

**Environmental
Product
Declaration**

ISO14025+EN15804+A2 Bepalingsmethode
'Milieuprestatie Bouwwerken' versie 2.0-februari 2025

This declaration is for:
Armourstone (waterbouwsteen)

Provided by:
Roxx International B.V.



MRPI® registration:

00042.2026.1.0

Program operator:

Stichting MRPI

Publisher:

Stichting MRPI

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COMPANY INFORMATION

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<https://roxx-international.com>

MRPI® REGISTRATION

00042.2026.1.0

DATE OF THIS ISSUE

22-09-2026

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22-09-2031

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by Vroege, Gert-Jan, Eco-Intelligence. The LCA study has been done by Vermaas, Bente, LBP|SIGHT B.V.. The certificate is based on a LCA-dossier According to ISO14025+EN15804+A2 Bepalingsmethode 'Milieuprestatie Bouwwerken' versie 2.0-februari 2025. It is verified according to the. 'Verification protocol for MRPI LCA project report & EPD 16th of April 2026, V. 5.3'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2.

PROGRAM OPERATOR

Stichting MRPI
Kingsfordweg 151
1043 GR
Amsterdam

PRODUCT

Armourstone (waterbouwsteen)

DECLARED AND FUNCTIONAL UNIT

Mass (1000 kg)

DESCRIPTION OF PRODUCT

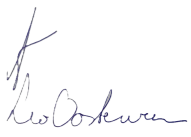
Armourstone (limestone) is used for erosion protection and stabilization of hydraulic structures such as shorelines, riverbanks, and coastal defenses. It provides high resistance to hydraulic forces and mechanical impacts while ensuring long-term durability under varying environmental conditions.

VISUAL PRODUCT



MORE INFORMATION

<https://roxx-international.com>

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 ISO14025+EN15804+A2 Bepalingsmethode 'Milieuprestatie Bouwwerken' versie 2.0-februari 2025 Internal: External: X
	Independent verifier: Vroege, Gert-Jan, Eco-Intelligence. Certified NMD verifier.
	
	[1] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Company information:
 Roxx International BV produces and supplies materials for the infrastructure and water engineering sector, granulate and armourstone such as limestone, sandstone, and basalt. The company connects quarries, processing locations, and customers, thereby playing a central role in coordinating the extraction, quality control, logistics, and delivery of stony materials for infrastructure and hydraulic engineering applications. Within this EPD, Roxx International BV is considered a linking entity that consolidates product flows and enables market application.

Carrières Moris is a producer of natural stone and is responsible for the extraction and processing of rocks used as armourstone. This EPD describes the environmental impact associated with the extraction of armourstone originating from the Carrières Moris quarry in Poulseur, Belgium.

Product information:
 Armourstone (limestone) is used for erosion protection and stabilization of hydraulic structures such as shorelines, riverbanks, and coastal defenses. It provides high resistance to hydraulic forces and mechanical impacts while ensuring long-term durability under varying environmental conditions.

The armourstone is sold in several sizes. This EPD is representative for all types shown in the table below.

Product type	Range (kg)
Armourstone LMA	5/40
Armourstone LMA	10/60
Armourstone LMA	40/200
Armourstone LMA	60/300
Armourstone HMB	100/1000
Armourstone HMA	300/1000

Technical data	Amount	Unit
Density	> 2650	kg / m³
Bulk weight	1650	kg / m³
Water absorption	< 0.5	%
Freeze-thaw resistance	FTa	Class
Dynamic crushing strength	80	MPa
Abrasion resistance	20	%

Quality control	Approved
BRL 9324	✓
Besluit Bodemkwaliteit (BSB)	✓
NEN EN 13383	✓
CE2+	✓
CP45-125	✓
CP45-180	✓
CP90-180	✓
CP90-250	✓

Component (> 1%)	%
Armourstone	100

Biogenic carbon content	Unit	Amount of uptake per functional unit
Biogenic carbon content in product	Kg C	0
Biogenic carbon content in accompanying packaging	Kg C	0
Note that 1 kg of biogenic carbon is equivalent to 44 / 12 kg of CO2.		

SCOPE AND TYPE

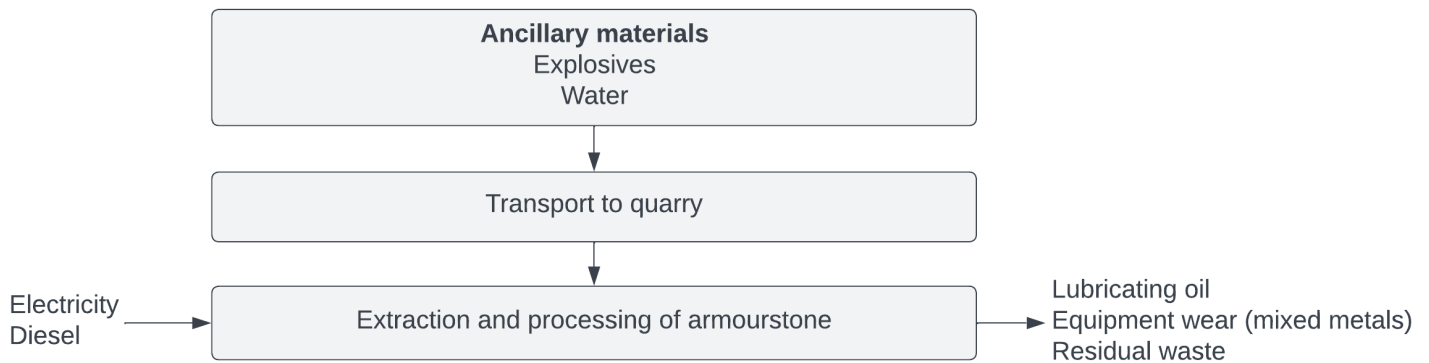
Background database: Ecoinvent 3.9.1
 Method: Cut-off by classification
 Software: Simapro 10.2
 Characterization factor: Environmental Footprint (EF) 3.1

This EPD is based on a product specific Cradle-to-Gate LCA of the armourstone of Carrières Moris, produced in a single production site in Poulseur, Belgium.

Company-specific data for the production stage has been collected by Carrières Moris. The LCI data has been evaluated by the LCA-practitioner and checked by the EPD verifier. Generic data has been used for the background processes, originating from the Ecoinvent 3.9 Cut-off by classification database (2022) using EF 3.1. For the calculation of the LCA results, the software program SimaPro 10.2.0.2 has been used.

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	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

X = Modules Assesed
 ND = Not Declared



REPRESENTATIVENESS (IF AVERAGE)

The data used for the LCA is representative for the production of the armoustone products, manufactured by Carrières Moris in Poulseur, Belgium.

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 CO ₂ eq	0.00E+00	0.00E00	4.16E+00	4.16E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP-fossil	kg CO ₂ eq	0.00E+00	0.00E00	4.16E+00	4.16E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP-biogenic	kg CO ₂ eq	0.00E+00	0.00E00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GWP-luluc	kg CO ₂ eq	0.00E+00	0.00E00	7.01E-04	7.01E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ODP (A2)	kg CFC11 eq	0.00E+00	0.00E00	1.04E-07	1.04E-07	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AP mol H+	mol H+ eq	0.00E+00	0.00E00	9.92E-03	9.92E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP-freshwater	kg P eq	0.00E+00	0.00E00	3.91E-05	3.91E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP-marine	kg N eq	0.00E+00	0.00E00	3.07E-03	3.07E-03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EP-terrestrial	mol N eq	0.00E+00	0.00E00	3.23E-02	3.23E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
POCP kg NMVOC	kg NMVOC eq	0.00E+00	0.00E00	1.30E-02	1.30E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADP-minerals & metals	kg Sb eq	0.00E+00	0.00E00	4.57E-06	4.57E-06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ADP-fossil	MJ, net calorific value	0.00E+00	0.00E00	5.77E+01	5.77E+01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
WDP	m3 world eq. Deprived	0.00E+00	0.00E00	3.11E-01	3.11E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

GWP-total = Global Warming Potential total
 GWP-fossil = Global Warming Potential fossil fuels
 GWP-biogenic = Global Warming Potential biogenic total
 GWP-LULUC = Global Warming Potential land use and land use change
 ODP = Depletion potential of the stratospheric ozone layer
 AP = Acidification Potential, Accumulated Exceedence
 AP-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 incidence	0.00E+00	0.00E+00	6.40E-08	6.40E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
IRP	kBq U235 eq	0.00E+00	0.00E+00	4.69E-02	4.69E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	0.00E+00	0.00E+00	2.09E+01	2.09E+01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	0.00E+00	0.00E+00	7.77E-09	7.77E-09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	0.00E+00	0.00E+00	2.17E-08	2.17E-08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQP	-	0.00E+00	0.00E+00	1.95E+02	1.95E+02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

PM = Potential incidence of disease due to particulate matter 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 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
HWD	kg	0.00E+00	0.00E+00	3.64E-04	3.64E-04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NHWD	kg	0.00E+00	0.00E+00	2.03E-01	2.03E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RWD	kg	0.00E+00	0.00E+00	3.47E-05	3.47E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MFR	kg	0.00E+00	0.00E+00	5.09E-05	5.09E-05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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 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	0.00E+00	0.00E+00	8.91E-01	8.91E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PERT	MJ	0.00E+00	0.00E+00	8.91E-01	8.91E-01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRE	MJ	0.00E+00	0.00E+00	5.77E+01	5.77E+01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PENRT	MJ	0.00E+00	0.00E+00	5.77E+01	5.77E+01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.00E+00	0.00E+00	1.16E-02	1.16E-02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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
 NRSF = Use of non-renewable secondary fuels
 FW = Use of net fresh water

CALCULATION RULES

The reference year of this study is 2025. The LCA was carried out in accordance with the requirements and guidelines of the NMD "Bepalingsmethode Milieuprestatie Bouwwerken" (Environmental Performance Assessment Method for Construction Works) (version 2.0, February 2025) and the NMD Verification protocol (version 2.0, June 2025). The NMD-Assessment method is based on ISO 14040 - ISO14044 and NEN-EN 15804:2012 + A2 (2019).

Allocation
 For the extraction of the armourestone, explosives, water, electricity, diesel, and capital goods are used, and production waste is generated in the form of hydraulic oil, mixed metals (due to equipment wear), and residual waste (household waste). These resources are also used simultaneously for, or generated during, the extraction of other product types and, except for the diesel consumption, therefore cannot be attributed to specific extracted product types. As a result, it is not possible to avoid allocation. Physical allocation (e.g. based on mass) is not considered appropriate, as the economic value of the output flows varies significantly. In line with EN 15804, economic allocation has therefore been applied, using a worst-case approach. Furthermore, a sensitivity analysis was performed to determine the variability of the results due to the uncertainty in economic value. The analysis has shown that the results are robust within the possible bandwidth of the economic allocation.

The diesel consumption was collected at the product level, thus no allocation is applied.

Cut-off
 In compliance to the EN15804 and the additional requirements in the NMD Assessment Method the following cut-off criteria have been applied:

- All input and output flows for which specific information was available have been included in the calculations.
- A cut-off process must contribute less than 1% of the energy usage and 1% of the total mass of the unit process. An excluded process cannot contribute over 5% to a single environmental impact indicator per module.
- The total number of excluded input streams can account for maximum 5% of the energy usages and mass.

No input streams have been disregarded in this LCA.

Within the system boundaries of this LCA study, and in compliance with EN 15804, the following inputs and output have been excluded from the LCA study:

- Overhead processes, like office departments, personal transportation, etc. (operational energy- and water usage, and production waste are included).

It is not to be expected for the upper mentioned processes to contribute significantly to the environmental profile of the products.

DATA QUALITY

The data provided by the manufacturer, was assessed based on the data quality system from Annex E.1 of the NMD verification protocol (version 2.0, June 2025). Data quality requirements follow EN15804+A2:2019. The foreground data collected by the manufacturer are based on yearly production amounts. The technological, geographical and temporal coverage reflects the physical reality as far as possible. Data quality is assessed as good on average to the goal and scope of the study.

POWER MIX

For the operational processes, electricity from the Belgium grid is used (residual mix). A market based approach is used, and specified in the table below.

Type and database	Process	GWP (kg CO2 eq.) per kWh
Electricity from grid, residual mix	Electricity, low voltage {BE} electricity, low voltage, residual mix Cut-off, U	0.203

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Production process

For the extraction of armoustone, explosives are procured. After removal of the overburden, rock fragments are loosened using these explosives. The blasted rock is then mechanically loaded, manually hammered into smaller fractions, and sorted. Various diesel-powered construction machines are used for these processing steps. Water and electricity are used for overhead processes.

During detonation of the explosives, emissions are released, which have been specifically modelled. During maintenance of the construction equipment, hydraulic oil is regularly replaced and disposed of as waste. In addition, a small quantity of mixed metals is generated due to wear of the equipment, and a residual waste stream is produced. Capital goods have been inventoried and modelled.

DECLARATION OF SVHC

The product does not contain materials listed in the "Candidate list of Substances of Very High Concern for authorization".

REFERENCES

- [1] The NMD "Bepalingsmethode Milieuprestatie Bouwwerken" (Environmental Performance Assessment Method for Construction Works) (version 2.0, February 2025) and the NMD-Verification protocol (version 2.0, June 2025).
- [2] NEN-EN 15804 Duurzaamheid van bouwwerken - Milieuverklaringen van producten - Basisregels voor de productgroep bouwproducten;
- [3] ISO, 2006. "Environmental management. Life cycle assessment - Principles and framework". ISO 14040:2006;
- [4] ISO, 2006. "Environmental management. Life cycle assessment - Requirements and Guidelines". ISO 14044:2006;
- [5] ISO, 2000. "Environmental labels and declarations - Type III environmental declarations". ISO/TR 14025:2000.