Environmental
Product
Declaration

According to ISO14025+EN15804 A2 (+indicators A1)

This declaration is for:
Walraven 434 Clamp zinc plated G1" PE-Pipe 315mm

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

MRPI® registration:
1.1.00949.2025

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

1.1.00949.2025

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 434 Clamp zinc plated G1" PE-Pipe 315mm

DECLARED UNIT / FUNCTIONAL UNIT

1 Piece

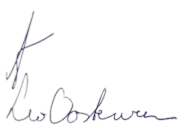
DESCRIPTION OF PRODUCT

Steel two-screw clamp for PE pipes, zinc plated and equipped with anti-loss washers. Designed as a guiding clamp and suitable for rigid fixing when used with appropriate liners.

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 434 Clamp zinc plated G1" PE-Pipe 315mm is a zinc-coated steel two-screw pipe clamp designed for securing PE pipes, providing reliable guidance and fixing. It features integrated anti-loss washers and can be combined with metal clamp liners for rigid mounting.

Manufacturing Location
The clamp is produced at Walraven's certified facility in the Horka, Czech Republic.

Manufacturing Process Overview
The clamp is made from steel for both the upper and lower parts. It includes Class 4.8 hollow pan-headed screws and Class 04 nuts, which are pre-assembled for easier installation. Anti-loss washers are made from POM to facilitate handling during installation. The steel parts are zinc-plated to provide corrosion resistance in line with ISO 9227. The clamp is delivered fully pre-assembled to reduce on-site labor.

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
The zinc coating ensures reliable corrosion protection in dry and semi-humid environments, while the steel contains approximately 50.2% recycled content. The product is SVHC free and has been modeled using EN15804+A2:2019 standards with Ecochain Helix v4.3.1 and Ecoinvent v3.6 databases. The clamp has a reference service life of 50 years under typical installation conditions.

Installation and Use Phase
The pre-assembled design with anti-loss features allows for quick and secure mounting. It functions as a guiding clamp and, when used with liners, can serve as a rigid fixing point. The product does not emit VOCs and is safe for indoor applications. The necessary internal transport of Czech Republic to Netherlands has been accounted in the production process of A1-A3.

End-of-Life Considerations
Steel and zinc components are nearly fully recyclable. Material recovery credits are included in the lifecycle assessment under Module D. Components can be manually separated to facilitate recycling at the end of life.

Packaging and Transport
The clamp is packaged in recyclable cardboard designed for efficient transport. Transport modeling is based on typical Euro 5 truck logistics at 50% load efficiency.

The product meets ISO 9227 corrosion testing standards and complies with EN 15804 + A2 and ISO 14025 for lifecycle assessment and environmental performance.

Name - Half parts	
Steel - Lower part	
Steel - Upper part	
Steel - Hollow pan head screw	
Steel - Nut	
Plastic - Antiloss washer	

Total Weight	1472 g

Component (> 1%)	(%)
Steel (combined)	96,83%

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.

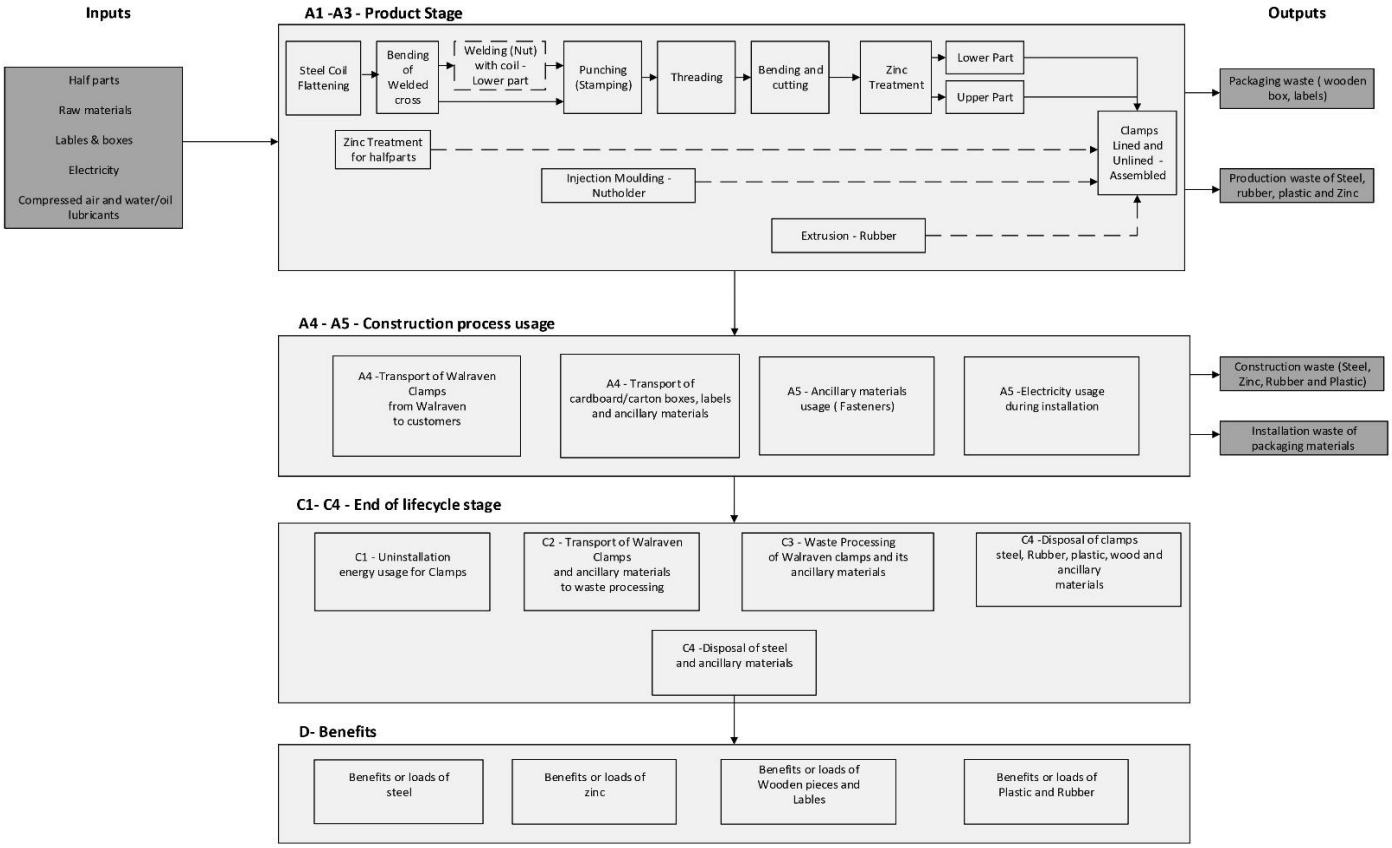
All significant inputs and outputs such as emissions, energy consumption, and material flows are accounted for. Materials representing less than 1% of the product's total weight may be excluded unless they are expected to contribute more than 5% to any environmental impact category. The cumulative environmental 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


Inputs
A1 -A3 - Product Stage
Outputs
Half parts
Raw materials
Lables & boxes
Electricity
Compressed air and water/oil lubricants
Steel Coil Flattening
Bending of Welded cross
Welding (Nut) with coil - Lower part
Punching (Stamping)
Threading
Bending and cutting
Zinc Treatment
Lower Part
Upper Part
Zinc Treatment for halfparts
Injection Moulding - Nutholder
Extrusion - Rubber
Clamps Lined and Unlined - Assembled
Packaging waste (wooden box, labels)
Production waste of Steel, rubber, plastic and Zinc
A4 - A5 - Construction process usage
A4 -Transport of Walraven Clamps from Walraven to customers
A4 - Transport of cardboard/carton boxes, labels and ancillary materials
A5 - Ancillary materials usage (Fasteners)
A5 -Electricity usage during installation
Construction waste (Steel, Zinc, Rubber and Plastic)
Installation waste of packaging materials
C1- C4 - End of lifecycle stage
C1 - Uninstallation energy usage for Clamps
C2 - Transport of Walraven Clamps and ancillary materials to waste processing
C3 - Waste Processing of Walraven clamps and its ancillary materials
C4 -Disposal of clamps steel, Rubber, plastic, wood and ancillary materials
C4 -Disposal of steel and ancillary materials
D- Benefits
Benefits or loads of steel
Benefits or loads of zinc
Benefits or loads of Wooden pieces and Lables
Benefits or loads of Plastic and Rubber

REPRESENTATIVENESS

The aggregation was done by choosing the reference product as Walraven 434 Clamp zinc plated G1" PE-Pipe 315mm. 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 Heavy Duty Clamp Stainless M16 279-289mm
Walraven Industrial Saddle hot dip galvanized 250mm
Walraven Industrial Saddle hot dip galvanized 225mm
Walraven Heavy Duty Clamp Stainless M16 DN250 10" 265-275mm
Walraven 434 Clamp zinc plated M10 PE-pipe 315mm
Walraven HD Clamp UNC 3/8 inch - 1/2 inch 89-92mm
Walraven HD500 Clamp BUP 1/2" 267-279mm
Walraven HD500 Clamp BUP M16 267-279mm
Walraven Heavy Duty Clamp Stainless M16 254-264mm
Walraven Heavy Duty Clamp epoxy coated 3/8" 1/2" 315mm
Walraven HD500 Clamp BUP M16 254-264mm
Walraven HD500 Clamp BUP 1" 244-254mm
Walraven 434 Clamp zinc plated G1" PE-Pipe 250mm
Walraven HD500 Clamp BUP 1/2" 244-254mm
Walraven HD500 Clamp BUP M16 244-254mm
Walraven W1000 Strut Clamp ZnMg 23-27mm
Walraven HD500 Clamp BUP M16 229-241mm
Walraven 434 Clamp zinc plated G1" PE-Pipe 225mm
Walraven 434 Clamp zinc plated M10 PE-pipe 250mm
Walraven HD500 Clamp BUP 1/2" 86-92mm
Walraven Industrial Saddle hot dip galvanized 200mm

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.	5,41E-02	4,65E-06	4,33E-06	5,41E-02	7,55E-07	2,71E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,26E-06	3,76E-06	3,36E-09	-7,01E-07
ADPF	MJ	7,65E+01	2,83E+00	5,67E+00	8,50E+01	4,52E-01	3,74E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,53E-01	9,17E-01	1,02E-02	-1,24E+01
GWP	kg CO2 eq.	5,21E+00	1,86E-01	4,21E-01	5,81E+00	2,95E-02	2,50E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,92E-02	6,75E-02	3,61E-04	-9,65E-01
ODP	kg CFC11 eq.	3,68E-07	3,29E-08	2,37E-08	4,25E-07	5,24E-09	2,07E-08	ND	ND	ND	ND	ND	ND	ND	0,00E+00	8,74E-09	8,40E-09	1,20E-10	-3,36E-08
POCP	kg ethene eq.	4,74E-03	1,17E-04	-1,21E-04	4,74E-03	1,78E-05	1,37E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,97E-05	5,91E-05	3,84E-07	-2,10E-03
AP	kg SO2 eq.	3,02E-02	9,46E-04	1,42E-03	3,26E-02	1,30E-04	1,52E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,17E-04	6,59E-04	2,64E-06	-3,26E-03
EP	kg (PO4) 3 eq.	4,34E-03	1,73E-04	3,03E-04	4,82E-03	2,55E-05	2,29E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,25E-05	8,41E-05	5,09E-07	-3,88E-04

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB eq.	1,01E+01	7,92E-02	-1,65E-02	1,02E+01	1,24E-02	4,84E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,07E-02	8,14E-02	1,63E-04	-6,03E-01
FAETP	kg DCB eq.	1,72E-01	2,27E-03	2,02E-03	1,77E-01	3,63E-04	9,32E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,05E-04	1,52E-03	3,87E-06	7,48E-03
MAETP	kg DCB eq.	3,25E+02	8,22E+00	1,03E+01	3,44E+02	1,31E+00	1,80E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,18E+00	6,59E+00	1,38E-02	6,25E+00
TETP	kg DCB eq.	6,03E-02	2,78E-04	2,03E-03	6,26E-02	4,40E-05	5,67E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,33E-05	2,53E-04	4,10E-07	5,04E-02
ECI	euro	1,40E+00	2,31E-02	2,94E-02	1,45E+00	3,56E-03	6,76E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,94E-03	1,50E-02	5,09E-05	-1,20E-01
ADPF	kg Sb eq.	3,68E-02	1,36E-03	2,73E-03	4,09E-02	2,17E-04	1,80E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,62E-04	4,41E-04	4,91E-06	-5,96E-03

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.	5,36E+00	1,88E-01	4,18E-01	5,97E+00	2,98E-02	2,54E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,97E-02	1,81E-02	3,68E-04	-1,03E+00
GWP-fossil	kg CO2 eq.	5,33E+00	1,88E-01	4,17E-01	5,93E+00	2,98E-02	2,52E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,97E-02	6,83E-02	3,68E-04	-1,03E+00
GWP-biogenic	kg CO2 eq.	2,37E-02	6,92E-05	6,73E-04	2,45E-02	1,11E-05	1,31E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,85E-05	-5,03E-02	2,15E-07	0,00E+00
GWP-luluc	kg CO2 eq.	1,04E-02	7,07E-05	4,35E-04	1,09E-02	1,09E-05	5,87E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,82E-05	7,60E-05	1,02E-07	7,64E-04
ODP	kg CFC11 eq.	3,74E-07	4,13E-08	1,85E-08	4,34E-07	6,58E-09	2,18E-08	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,10E-08	9,75E-09	1,51E-10	-2,53E-08
AP	mol H+ eq.	3,73E-02	1,25E-03	1,70E-03	4,03E-02	1,73E-04	1,88E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,88E-04	8,23E-04	3,49E-06	-3,99E-03
EP-fresh water	kg PO4 eq.	4,26E-04	1,86E-06	7,01E-05	4,97E-04	3,01E-07	2,33E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	5,01E-07	4,62E-06	4,12E-09	-3,65E-05
EP-marine	kg N eq.	7,93E-03	4,19E-04	2,39E-04	8,59E-03	6,09E-05	4,10E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,01E-04	1,81E-04	1,20E-06	-7,40E-04
EP-terrestrial	mol N eq.	8,78E-02	4,62E-03	2,91E-03	9,53E-02	6,71E-04	4,53E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,12E-03	2,11E-03	1,32E-05	-8,64E-03
POCP	kg NMVOC eq.	2,81E-02	1,31E-03	3,78E-04	2,98E-02	1,92E-04	1,25E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,19E-04	5,75E-04	3,84E-06	-5,88E-03
ADP-minerals & metals	kg Sb eq.	5,41E-02	4,65E-06	4,33E-06	5,41E-02	7,55E-07	2,71E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,26E-06	3,76E-06	3,36E-09	-7,01E-07
ADP-fossil	MJ, net calorific value	6,91E+01	2,82E+00	6,13E+00	7,80E+01	4,49E-01	3,65E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,49E-01	9,40E-01	1,03E-02	-7,23E+00
WDP	m3 world eq. Deprived	3,47E+00	9,91E-03	9,11E-02	3,57E+00	1,61E-03	1,69E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,68E-03	9,49E-03	4,61E-04	-1,97E-01

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	3,57E-07	1,65E-08	-6,73E-09	3,66E-07	2,68E-09	1,62E-08	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,46E-09	1,03E-08	6,77E-11	-5,98E-08
IRP	kBq U235 eq.	3,32E-01	1,18E-02	3,45E-02	3,78E-01	1,88E-03	2,03E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	3,14E-03	4,68E-03	4,22E-05	1,77E-02
ETP-fw	CTUe	6,09E+02	2,49E+00	3,17E-01	6,12E+02	4,01E-01	2,91E+01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,68E-01	4,05E+00	6,67E-03	-3,47E+01
HTP-c	CTUh	3,61E-08	8,26E-11	-5,83E-10	3,56E-08	1,30E-11	1,78E-09	ND	ND	ND	ND	ND	ND	ND	0,00E+00	2,17E-11	9,86E-11	1,54E-13	-1,32E-10
HTP-nc	CTUh	6,27E-07	2,71E-09	1,62E-10	6,29E-07	4,38E-10	4,18E-08	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,30E-10	4,68E-09	4,74E-12	2,00E-07
SQP	-	2,77E+01	2,39E+00	1,67E+00	3,18E+01	3,90E-01	1,66E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	6,50E-01	1,89E+00	2,16E-02	-1,60E+00

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	7,04E-03	7,01E-06	-7,74E-06	7,04E-03	1,14E-06	3,46E-04	ND	ND	ND	ND	ND	ND	ND	0,00E+00	1,90E-06	2,84E-06	1,54E-08	-1,24E-04
NHWD	kg	1,50E+00	1,74E-01	3,37E-02	1,71E+00	2,85E-02	8,90E-02	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,75E-02	2,75E-02	6,98E-02	-1,01E-01
RWD	kg	2,60E-04	1,85E-05	2,89E-05	3,08E-04	2,95E-06	1,64E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	4,92E-06	5,57E-06	6,75E-08	6,11E-06
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	2,64E-04	2,64E-04	0,00E+00	1,32E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	1,33E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	1,60E-05	1,60E-05	0,00E+00	8,01E-07	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	1,80E-04	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	9,23E-04	9,23E-04	0,00E+00	4,61E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,35E-03
ETE	MJ	0,00E+00	0,00E+00	5,37E-04	5,37E-04	0,00E+00	2,68E-05	ND	ND	ND	ND	ND	ND	ND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,84E-04

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	7,63E+00	3,48E-02	6,87E-01	8,35E+00	5,63E-03	4,36E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,38E-03	1,48E-01	8,31E-05	2,10E-01
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	7,63E+00	3,48E-02	6,87E-01	8,35E+00	5,63E-03	4,36E-01	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,38E-03	1,48E-01	8,31E-05	2,10E-01
PENRE	MJ	7,34E+01	2,99E+00	6,61E+00	8,30E+01	4,77E-01	3,89E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,95E-01	9,97E-01	1,09E-02	-7,50E+00
PENRM	MJ	4,36E-03	0,00E+00	0,00E+00	4,36E-03	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	7,34E+01	2,99E+00	6,61E+00	8,30E+01	4,77E-01	3,89E+00	ND	ND	ND	ND	ND	ND	ND	0,00E+00	7,95E-01	9,97E-01	1,09E-02	-7,50E+00
SM	kg	6,00E-01	0,00E+00	7,72E-05	6,01E-01	0,00E+00	3,86E-06	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	1,04E-01	3,38E-04	1,14E-02	1,16E-01	5,47E-05	5,64E-03	ND	ND	ND	ND	ND	ND	ND	0,00E+00	9,12E-05	4,47E-04	1,10E-05	-3,74E-03

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 for the Walraven clamp have been modeled to reflect real production conditions as accurately as possible. Primary data from Walraven's Czech production facility was prioritized for all processes. When site specific data was unavailable or incomplete, verified and geographically relevant background datasets from sources such as Ecoinvent 3.6 via the Dutch Nationale Milieudatabase v3.8 were applied.

For Module A1, product composition data was collected directly from Walraven. Module A2 includes recorded transport distances for each material to the production site. Module A3 captures electricity consumption, material losses, and waste outputs from the 2023/2024 production year. All background processes and auxiliary datasets were aligned with EN15804+A2:2019 standards.

Data Collection Period

The dataset represents production processes during 2023/2024.

Methodology and Reproducibility

The LCA was performed according to EN 15804+A2:2019, ISO 14040, ISO 14044, ISO 14025, and the NMD Bepalingsmethode v1.2 (2025). Modeling and impact calculations were conducted using Ecochain Helix version 4.3.1. Life cycle stages included in the assessment:

A1–A3: Raw material extraction, transport, and manufacturing
A4–A5: Transport to site and installation
C1–C4: End-of-life processes including dismantling, transport, treatment, and disposal
D: Potential benefits from recycling and energy recovery

Inventory and Allocation

All material and energy inputs, emissions, and waste flows were included. Allocation follows EN15804 guidance, with mass-based allocation used to distribute shared inputs (e.g., electricity, auxiliary materials) across products. No secondary materials were used in production. Cut-off criteria were applied so that excluded flows do not exceed 5% of mass or energy per module.

Data Sources

Primary data from Walraven's Czech facility included material compositions (steel, POM, Class 4.8 screws and nuts, zinc), transport distances, and production energy and waste records. When manufacturer-specific data was unavailable, appropriate datasets from Ecoinvent 3.6 and NMD v3.8 were used. Downstream processes, including waste treatment, recycling, and avoided burdens in Module D, were modeled using these sources.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Modules A1 to A3 describe the production phase of the Walraven 434 Clamp zinc plated G1" PE-Pipe 315mm, including raw material sourcing, transport to the production facility, and manufacturing processes. The clamp is primarily composed of hot-rolled low-alloyed steel (both upper and lower parts), zinc coating, fasteners (nuts and screws), and a POM plastic washer. Material composition is based on 2023/2024 bills of materials from the Walraven Czech Republic production facility. All upstream materials were modeled using background data from the Dutch Nationale Milieudatabase (NMD) v3.8 and Ecoinvent v3.6. Steel inputs were modeled with a blend of 57% primary and 43% secondary content as per standard LCA convention.

Module A2 models transport of materials to the production site using standardized assumptions in line with EN 15804+A2:2019. All material transportation was assumed with a 50% load factor (full inbound, empty return) and modeled using freight truck and ship references from NMD/Ecoinvent databases.

Module A3 includes energy consumption, production waste, and ancillary material use based on 2023/2024 operational data from the Czech production site. Electricity was drawn from the Czech national grid and used in both the main clamp manufacturing processes and zinc treatment steps. Lubricating oil was used as an auxiliary input, and steel scrap was generated as production waste. A share of this scrap was recycled internally. No hazardous waste was reported. Capital goods were excluded under the EN 15804+A2 cutoff rule as their contribution was below 5% of total environmental impacts.

Module A4 evaluates transportation of the finished clamp to the customer. A default transport distance of 150 km was assumed, using a 50% truck load factor based on Bepalingsmethode v1.2. Emissions were modeled using the standard unspecified freight truck dataset from NMD v3.8 / Ecoinvent 3.6.

Module A5 addresses installation activities and related waste. Manual installation of the clamp incurs no additional energy consumption. A standard 5% material loss was assumed during installation. This waste was modeled with appropriate transportation to waste processing facilities plastic sent 100 km to incineration (AVI) and steel to landfill/recycling over 100 km. Waste types and routes follow Bepalingsmethode v1.2 fixed assumptions.

End-of-Life Scenario Fixed Values Used:

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

Module C1 addresses manual deconstruction of the Walraven 434 Clamp, assuming negligible energy consumption during removal. No machinery or additional energy inputs are required, reflecting typical on-site practices.

Module C2 covers transport of end-of-life materials to processing facilities. Steel and zinc components are transported 50 km to recycling or disposal sites, while POM plastic parts are sent 100 km to AVI incineration plants. Emissions from transport are modeled using standard truck references from NMD v3.8.

Module C3 captures waste processing. Steel and zinc are fully sorted and recycled, ensuring maximum material recovery. POM plastic is incinerated with energy recovery, and emissions and energy flows are modeled using: 0264-avC&Verbranden kunststoffen for plastics, 0315-reC&Sorteren en persen oud ijzer for steel, and relevant references for zinc.

Module C4 models final disposal. A residual 5% of steel and zinc is assumed to go to landfill, while all plastic is fully incinerated. Landfill references used include 0253-sto&Stort staal for steel and 0248-sto&Stort koper, lood, verzinkt staal, zink for zinc.

Module D quantifies environmental benefits beyond the system boundary. Steel recycling is credited at 52% (accounting for 95% recycling minus 43% secondary content), zinc at 95% recycling efficiency, and POM plastic incineration is assumed to achieve 100% energy substitution via recovered thermal and electrical energy.

The end-of-life modeling is fully compliant with EN 15804+A2:2019 + AC:2021 and the Dutch Bepalingsmethode v1.2 (2025), ensuring a transparent and reproducible LCA that reflects best-practice methodology for construction product declarations.

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.