Environmental Product Declaration

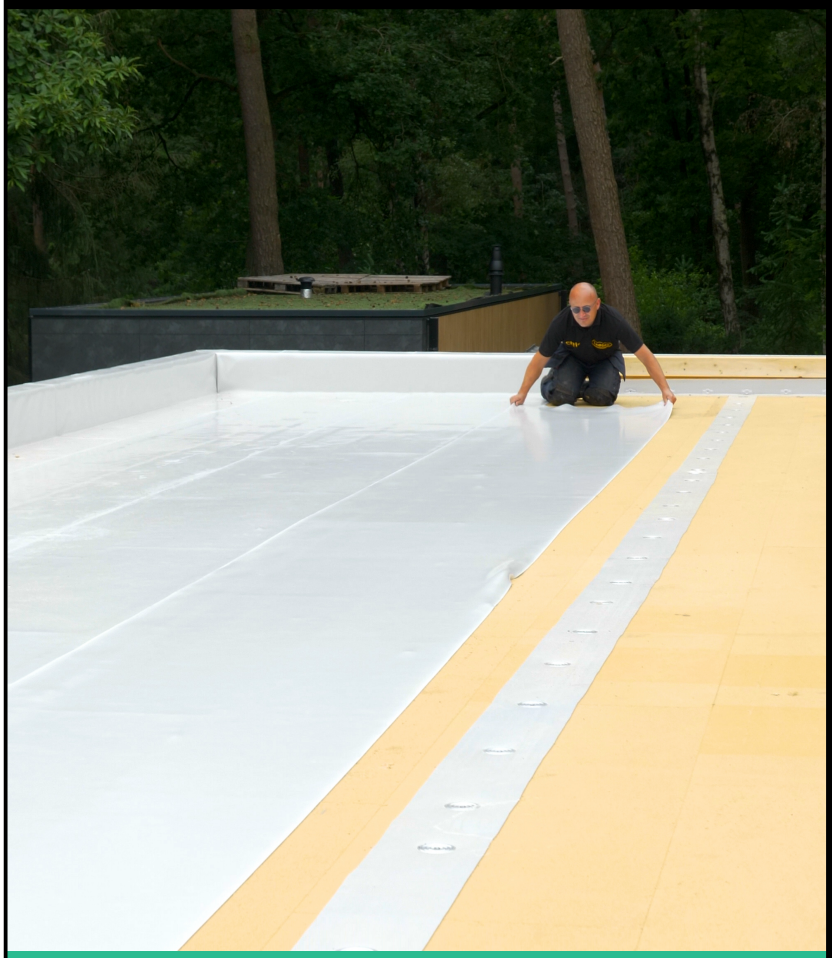
according to ISO 14025 and EN 15804

This declaration is for:

Leadax Roov

Provided by:

Leadax Circular Roofing BV



program operator

Stichting MRPI®

publisher

Stichting MRPI®

www.mrpi.nl

MRPI® registration

1.1.00386.2022

date of first issue

29-11-2022

date of this issue

29-11-2022

expiry date

29-11-2027

COMPANY INFORMATION

Leadax Circular Roofing BV
Ir. R.R. van der Zeelaan 10
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Wapenveld

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www.leadax.com

PRODUCT

Leadax Roov

DECLARED UNIT/FUNCTIONAL UNIT

1m² of roof covering including fasteners for a waterproof flat, based on a 1000 m² roof (40x25 m²) as a representative of roof areas larger than 50 m². Overlaps and roof upstands are included.

DESCRIPTION OF PRODUCT

Leadax Roov is a circular roofing material in reflective off-white, made from Post Consumer Recycled PVB.

VISUAL PRODUCT

MRPI® REGISTRATION

1.1.00386.2022

DATE OF ISSUE

29-11-2022

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MORE INFORMATION

https://www.leadax.com/en/products/leadax-pvb-roofing

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Gert-Jan Vroege, Eco Intelligence.**
The LCA study has been done by **Laureen van Munster, NIBE BV.**
The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2/Bepalingsmethode. 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/Bepalingsmethode. 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
1043GR
Amsterdam

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 Vroege, Eco Intelligence
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

Leadax Roov is a roofing system that consists of two membranes:

Membrane 1: Top layer (exposed to weather conditions) with following dimensions, length 1250 cm, width 100 cm and weight 1.85 kg/m².
Membrane 2: Underlayer (fixation strips) with following dimensions, length 1500 cm, width 100 cm and weight 1.5 kg/m²

Both membranes have a thickness of about 1.5 mm

The following quantities of the membranes are required to achieve 1m² of roofing system (Functional Unit?):
1.1 m² of membrane 1 and 0.176 m² of membrane 2. The total weight of de roofing membrane is 2.299 kg/m².

For the LCA calculation, a safe value of 30 years outdoor exposure in the Western European climate is used for durability of membrane 1 (top layer). For membrane 2 (fixation strips) we are assuming a durability of 75 years because it is not exposed to weather conditions. For the LCA calculation we use a life expectancy of the building of 75 years. During this period, the single-ply roofing material membrane 1 will be applied once and replaced 1,5 times. The underlying fixation strips (membrane 2) will be applied once.

COMPONENT >1% of total mass	[kg / %]
PVB	70%
Other additives	30%

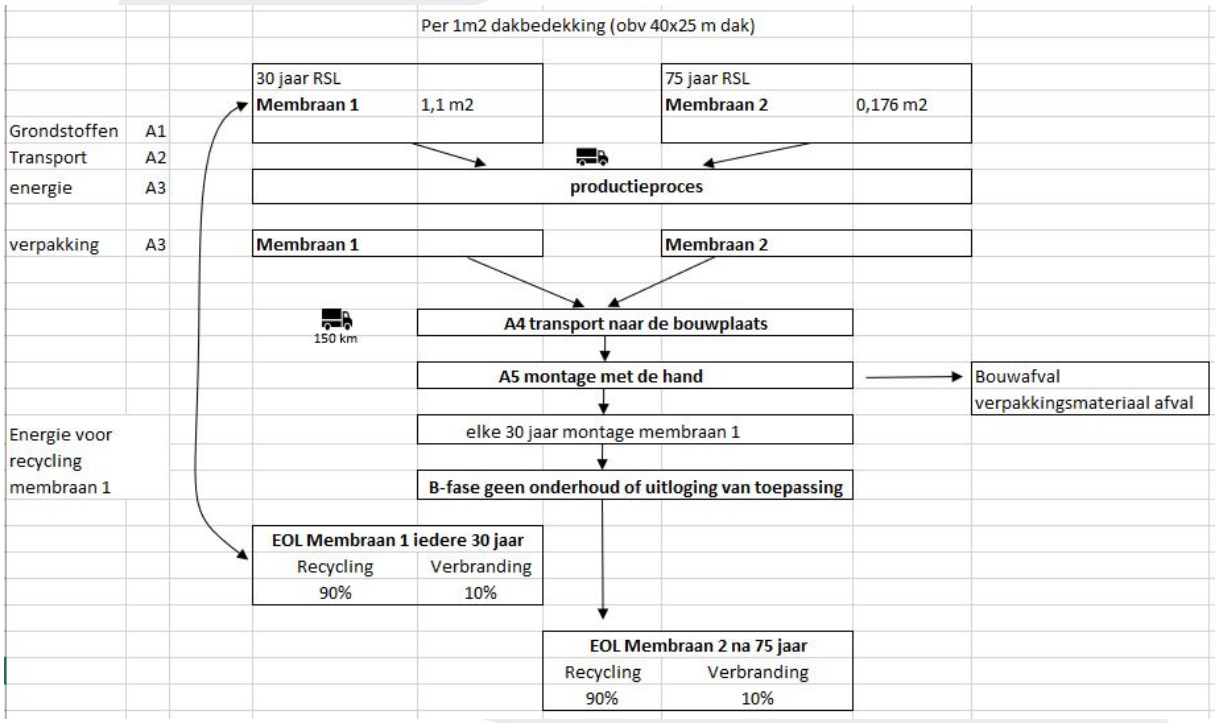
SCOPE AND TYPE

The product specific EPD for Leadax Roov is a Cradle-to-Grave with options EPD. The product is produced in the Netherlands. The software Simapro 9.1 and NIBE's R<THiNK application are used to perform the LCA. The Ecoinvent 3.6 database was used. The validity of this EPD is in correspondence with the specifications of the LCA project report. The target groups of this LCA study are users of EPD's (business to business) in accordance with the EN 15804:2019 +A2 (+indicators A1). The LCA is intended for publication at MRPI and NMD. The input data are representative for Leadax Roov, a product of Leadax Circular Roofing B.V. The data are representative for production in the Netherlands for the European market.

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

X = Modules Assessed

ND = Not Declared



LCA process diagram according to EN 15804 (7.2.1)

REPRESENTATIVENESS

All data (materials, production amount and total energy) is collected in 2021-2022 and relate to the year 2020. The amounts of electricity use for production are based on consumption data in the year 2020.

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

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ADPE	kg Sb eq.	6.49 E-6	2.30 E-6	3.78 E-5	4.66 E-5	1.31 E-6	9.05 E-6	0.00	0.00	1.90 E-5	0.00	4.72 E-7	2.28 E-6	0.00	4.42 E-4
ADPF	MJ	1.38 E+1	1.38 E+0	2.10 E+1	3.62 E+1	7.85 E-1	6.92 E+0	0.00	0.00	3.71 E+1	0.00	2.82 E-1	8.42 E+0	0.00	1.49 E+1
GWP	kg CO2 eq.	7.61 E-1	9.01 E-2	8.60 E-1	1.71 E+0	5.14 E-2	1.14 E+0	0.00	0.00	3.34 E+0	0.00	1.85 E-2	1.26 E+0	0.00	1.39 E-1
ODP	kg CFC11 eq.	2.66 E-6	1.60 E-8	8.91 E-8	2.76 E-6	9.11 E-9	1.79 E-7	0.00	0.00	4.33 E-6	0.00	3.28 E-9	2.77 E-8	0.00	1.35 E-7
POCP	kg ethene eq.	5.81 E-4	5.44 E-5	8.26 E-4	1.46 E-3	3.10 E-5	5.51 E-4	0.00	0.00	1.17 E-3	0.00	1.11 E-5	8.26 E-5	0.00	1.11 E-3
AP	kg SO2 eq.	4.29 E-3	3.96 E-4	3.11 E-3	7.79 E-3	2.26 E-4	2.07 E-3	0.00	0.00	9.32 E-3	0.00	8.12 E-5	1.07 E-3	0.00	4.22 E-3
EP	kg (PO4)3- eq.	4.23 E-4	7.79 E-5	3.81 E-4	8.82 E-4	4.44 E-5	5.47 E-4	0.00	0.00	1.19 E-3	0.00	1.59 E-5	2.29 E-4	0.00	4.75 E-4

Toxicity indicators for Dutch market

HTP	kg DCB eq.	4.83 E-1	3.79 E-2	2.31 E-1	7.52 E-1	2.16 E-2	1.94 E-1	0.00	0.00	9.50 E-1	0.00	7.77 E-3	6.27 E-2	0.00	3.92 E-1
FAETP	kg DCB eq.	2.21 E-2	1.11 E-3	7.14 E-3	3.03 E-2	6.31 E-4	3.81 E-2	0.00	0.00	4.06 E-2	0.00	2.27 E-4	1.79 E-3	0.00	1.00 E-2
MAETP	kg DCB eq.	3.81 E+1	3.99 E+0	1.89 E+1	6.10 E+1	2.27 E+0	1.68 E+1	0.00	0.00	8.06 E+1	0.00	8.16 E-1	7.29 E+0	0.00	3.33 E+1
TETP	kg DCB eq.	3.33 E-3	1.34 E-4	1.21 E-3	4.68 E-3	7.64 E-5	7.87 E-3	0.00	0.00	9.50 E-3	0.00	2.75 E-5	2.75 E-3	0.00	3.18 E-3
ECI	Euro	1.09 E-1	1.09 E-2	8.51 E-2	2.05 E-1	6.19 E-3	9.26 E-2	0.00	0.00	3.16 E-1	0.00	2.23 E-3	7.66 E-2	0.00	7.06 E-2
ADPF	kg Sb. eq.	6.64 E-3	6.63 E-4	1.01 E-2	1.74 E-2	3.78 E-4	3.33 E-3	0.00	0.00	1.79 E-2	0.00	1.36 E-4	4.05 E-3	0.00	7.16 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.]

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

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	7.89 E-1	9.10 E-2	7.82 E-1	1.66 E+0	5.18 E-2	1.11 E+0	0.00	0.00	3.41 E+0	0.00	1.86 E-2	1.27 E+0	0.00	1.31 E-1
GWP-fossil	kg CO2 eq.	7.90 E-1	9.09 E-2	8.81 E-1	1.76 E+0	5.18 E-2	1.15 E+0	0.00	0.00	3.40 E+0	0.00	1.86 E-2	1.26 E+0	0.00	1.46 E-1
GWP-biogenic	kg CO2 eq.	-1.04 E-3	4.20 E-5	-1.00 E-1	-1.01 E-1	2.39 E-5	-3.92 E-2	0.00	0.00	6.75 E-3	0.00	8.59 E-6	5.96 E-3	0.00	-1.61 E-2
GWP-luluc	kg CO2 eq.	3.07 E-4	3.33 E-5	8.93 E-4	1.23 E-3	1.90 E-5	3.63 E-3	0.00	0.00	7.97 E-4	0.00	6.82 E-6	1.62 E-4	0.00	7.72 E-4
ODP	kg CFC11 eq.	2.31 E-6	2.01 E-8	8.49 E-8	2.41 E-6	1.14 E-8	1.63 E-7	0.00	0.00	3.78 E-6	0.00	4.11 E-9	2.76 E-8	0.00	1.68 E-7
AP	mol H+ eq.	5.07 E-3	5.27 E-4	3.78 E-3	9.38 E-3	3.00 E-4	2.76 E-3	0.00	0.00	1.13 E-2	0.00	1.08 E-4	1.36 E-3	0.00	4.94 E-3
EP-freshwater	kg PO4 eq.	4.16 E-5	9.17 E-7	3.12 E-5	7.37 E-5	5.22 E-7	2.96 E-5	0.00	0.00	1.12 E-4	0.00	1.88 E-7	3.08 E-5	0.00	3.81 E-5
EP-marine	kg N eq.	6.68 E-4	1.86 E-4	6.95 E-4	1.55 E-3	1.06 E-4	8.74 E-4	0.00	0.00	1.95 E-3	0.00	3.80 E-5	3.10 E-4	0.00	5.67 E-4
EP-terrestrial	mol N eq.	7.70 E-3	2.05 E-3	7.64 E-3	1.74 E-2	1.17 E-3	7.69 E-3	0.00	0.00	2.25 E-2	0.00	4.19 E-4	3.75 E-3	0.00	6.64 E-3
POCP	kg NMVOC eq.	2.70 E-3	5.85 E-4	3.21 E-3	6.50 E-3	3.33 E-4	1.89 E-3	0.00	0.00	7.01 E-3	0.00	1.20 E-4	9.27 E-4	0.00	3.69 E-3
ADP-minerals & metals	kg Sb eq.	3.82 E-6	2.30 E-6	3.77 E-5	4.39 E-5	1.31 E-6	8.78 E-6	0.00	0.00	1.47 E-5	0.00	4.72 E-7	2.28 E-6	0.00	4.42 E-4
ADP-fossil	MJ, net calorific value	1.25 E+1	1.37 E+0	2.08 E+1	3.47 E+1	7.81 E-1	6.66 E+0	0.00	0.00	3.32 E+1	0.00	2.81 E-1	7.15 E+0	0.00	1.78 E+1
WDP	m3 world eq. deprived	2.99 E-1	4.90 E-3	5.92 E-1	8.96 E-1	2.79 E-3	5.39 E-1	0.00	0.00	5.80 E-1	0.00	1.00 E-3	6.27 E-2	0.00	6.52 E-1

GWP-total = Global Warming Potential total
GWP-fossil = Global Warming Potential fossil fuels
GWP-biogenic = Global Warming Potential biogenic
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 [2]
ADP-fossil = Abiotic Depletion for fossil resources potential [2]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]

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.

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

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
PM	Disease incidence	4.69 E-8	8.18 E-9	3.30 E-8	8.80 E-8	4.66 E-9	2.42 E-8	0.00	0.00	1.01 E-7	0.00	1.67 E-9	4.65 E-9	0.00	6.37 E-8
IRP	kBq U235 eq.	1.77 E-2	5.74 E-3	3.27 E-2	5.61 E-2	3.27 E-3	1.78 E-2	0.00	0.00	6.25 E-2	0.00	1.18 E-3	1.49 E-2	0.00	1.10 E-1
ETP-fw	CTUe	2.40 E+1	1.22 E+0	1.79 E+1	4.31 E+1	6.96 E-1	2.39 E+1	0.00	0.00	5.32 E+1	0.00	2.50 E-1	8.36 E+0	0.00	1.81 E+1
HTP-c	CTUh	2.37 E-9	3.97 E-11	3.41 E-10	2.75 E-9	2.26 E-11	1.24 E-9	0.00	0.00	4.07 E-9	0.00	8.12 E-12	1.31 E-10	0.00	4.92 E-10
HTP-nc	CTUh	4.13 E-8	1.34 E-9	9.74 E-9	5.24 E-8	7.62 E-10	1.97 E-8	0.00	0.00	7.58 E-8	0.00	2.74 E-10	4.51 E-9	0.00	1.93 E-8
SQP	---	1.65 E+0	1.19 E+0	5.47 E+0	8.32 E+0	6.77 E-1	5.42 E+0	0.00	0.00	7.52 E+0	0.00	2.44 E-1	1.49 E+0	0.00	2.67 E+0

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 [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 disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

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.

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

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
PERE	MJ	3.00 E-1	1.72 E-2	2.16 E+0	2.48 E+0	9.78 E-3	2.83 E+0	0.00	0.00	1.58 E+0	0.00	3.52 E-3	7.61 E-1	0.00	7.24 E-1
PERM	MJ	0.00	0.00	7.71 E-1	7.71 E-1	0.00	3.28 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-3.55 E-2
PERT	MJ	3.00 E-1	1.72 E-2	2.93 E+0	3.25 E+0	9.78 E-3	3.19 E+0	0.00	0.00	1.59 E+0	0.00	3.52 E-3	7.65 E-1	0.00	6.96 E-1
PENRE	MJ	1.34 E+1	1.46 E+0	1.26 E+1	2.75 E+1	8.29 E-1	6.01 E+0	0.00	0.00	3.55 E+1	0.00	2.98 E-1	7.61 E+0	0.00	7.46 E+0
PENRM	MJ	0.00	0.00	9.61 E+0	9.61 E+0	0.00	7.20 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.12 E+1
PENRT	MJ	1.34 E+1	1.46 E+0	2.22 E+1	3.71 E+1	8.29 E-1	7.12 E+0	0.00	0.00	3.56 E+1	0.00	2.98 E-1	7.66 E+0	0.00	1.84 E+1
SM	kg	0.00	0.00	0.00	0.00	0.00	2.07 E-2	0.00	0.00	0.00	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	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	0.00	0.00	0.00	0.00	0.00
FW	m3	7.47 E-3	1.67 E-4	1.50 E-2	2.26 E-2	9.51 E-5	1.41 E-2	0.00	0.00	1.99 E-2	0.00	3.42 E-5	5.26 E-3	0.00	1.90 E-2

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

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

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
HWD	kg	6.87 E-6	3.47 E-6	3.34 E-5	4.38 E-5	1.98 E-6	1.36 E-5	0.00	0.00	2.77 E-5	0.00	7.12 E-7	6.04 E-6	0.00	-3.94 E-6
NHWD	kg	3.27 E-1	8.70 E-2	8.34 E-2	4.98 E-1	4.95 E-2	1.10 E-1	0.00	0.00	7.90 E-1	0.00	1.78 E-2	3.78 E-2	0.00	6.99 E-2
RWD	kg	2.05 E-5	9.00 E-6	3.10 E-5	6.05 E-5	5.13 E-6	1.79 E-5	0.00	0.00	7.48 E-5	0.00	1.84 E-6	1.49 E-5	0.00	1.40 E-4
CRU	kg	0.00	0.00	0.00	0.00	0.00	4.22 E-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	0.00	0.00	4.26 E-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	1.09 E-1	1.09 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.70 E+0
ETE	MJ	0.00	0.00	1.87 E-1	1.87 E-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.37 E+0

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

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

	UNIT	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
BCCpr	kg C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BCCpa	kg C	0.00	0.00	2.28 E-2	2.28 E-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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

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.

Allocation

The PVB material used as raw material in this product is post-consumer material derived from used glass where the PVB film is in between. This means that the environmental impacts of the primary material and the end-of-life scenario have been assigned to the first life stage when it is used as part of the glass. The recycling company ensures that the film is collected and converted into granulate. Leadax receives the post-consumer PVB as granulate, all processing done from this point on falls within the scope of this LCA. The conversion the film from the glass to the granulate still falls under the previous end-of-life scenario and therefore falls outside of these system boundaries.

In the Life cycle assessment the following is included in this study:

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)

This stage consists the transport of the product from production plant to the construction site. It also includes the loss of material during construction. The additional needed production, transport and end-of-life of the lost material during construction is included.
The end-of-life of packaging material up to the end-of-waste state or disposal of final residues is also included. The installation of the product including manufacture, transportation and end-of-life of ancillary materials and any energy or water use required for installation or operation of the construction site are taken into account.

Use stage (B1-B3)

This stage consists of the impacts arising from components of the building and construction works during their use. The stage also covers the combination of all planned technical and associated administrative maintenance actions during the service life to maintain the product installed in a building, in a construction works or its parts in a state in which it can perform its required functional and technical performance, as well as preserve the aesthetic qualities of the product. This will include preventative and regular maintenance activities.

Product replacement (B4) and renovation (B5) only apply when the product is considered in a lifespan (of a building, work , etc.). Operational water and energy use are 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 de-construction/demolition (C1), 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 default end-of-life scenarios of the annex (november 2020) to the NMD Determination method v1.1 have been used for the various materials in the product.

Benefits and loads beyond the system boundary (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-wastepoint 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. In addition, the benefits of energy recovery are granted at this stage. The amount of avoided energy is based on the Lower Heating Values of the materials and the efficiencies of the incinerators as mentioned in the NMD Determination method v1.1 or EcoInvent 3.6 (2019).

Data quality
The data quality is decribed below by theme:

Geographical coverage
The input data is representative for Leadax roov of Leadax Circular Roofing B.V. The data are representative for production in the Netherlands, for the European market.

Time period covered
Production data concerning the material composition are collected in the period 2021-2022 and relate to the year 2020. The amounts of electricity and gas use for production are based on consumption data in the year 2020.

Technology coverage
The (current) technology for the production of raw materials in the year 2022 is used.

Attention was paid to the accuracy, completeness, representativeness, consistency and reproducibility of the data, as follows:

Precision
Production Data are collected from bill of materials, calculations, measurements and estimates. The collected data has sufficient accuracy for true outcomes.

Completeness
The aim was to obtain complete data of materials, transportation, energy, emissions and waste. All relevant environmental interventions are included in the inventory.

Representativeness
The representativeness of the data is good, because they are based on the processes that occur mainly in one factory. The origin of the materials is properly inventoried.

Consistency
The consistency is guaranteed by only using one database, EcoInvent 3.6.

Reproducability
The values on which this LCA is performed, can be found in the EPD report and the corresponding project file. The way on which the data are collected and where the information is based on, is included. As a result, the preformed LCA is reproducable.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

End-of-life stage (C2-C4)
At the end-of-life stage scenarios are used for waste processing. The scenarios on which the LCA is based are outlined in more detail below.

NIBE elastomeres (i.a. epdm) (i.a. roofing, foils) (90% recycling)	Value	Unit
Transport distance for recycling (module C2)	50	km
Transport distance for incineration (module C2)	150	km
Recycling	90	%
Incineration	10	%

Leadax Roov is a roofing material that consists of 100% secondary raw materials (PVB). The product was developed with circularity in mind, avoiding depletion of primary raw materials. Because the roofing consists mainly of PVB (a few additives have been added), recycling at the end of its life is quite possible. A study conducted by Leadax shows that the PVB can be recycled up to 3 times without losing its technical properties. The default waste scenario for PVB would be: elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 19). This scenario assumes 10% landfill, 85% incineration and 5% recycling. The waste scenario has a major impact on the final environmental score of the product. Leadax is in the process of ensuring all necessary steps to achieve recycling of the Roov products. Leadax has set up a collection structure and offers a return guarantee for used Leadax Roov material. For the raw materials, we assumed the waste profile: NIBE elastomeres (i.a. epdm)(i.a. roofing, foils) (90% recycling). We adjusted this waste scenario (original NMD ID 20) to 90% recycling and 10% incineration. We assume that 90% of the membranes can be recycled into secondary raw material for other Leadax products and that there is a 10% loss due to contamination and cutting.

plastics, via residue) (NMD ID 43)	Value	Unit
Transport distance for landfill (module C2)	100	km
Transport distance for incineration (module C2)	150	km
Landfill	20	%
Incineration	80	%

finishes (adhered to wood, plastic, metal) (NMD ID 1)	Value	Unit
Transport distance for incineration (module C2)	150	km
Incineration	100	%

DECLARATION OF SVHC

The product does not contain SVHC.

REFERENCES

ISO 14040

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

ISO 14044

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

ISO 14025

ISO 14025:2011-10: Environmental labels and declarations – Type III environmental declarations – Principles and procedures

EN 15804+A1

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

EN 15804+A2

EN 15804+A2: 2019: Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products

SBK-verification protocol

SBK-verification protocol – inclusion data in the Dutch environmental database, Final Version 3.0, January 2019, SBK

NMD Determination method

NMD Determination method Environmental performance Construction works v1.0 July 2020, foundation NMD

REMARKS

None