Environmental
Product
Declaration

According to ISO14025+EN15804 A2 (+indicators A1)

This declaration is for:
Walraven 2S Clamp set zinc plated M8 20-24mm

Provided by:
J. van Walraven Holding B.V.

MRPI® registration:
1.1.00945.2025

Program operator:
Stichting MRPI®
Publisher:
Stichting MRPI®
www.mrpi.nl

Date of first issue:
15-5-2025
Date of this issue:
15-5-2025
Expiry date:
15-5-2030

COMPANY INFORMATION

J. van Walraven Holding B.V.
Industrieweg 5
3641 RK
Mijdrecht
Netherlands
+31(0) 297 233000
Arunkumar Kuppusamy (info.nl@walraven.com)
https://www.walraven.com/int/

MRPI® REGISTRATION

1.1.00945.2025

DATE OF THIS ISSUE

15-5-2025

EXPIRY DATE

15-5-2030

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Anne Kees Jeeninga , Advies Lab Vof. The LCA study has been done by Arunkumar Kuppusamy, J. van Walraven Holding B.V.. The certificate is based on an LCA-dossier according to ISO14025+EN15804 A2 (+indicators A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2. 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®
Kingsfordweg 151
1043 GR
Amsterdam

PRODUCT

Walraven 2S Clamp set zinc plated M8 20-24mm

DECLARED UNIT / FUNCTIONAL UNIT

1 Piece

DESCRIPTION OF PRODUCT

Zinc-plated two-screw clamp set from the gapless range, featuring anti-loss washers for easy installation. Includes steel clamp and hanger bolt, with a polyamide plug — ideal for secure pipe mounting.

VISUAL PRODUCT

MORE INFORMATION

https://www.walraven.com/int/products/standard-clamps/

Ing. L. L. Oosterveen MSc. MBA Managing Director MRPI	DEMONSTRATION OF VERIFICATION
	CEN standard EN15804 serves as the core PCR [1]
	Independent verification of the declaration and data according to ISO14025+EN15804 A2 (+indicators A1) Internal: External: X
	Third party verifier: Anne Kees Jeeninga , Advies Lab Vof
	[1] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Product Description:
The Walraven 2S Clamp Set zinc plated M8 20–24 mm is a compact and robust two-screw pipe clamp. This complete set includes a zinc-plated steel clamp, a double-thread hanger bolt, and a polyamide plug, ensuring straightforward installation.

Manufacturing Location:
Production takes place in the Borovince, Czech Republic under certified environmental management systems, ensuring compliance with sustainability and quality standards.

Manufacturing Process Overview:
The clamp body is made from DC01-grade steel, while the hanger bolt uses DD11-grade steel for strength and durability. Both components are zinc plated for corrosion protection. The set also includes a polyamide plug and POM anti-loss washers. The upper and lower clamp parts are precision-formed, and the screws are produced to EN ISO 898-1, Class 4.8 standards. Surface treatment involves zinc plating, with environmental modeling accounting for 5% zinc waste.

Electricity usage references:
Reference: 0569-pro & Elektriciteit, Nederlandse mix, bij consument, per kWh (73% grijs, 27% hernieuwbaar), Database: Ecoinvent v3.6 (Cut-off, NMD), GWP : 0.389 kg CO_2eq/kWh

Reference: market for electricity, low voltage | electricity, low voltage | Czech Republic, Database: Ecoinvent v3.6 (Cut-off, NMD), GWP : 0.936 kg CO2-eq/kWh

Environmental Performance:
A full life cycle assessment, in accordance with EN 15804+A2, covers the product from raw material extraction to end-of-life processing. No hazardous substances such as SVHCs or VOCs are present. Energy consumption during manufacturing combines manual and mechanical processes powered by low-voltage electricity. Environmental modeling uses Ecochain Helix v4.3.1, with background data from the Nationale Milieudatabase v3.8 and Ecoinvent v3.6.

Installation and Use Phase:
For transport (Module A4), the model assumes EURO 5/6 truck at 50% load. The necessary internal transport of Czech Republic to Netherlands has been accounted in the production process of A1-A3. Installation (Module A5) is carried out manually, without additional energy requirements. The clamp has a design life of 50 years, requiring no maintenance or generating any operational emissions during use (Module B1).

End-of-Life Considerations:
At end-of-life, the clamp can be manually disassembled, with all components collected and sorted. Recycling rates are estimated at 95% for the steel, zinc, and plastic components, with only 5% of materials sent to landfill. Material recovery provides environmental credits (Module D)

Compliance and Certifications:
The product meets the requirements of EN 15804+A2, ISO 14025, and ISO 14040/44 for environmental declarations and life cycle assessments.

Name - Half parts	
Steel - Lower part	
Steel - Upper part	
Steel - Hollow pan head screw	
Plastic - PP (PolyPropylene) - Universal Plug	
Plastic - POM (PolyOxyMethylene) Anti loss washer	
Steel - St. 1.0332 (DD11) - Hanger Bolt Bolt zp	

Total Weight	63.23 g

Component (> 1%)	(%)
Steel (combined)	93,36%
Plastic	3,79%

SCOPE AND TYPE

This study involves conducting a comprehensive Life Cycle Assessment (LCA) for the Walraven Clamps, aiming to analyze all life cycle phases from Cradle to Grave (A1–D) using the best available data. The assessment follows the full scope of LCA, meaning the product is evaluated not as a standalone item, but as part of a broader system aggregated with other materials and processed into other products. Consequently, the clamp becomes an integral component of a Declared Unit.

The LCA is performed using the Ecochain Helix software, leveraging background data from authoritative sources such as the Dutch Nationale Milieu Database v3.8 (based on Ecoinvent 3.6) and adhering to the NMD Bepalingsmethode 1.2 (2025) standard. This rigorous methodology ensures a detailed and transparent examination of the environmental impact of the Walraven Clamps across their entire life cycle from the extraction of raw materials (Cradle) through production, installation, and use, to final disposal or recycling (Grave).

The system boundary includes all relevant stages, up to and including Module D (benefits and loads beyond the system boundary). It excludes operational energy use (B6) and water consumption (B7) during the use phase. The environmental impact is declared per one piece of Walraven Clamp, inclusive of ancillary materials, installation, internal transport, and waste processing.

The reference service life is assumed to be 50 years, based on internal product owner data and supported by the European Technical Assessment (ETA) for Walraven Clamps, which confirms a minimum working life of 50 years under appropriate usage and maintenance conditions.

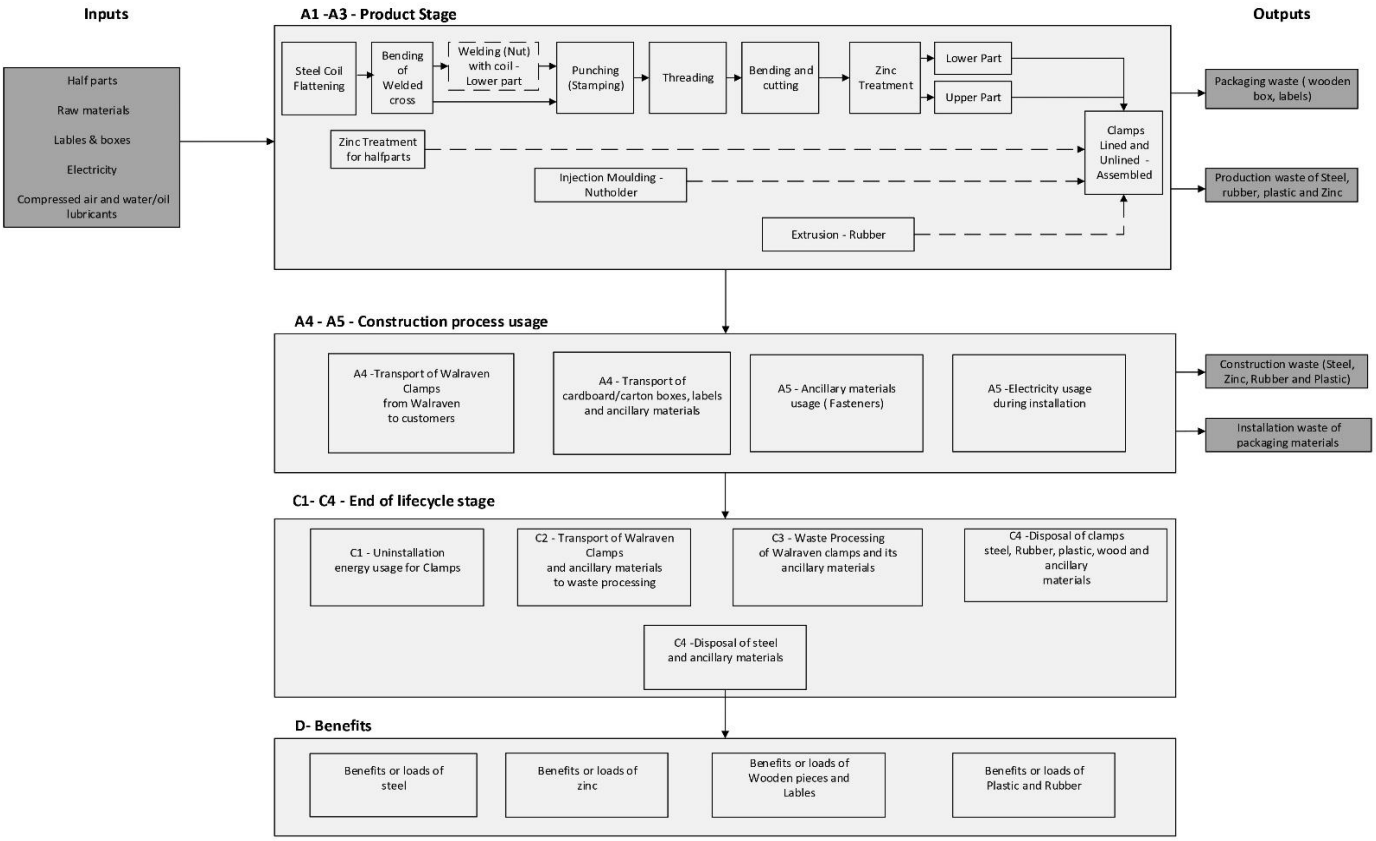
All significant inputs and outputs such as emissions, energy consumption, and material flows are accounted for. Materials representing less than 1% of the product's total weight may be excluded unless they are expected to contribute more than 5% to any environmental impact category. The cumulative environmental impact of excluded materials shall not exceed 5% for any given category.

This comprehensive approach ensures a scientifically sound and holistic understanding of the Walraven Clamp’s environmental footprint throughout its full life cycle.

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	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x

X = Modules Assessed

ND = Not Declared



REPRESENTATIVENESS

The aggregation was done by choosing the reference product as Walraven 2S Clamp set zinc plated M8 20-24mm. The remaining products which are aggregated in the same group by following the 20% allocation and worst case scenario as per the EN 15804+A2 & NMD Bepalingsmethode v1.2 (2025) are listed below:

Walraven 2S Clamp set zinc plated M8 20-24mm
Walraven 2S Clamp zinc plated M8/10 38-46mm
Walraven 2S Clamp zinc plated M8 47-52mm
Walraven 2S Clamp set zinc plated M8 15-19mm
Walraven 2S Clamp zinc plated M8 38-46mm
Walraven 2S Clamp zinc plated M8/10 31-37mm
Walraven 2S Clamp zinc plated M8 31-37mm
Walraven 2S Clamp zinc plated M8/10 25-30mm
Walraven 2S Clamp zinc plated M8/10 20-24mm
Walraven 2S Clamp zinc plated M8 25-30mm
Walraven 2S Clamp zinc plated M8/10 15-19mm

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

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
ADPE	kg Sb eq.	1,77E-03	2,23E-07	3,56E-07	1,77E-03	3,24E-08	8,83E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,41E-08	4,22E-08	1,19E-10	-4,79E-08
ADPF	MJ	3,06E+00	1,33E-01	4,20E-01	3,61E+00	1,94E-02	1,57E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,23E-02	1,29E-02	3,60E-04	-5,33E-01
GWP	kg CO2 eq.	2,04E-01	8,72E-03	3,21E-02	2,45E-01	1,27E-03	1,09E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,12E-03	6,02E-03	1,27E-05	-3,66E-02
ODP	kg CFC11 eq.	1,56E-08	1,55E-09	1,77E-09	1,89E-08	2,25E-10	9,26E-10	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,75E-10	2,43E-10	4,24E-12	-1,23E-09
POCP	kg ethene eq.	1,75E-04	5,27E-06	-1,39E-05	1,67E-04	7,66E-07	4,67E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,28E-06	7,35E-07	1,36E-08	-7,61E-05
AP	kg SO2 eq.	1,11E-03	3,85E-05	1,12E-04	1,26E-03	5,58E-06	5,79E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,30E-06	8,08E-06	9,30E-08	-1,23E-04
EP	kg (PO4) 3 eq.	1,61E-04	7,54E-06	2,45E-05	1,93E-04	1,10E-06	9,16E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,83E-06	1,09E-06	1,79E-08	-1,43E-05

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB eq.	3,55E-01	3,67E-03	-2,86E-03	3,56E-01	5,34E-04	1,68E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,91E-04	1,12E-03	5,75E-06	-2,16E-02
FAETP	kg DCB eq.	6,54E-03	1,07E-04	1,61E-04	6,81E-03	1,56E-05	3,57E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,60E-05	3,42E-05	1,36E-07	2,56E-04
MAETP	kg DCB eq.	1,14E+01	3,86E-01	8,41E-01	1,26E+01	5,61E-02	6,54E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,35E-02	1,21E-01	4,88E-04	1,98E-01
TETP	kg DCB eq.	2,50E-03	1,30E-05	1,57E-04	2,67E-03	1,89E-06	2,23E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,15E-06	3,27E-06	1,44E-08	1,78E-03
ECI	euro	5,04E-02	1,05E-03	2,12E-03	5,35E-02	1,53E-04	2,50E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,55E-04	4,60E-04	1,80E-06	-4,46E-03
ADPF	kg Sb eq.	1,47E-03	6,41E-05	2,02E-04	1,74E-03	9,33E-06	7,56E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,56E-05	6,21E-06	1,73E-07	-2,56E-04

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

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	2,10E-01	8,80E-03	3,17E-02	2,50E-01	1,28E-03	1,10E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,13E-03	5,02E-03	1,30E-05	-3,91E-02
GWP-fossil	kg CO2 eq.	2,08E-01	8,79E-03	3,16E-02	2,48E-01	1,28E-03	1,09E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,13E-03	6,03E-03	1,30E-05	-3,92E-02
GWP-biogenic	kg CO2 eq.	8,98E-04	3,28E-06	5,94E-05	9,60E-04	4,77E-07	5,05E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,96E-07	-1,01E-03	7,58E-09	0,00E+00
GWP-luluc	kg CO2 eq.	5,73E-04	3,22E-06	3,76E-05	6,14E-04	4,69E-07	3,21E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,82E-07	1,14E-06	3,61E-09	2,63E-05
ODP	kg CFC11 eq.	1,57E-08	1,94E-09	1,31E-09	1,90E-08	2,83E-10	9,52E-10	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,71E-10	2,55E-10	5,34E-12	-9,34E-10
AP	mol H+ eq.	1,36E-03	5,11E-05	1,34E-04	1,55E-03	7,42E-06	7,13E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,24E-05	1,01E-05	1,23E-07	-1,50E-04
EP-fresh water	kg PO4 eq.	1,68E-05	8,87E-08	5,88E-06	2,27E-05	1,29E-08	1,08E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,15E-08	5,96E-08	1,45E-10	-1,33E-06
EP-marine	kg N eq.	2,81E-04	1,80E-05	1,80E-05	3,17E-04	2,62E-06	1,50E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,36E-06	2,36E-06	4,23E-08	-2,77E-05
EP-terrestrial	mol N eq.	3,11E-03	1,98E-04	2,18E-04	3,53E-03	2,88E-05	1,66E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,81E-05	2,71E-05	4,67E-07	-3,22E-04
POCP	kg NMVOC eq.	9,94E-04	5,67E-05	1,99E-05	1,07E-03	8,23E-06	4,42E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,37E-05	7,34E-06	1,36E-07	-2,16E-04
ADP-minerals & metals	kg Sb eq.	1,77E-03	2,23E-07	3,56E-07	1,77E-03	3,24E-08	8,83E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,41E-08	4,22E-08	1,19E-10	-4,79E-08
ADP-fossil	MJ, net calorific value	2,87E+00	1,33E-01	4,73E-01	3,48E+00	1,93E-02	1,59E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,22E-02	1,27E-02	3,62E-04	-3,52E-01
WDP	m3 world eq. Deprived	1,29E-01	4,74E-04	8,03E-03	1,38E-01	6,91E-05	6,48E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,15E-04	3,58E-04	1,62E-05	-8,86E-03

GWP-total	=	Global Warming Potential total
GWP-fossil	=	Global Warming Potential fossil fuels
GWP-biogenic	=	Global Warming Potential biogenictotal
GWP-luluc	=	Global Warming Potential land use and land use change
ODP	=	Depletion potential of the stratospheric ozone layer
AP	=	Acidification Potential, Accumulated Exceedence
EP-freshwater	=	Eutrophication Potential, fraction of nutrients reaching freshwater end compartment
EP-marine	=	Eutrophication Potential, fraction of nutrients reaching marine end compartment
EP-terrestrial	=	Eutrophication Potential, Accumulated Exceedence
POCP	=	Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals & metals	=	Abiotic Depletion Potential for non-fossil resources [1]
ADP-fossil	=	Abiotic Depletion for fossil resources potential [1]
WDP	=	Water (user) deprivation potential, deprivation-weighted water consumption [1]

Disclaimer [1]:

- 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.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease inci-dence	1,25E-08	7,89E-10	-7,53E-10	1,26E-08	1,15E-10	5,41E-10	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,92E-10	1,16E-10	2,39E-12	-2,19E-09
IRP	kBq U235 eq.	1,39E-02	5,56E-04	2,94E-03	1,74E-02	8,09E-05	9,11E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,35E-04	6,05E-05	1,49E-06	5,75E-04
ETP-fw	CTUe	2,04E+01	1,18E-01	-5,32E-02	2,05E+01	1,72E-02	9,69E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,87E-02	1,06E-01	2,35E-04	-1,24E+00
HTP-c	CTUh	1,24E-09	3,84E-12	-6,05E-11	1,19E-09	5,59E-13	5,92E-11	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,31E-13	1,93E-12	5,43E-15	-5,20E-12
HTP-nc	CTUh	2,14E-08	1,29E-10	-6,13E-11	2,15E-08	1,88E-11	1,43E-09	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,14E-11	6,55E-11	1,67E-13	7,05E-09
SQP	-	1,03E+00	1,15E-01	1,16E-01	1,26E+00	1,67E-02	6,34E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,79E-02	1,92E-02	7,60E-04	-5,89E-02

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans, cancer [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]

Disclaimer [1]:

- This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste.

Disclaimer [2]:

- 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.

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

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	2,31E-04	3,36E-07	-9,19E-07	2,30E-04	4,89E-08	1,13E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,15E-08	3,43E-08	5,42E-10	-4,38E-06
NHWD	kg	5,36E-02	8,41E-03	2,69E-03	6,48E-02	1,22E-03	3,36E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,04E-03	3,41E-04	2,46E-03	-3,65E-03
RWD	kg	1,13E-05	8,71E-07	2,44E-06	1,46E-05	1,27E-07	7,61E-07	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,11E-07	6,64E-08	2,38E-09	1,74E-07
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	1,51E-05	1,51E-05	0,00E+00	7,54E-07	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	4,68E-02	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	9,16E-07	9,16E-07	0,00E+00	4,58E-08	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	2,03E-03	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	5,27E-05	5,27E-05	0,00E+00	2,64E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,52E-02
ETE	MJ	0,00E+00	0,00E+00	3,07E-05	3,07E-05	0,00E+00	1,53E-06	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,83E-03

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

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

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	3,14E-01	1,66E-03	5,09E-02	3,66E-01	2,42E-04	1,87E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,03E-04	1,81E-03	2,93E-06	6,04E-03
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	3,14E-01	1,66E-03	5,09E-02	3,66E-01	2,42E-04	1,87E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,03E-04	1,81E-03	2,93E-06	6,04E-03
PENRE	MJ	3,05E+00	1,41E-01	5,10E-01	3,70E+00	2,05E-02	1,70E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,42E-02	1,35E-02	3,85E-04	-3,69E-01
PENRM	MJ	4,91E-02	0,00E+00	0,00E+00	4,91E-02	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	3,10E+00	1,41E-01	5,10E-01	3,75E+00	2,05E-02	1,70E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,42E-02	1,35E-02	3,85E-04	-3,69E-01
SM	kg	2,12E-02	0,00E+00	4,41E-06	2,12E-02	0,00E+00	2,21E-07	ND	ND	ND	ND	ND	ND	ND	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	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NSRF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	3,97E-03	1,61E-05	9,76E-04	4,96E-03	2,35E-06	2,41E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,92E-06	1,21E-05	3,87E-07	-1,60E-04

PERE = Use of renewable primary energy excluding renewable primary energy 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 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
NSRF = Use of non-renewable secondary fuels
FW = Use of net fresh water

BIOGENIC CARBON CONTENT per functional unit or declared unit (A1 and A2)

	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
BBCpr	kg C	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
BCCpa	kg C	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging

CALCULATION RULES

Data Quality

Data flows have been modeled to reflect realistic production and supply chain operations. Primary data were collected directly from Walraven's Czech production facility for all available processes. Where supplier-specific data were unavailable or incomplete, validated reference datasets were used, primarily from the Nationale Milieudatabase (NMD) v3.8, which is based on Ecoinvent 3.6.

For Module A1, detailed product composition data were provided by the manufacturer. Module A2 incorporates actual transport distances and modes for raw materials delivered to the production site. Module A3 captures site-specific energy consumption, production waste, and emissions for the 2023/2024 production period.

Data Collection Period

The dataset represents the production processes and operational conditions during 2023/2024.

Methodology and Reproducibility

The life cycle assessment adheres to EN 15804+A2:2019, ISO 14040, ISO 14044, ISO 14025, and the NMD Bepalingsmethode v1.2 (2025). All calculations and environmental modeling were performed using Ecochain Helix software (v4.3.1), ensuring reproducibility and compliance with current European and Dutch LCA practices.

Life Cycle Modules

The assessment covers the full life cycle, including A1–A3 (raw material acquisition, transport, and manufacturing), A4–A5 (transport to site and installation), C1–C4 (demolition, waste transport, treatment, and disposal), and D (reuse, recovery, and recycling potential).

Inventory and Allocation

All material and energy inputs, emissions, and outputs are included, following the modular approach of EN 15804. Mass-based allocation was applied to distribute site-level inputs across multiple products. No secondary materials were used in production. Cut-off criteria were applied to ensure that any excluded flows do not exceed 5% of total mass or energy per module.

Data Sources

Primary data from Walraven's Czech facility covers energy use, raw material types, transport distances, emissions, and waste management. When primary data were unavailable, representative datasets from Ecoinvent 3.6 were used via NMD v3.8, covering steel, zinc coatings, and plastic components (POM, PP), as well as truck and ship transport. Environmental impact characterization used EF 3.0 and CML methods, with upstream and downstream processes modeled according to EN 15804+A2.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Modules A1–A3 cover the life cycle stages from raw material extraction to the final manufacturing of the clamp. For Module A1, all relevant raw materials and auxiliary inputs are modeled based on 2023/2024 production data from the Walraven Czech facility. Key components include steel (multiple grades), zinc, and plastics (POM and PP). Materials are modeled using NMD v3.8 and Ecoinvent v3.6, with generic datasets used where needed. The steel content includes 57% primary and 43% secondary material, per average Dutch market figures.

Module A2 addresses inbound logistics to the manufacturing site. All transports (truck and ship) are modeled per EN 15804+A2 using NMD/Ecoinvent datasets with a 50% load factor (full in, empty return). Distances vary: plastic PP (1600 km truck), POM (950 km truck and 20,000 km ship), and various steel components range from 200 km to 1140 km. Additional 100 km legs are included for transport to zinc treatment facilities.

Module A3 captures the energy, materials, and emissions during production. Primary data from 2023/2024 shows use of grid electricity (Czech mix), on-site fuels, and lubricants. Manufacturing includes packaging and waste streams, notably steel scrap, which is partially recycled. Lubricating oil is used in small quantities during metal processing. Zinc treatment requires additional electricity. Production waste is quantified and partially diverted to recycling facilities. Capital goods are excluded under the EN 15804+A2 cutoff rule (<5% impact).

Module A4 describes distribution from the plant to the installation site. An average 150 km truck transport with 50% load factor is assumed, following Bepalingsmethode v1.2. Emissions are calculated based on NMD v3.8 / Ecoinvent v3.6 transport datasets.

Module A5 includes installation on-site, assuming 5% material loss due to manual handling. No energy is required during installation. Lost materials steel, plastic are transported to end-of-life facilities: steel to landfill/recycling over 100 km, and plastic to incineration plants (AVI) over 100 km. These assumptions align with Bepalingsmethode v1.2 (2025).

The End-of-Life Scenario Fixed Values used are:

Material	Leave	Landfill	Incineration (AVI)	Recycling	Reuse
Steel, Zinc	0%	5%	0%	95%	0%
Rubber/Plastic	0%	0%	100%	0%	0%

Module C1 – Deconstruction
At the end of its life, the clamp is manually dismantled, with negligible energy input required. This reflects typical on-site practices, where no mechanized processes are needed for removal.

Module C2 – Transport
Once dismantled, materials are transported to their respective waste management facilities. Steel and zinc are carried approximately 50 km to recycling facilities, while plastic components are transported 100 km to incineration plants with energy recovery. Transport-related emissions are calculated using standard truck datasets from NMD v3.8 and Ecoinvent v3.6, based on weight and distance.

Module C3 – Waste Processing
Steel and zinc are assumed to be fully recycled through sorting and pressing processes, ensuring minimal loss of material. Plastic components are fully incinerated in AVI plants, with energy recovery accounted for. The modeling references used include 0315-reC&Sorteren en persen oud ijzer for steel and 0264-avC&Verbranden kunststoffen for plastic.

Module C4 – Final Disposal
A small portion of steel and zinc, approximately 5%, is directed to landfill, while plastics are entirely incinerated. Landfill processes are modeled using the NMD datasets 0253-sto&Stort staal and 0248-sto&Stort koper, lood, verzinkt staal, zink.

Module D – Benefits Beyond the System Boundary
Environmental credits are assigned for material recovery and energy substitution beyond the system boundary. For steel, the 95% recycling rate combined with 43% secondary material content results in a 52% substitution benefit, effectively reducing the need for virgin material production. Zinc recycling is assumed to deliver a 95% benefit, and plastics incineration is credited with 100% energy recovery.

The life cycle assessment is conducted in full accordance with EN 15804+A2:2019 + AC:2021 and the Dutch Bepalingsmethode v1.2 (2025). All material flows, waste treatments, transport, emissions, and environmental credits are modeled using primary data from Walraven production and high-quality reference datasets from NMD v3.8 and Ecoinvent v3.6, ensuring transparency and reproducibility.

DECLARATION OF SVHC

No substances that are listed in the latest “Candidate List of Substances of Very High Concern for authorisation” are included in the product that exceeds the limit for registration

REFERENCES

[1] ISO, ISO 14040: Environmental management – Life cycle assessment – Principles and Framework, ISO 14040:2006 + Amd 1:2020, International Organization for Standardization, 2020.

[2] ISO, ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines, ISO 14044:2006 + Amd 2:2020, International Organization for Standardization, 2020.

[3] ISO, ISO 14025: Environmental labels and declarations – Type III environmental declarations – Principles and procedures, ISO 14025:2006, International Organization for Standardization, 2006.

[4] European Technical Assessment (ETA) for Walraven Bifix® G2 Clamps, Walraven, Mijdrecht, 2024.

[5] NMD, Bepalingsmethode ‘Milieuprestatie Bouwwerken’ versie 1.2 inclusief de bijbehorende wijzigingsbladen, Nationale Milieudatabase, 2025.

[6] CE Delft, Handboek Schaduwprijzen, 2010. [Online]. Available: https://ce.nl/publicaties/handboek-schaduwprijzen-waardering-en-weging-van-emissies-en-milieueffecten/

[7] TNO, Toxiciteit heeft z'n prijs: schaduwprijzen voor (eco-)toxiciteit en uitputting van abiotische grondstoffen binnen DuboCalc. [Online]. Available: https://puc.overheid.nl/rijkswaterstaat/doc/PUC_119145_31/

[8] NEN, NEN-EN 15804: Duurzaamheid van bouwwerken – Milieuverklaringen van producten – Basisregels voor de productgroep bouwproducten, NEN-EN 15804:2012 + A2:2019 + AC:2021, Nederlands Normalisatie-instituut, 2021.

[9] P. P. Lahoti and V. D. M., Lubrication in cold rolling of steel, Journal of Materials Processing Technology, vol. 209, no. 9, pp. 4638–4642, 2009.

[10] F. G. H. van Wees, J. V. B., J. O. P. R., Energy Consumption for Steel Production, in World Energy Conference, Cannes, Nov. 1986.

[11] The Engineering Toolbox, 2001. [Online]. Available: https://www.engineeringtoolbox.com/

[12] NMD, Environmental Performance Assessment Method for Construction Works, January 2025. [Online]. Available: https://milieudatabase.nl/wp-content/uploads/2022/05/Bepalingsmethode_Milieuprestatie_Bouwwerken_maart_2022_Engels.pdf.