.22 E-2	3.37 E-2	6.89 E-1	8.03 E-3	2.81 E-3	0.00	1.15 E-4	-2.68 E-2
FAETP	[kg DCB-Eq]	2.24 E-2	1.59 E-3	1.21 E-3	2.52 E-2	2.33 E-4	8.16 E-5	0.00	2.78 E-6	-1.55 E-4
MAETP	[kg DCB-Eq]	4.21 E+1	6.08 E+0	2.53 E+0	5.07 E+1	8.32 E-1	2.91 E-1	0.00	9.75 E-3	-5.00 E-1
TETP	[kg DCB-Eq]	6.57 E-2	2.09 E-4	3.45 E-3	6.94 E-2	2.77 E-5	9.69 E-6	0.00	2.87 E-7	-6.59 E-5
ECI	[euro]	1.27 E-1	2.07 E-2	8.57 E-3	1.57 E-1	2.33 E-3	8.17 E-4	0.00	3.72 E-5	-5.34 E-3

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources expressed in [kg Sb-eq.]
ND = Not Declared

RESOURCE USE per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	C2	C3	C4	D
PERE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	1.31 E+0	3.08 E-2	6.96 E-2	1.41 E+0	3.21 E-3	1.12 E-3	0.00	6.64 E-5	-7.46 E-3
PENRE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRM	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PENRT	[MJ]	1.36 E+1	2.38 E+0	1.08 E+0	1.70 E+1	3.25 E-1	1.14 E-1	0.00	8.62 E-3	-4.25 E-1
SM	[kg]	1.03 E+0	0.00	4.89 E-2	1.08 E+0	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FW	[m3]	1.64 E-2	3.90 E-4	8.44 E-4	1.76 E-2	5.19 E-5	1.82 E-5	0.00	8.39 E-6	-4.58 E-5

PERE = Use of renewable energy excluding renewable primary energy resources
PERM = Use of renewable energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable 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 materials
RSF = Use of renewable secondary fuels
NRSF = Use of non renewable secondary fuels
FW = Use of net fresh water
ND = Not Declared

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3	A4	C2	C3	C4	D
HWD	[kg]	3.23 E-5	1.40 E-6	1.83 E-6	3.55 E-5	1.95 E-7	6.81 E-8	0.00	5.43 E-9	-4.09 E-6
NHWD	[kg]	3.06 E-1	1.02 E-1	2.30 E-2	4.31 E-1	1.86 E-2	6.52 E-3	0.00	5.00 E-2	-1.67 E-3
RWD	[kg]	5.57 E-5	1.49 E-5	4.00 E-6	7.46 E-5	2.06 E-6	7.21 E-7	0.00	5.37 E-8	-5.01 E-7
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	4.51 E-2	4.51 E-2	0.00	0.00	9.50 E-1	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ETE	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy
ND = Not Declared

CALCULATION RULES

Cut off criteria

There is no cut-off of inputs and outputs in any of the processes during the life cycle stage, unit processes of each declared life cycle stage are considered.

Data quality and data collection period

Specific data is collected from HRC through a questionnaire. The data collected data considers 2017 till 2019. Generic data are selected from the Ecoinvent 3.5 database.

Allocation

The energy use per kg is determined by allocating the total energy use of 2017-2019 to the total amount of produced products in kg.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

A-3: Description of HRC's production process at Lelystad

• The rebar is cut to length according to the production order. Small, unusable cut-off lengths are collected and sent to recycling;
• The raw material for end-components is cut to correct length/geometry;
• Threaded components (rebar couplers and cast-in connections) are processed by CNC-machines;
• Small, unusable cut-off lengths and swarf from cutting and CNC-machining are collected and sent to recycling;
• The end components are attached to the rebar by friction welding.
• If required by the production order, products are bent by a rebar bending machine.

Stage A-4: the transport to the construction site is according to the Dutch Determination Method 150km.

The scenarios for the stages C2,3,4 and module D are according to the Dutch Determination Method. For C-2 this means 50 km transport to a processing location. From there 5% of the product will be transported 50 km to a landfill location. The end of life scenario is as given in the Dutch determination method: 95% recycling and 5% waste (landfill). The iron or steel scrap shall have been segregated at source or while collecting and been kept separate; or theinput wastes shall have been treated to separate the iron and steel scrap from the non-metal and nonferrous components. All mechanical treatment (like cutting, shearing, shredding or granulating; sorting, separation, cleaning, de-polluting, emptying) needed to prepare the material for direct input into final use shall have been completed. [End-of-waste Criteria for Iron and Steel Scrap: Technical Proposals, Publications Office of the European Union, 2010]

Benefits recycling and re-use (module D):

When a raw material is being recycled or re-used a benefit may be declared at module D. The percentage of secondary material in the product is excluded for benefit in module D. The following environmental profile is calculated as avoided impact per kg primary material that is recycled or reused: Pig iron | production (GLO)

DECLARATION OF SVHC

The product does not contain any substance from the REACH candidates list.

REFERENCES

ISO 14040
DIN EN ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044
DIN EN ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14040:2006

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

Report no: OR.19.18 (LCA HRC Europe AS: HRC 100, 200, 400 and 700 Series: Headed reinforcement, Rebar with mechanical couplers, Cast-in connections)
0.1-07-2018, Fredrik Moltu Johnsen and Lars Gunnar Tellnes, Østfoldforskning AS, Norway

European LCI Database for Coiled Flat Products
April 2000, Eurofer Stainless producers group

LIFE CYCLE INVENTORY METHODOLOGY REPORT
2017, ISBN 978-2-930069-89-0, World Steel Association (worldsteel)

REMARKS

This EPD covers an average composition of component(s) and rebar. The components are made of different steel types. Another composition will lead to different environmental effects. For consideration of different compositions, a sensitivity check has been done.
A shift per environmental impact category of less then 20%, caused by changes in composition will be accepted by e.g. The Dutch Determination Method (SBK). Related to this, an increase in share of HRC 100-400 to 20% per delivery will lead to recalculation of this LCA. The same applies to an increase in share of the HRC720SS component to more than 1% per delivery.