

EN 15804+A2 EPD



## ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2.  
Owner of the Declaration – Partel

Declaration number: EPDIE-22-83  
Issue date 18th July 2022  
Valid to 18th July 2027

EPD Programme - EPD Ireland  
Programme Operator - Irish Green Building Council  
[www.epdireland.org](http://www.epdireland.org)



### Vapour Control Membranes

IZOPERM PLUS

VARA PLUS

# 1. General information

PROGRAMME OPERATOR	OWNER OF DECLARATION
Irish Green Building Council 19 Mountjoy Square, Dublin D01 E8P5 info@igbc.ie	Partel 17 Claregalway Corporate Park, Claregalway, Co. Galway Ireland H91 R85P
DECLARATION NUMBER	MANUFACTURER ADDRESS
EPDIE-22-83	Partel 17 Claregalway Corporate Park, Claregalway, Co. Galway Ireland H91 R85P
ECO PLATFORM EPD	DECLARED UNIT
Yes	1 m <sup>2</sup> of IZOPERM PLUS Vapour Control Membrane 1 m <sup>2</sup> of VARA PLUS Smart Vapour Control Layer
APPLICABLE PRODUCT CATEGORY RULES	DECLARED PRODUCT
1. EN 15804:2012+A2:2019 2. Product Category Rules : Part A Implementation and use of I.S. EN 15804:2012+A1 and + A2, and CEN TR 16970:2016 in Ireland for the development of Environmental Product Declarations (issued 05.03.2022), Version 2.1.	Partel Membranes IZOPERM PLUS VARA PLUS
DATE OF ISSUE	SCOPE OF EPD
18th July 2022	Cradle to gate, with options including Modules C and D
DATE OF EXPIRY	LCA CONSULTANT OR PERSON RESPONSIBLE FOR LCA
18th July 2027	Ecoreview, Kilkenny, Ireland. +353 (087) 258 9783 www.ecoreview.ie
TYPE OF EPD: SINGLE OR MULTI PRODUCT	LCA SOFTWARE AND DEVELOPER IF APPLICABLE
Multi product EPD	Ecochain LCA tool version 3.5.13 (2022)
PRODUCT CLASSIFICATION OR NACE CODE	NAME AND VERSION OF INVENTORY USED
Vapour control membrane	Ecoinvent version 3.6
COMPARABILITY	
Environmental Product Declarations from different programmes may not be directly comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See clause 5.3 of EN 15804:2012+A2:2019	
The CEN Norm /EN 15804:2012+A2:2019 serves as the core PCR	
Independent verification of the declaration according to ISO 14025	

Internally  Externally

SIGNATURE OF PROGRAMME OPERATOR	SIGNATURE VERIFIER
Pat Barry - CEO - Irish Green Building Council  	Chris Foster - EuGeos SRL  

## 2. Scope and Type of EPD

### Scope

This is a Cradle to Gate, with options EPD. The Modules that are declared are shown in the table below.

PRODUCT STAGE			CONSTRUCTION ON PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES	
Raw material supply	Transport	Manufacturing	Transport from the gate to the 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
MDT	MDT	MDT	OP	OP	OP	OP	OP	OP	OP	OP	OP	MDT	MDT	MDT	MDT		MDT

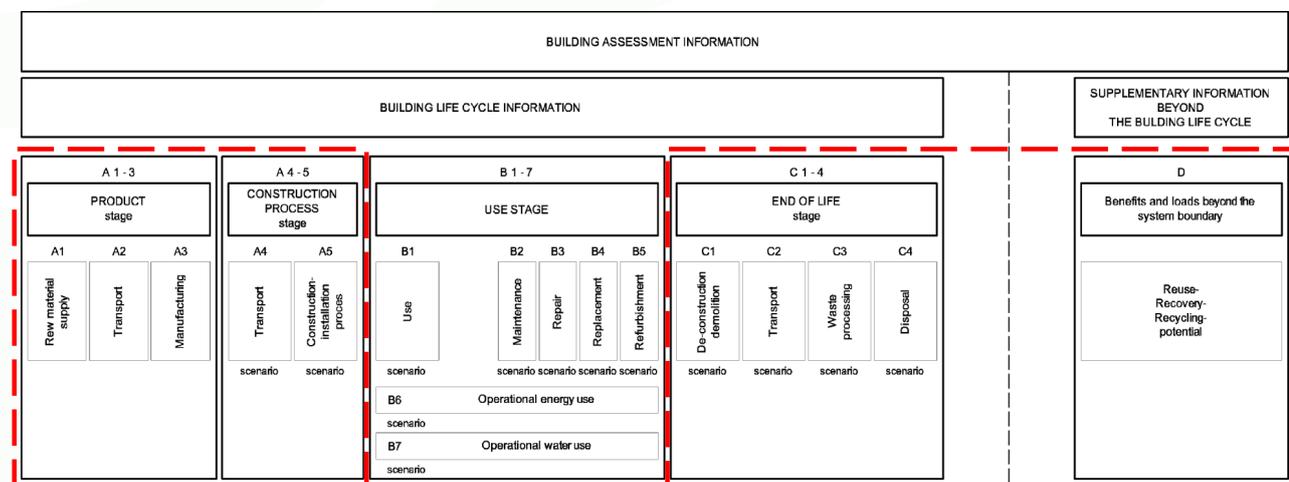
X = Module declared; ND = Module not declared; MDT = Mandatory; OP = Optional.

### Declared Functional Unit

- 1 m<sup>2</sup> of VARA PLUS Smart Vapour Control Layer
- 1 m<sup>2</sup> of IZOPERM PLUS Vapour Control Membrane

### System Boundaries

This LCA covers the Product (A1 - A3), Construction Process (A4 - A5), end of Life (C1 - C4), and benefits and loads beyond the system boundary (D).



### 3. Detailed product description

This EPD is for Partel's VARA PLUS Smart Vapour Control Layer and IZOPERM PLUS Vapour Control Membrane. The raw materials are predominantly polypropylene non-woven or scrim and one or more copolymers, with a small amount of ink printed on one side of the membrane to ensure correct installation.

VARA PLUS is a smart high-performance vapour barrier with an optimum SD value range of 0.4m to >60m, ensuring maximum airtightness and intelligently controls the water vapour, allowing the building to dry out and preventing the risk of condensation within the construction. An SD Value of this range, along with the Hygrovariable Technology, ensure optimum summer drying conditions and winter protection. VARA PLUS can be used as an inner airtight membrane and vapour control layer for externally vapour open build ups. VARA PLUS is also a key component in demanding externally vapour closed structures such as flat roofs, green roofs and unventilated roofs. It can be applied to the roof, walls, floor and ceiling in residential and commercial buildings.

IZOPERM PLUS is an extremely strong, yet lightweight vapour control layer designed to be compatible with all conventional building systems, the highest pH class ensures the best energy efficiency standard. IZOPERM PLUS can be used as an inner airtight membrane and vapour control layer for externally vapour open buildings. It can be applied to the roof, wall, floor and ceiling in both residential and commercial buildings.

VARA PLUS technical data:

SD value: 0.4m to >60m

Tensile Strength: MD 350 / CD 315 / 50mm

Nail Tear Resistance: MD 350 N / CD 375

IZOPERM PLUS technical data:

SD Value: 5m

Tensile Strength: MD 290 / CD 310 / 50mm

Nail Tear Resistance: MD 290 / CD 246 N

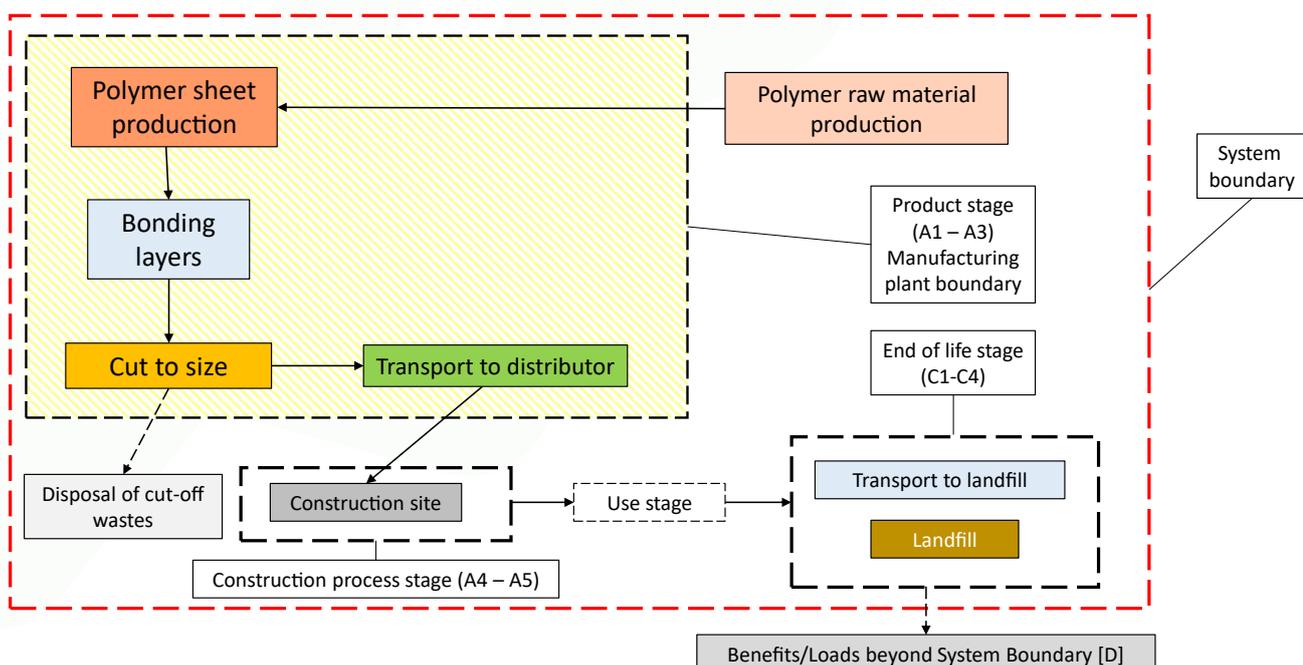
Full technical details on these products can be found at:

<https://www.partel.ie/product/izoperm-plus-pha-vapour-control-membrane/>

<https://www.partel.ie/product/22/1/vara-plus-smart-vapour-control-layer>

#### 3.1 Manufacturing Process Description

The membranes are manufactured by applying a polymer sheet onto a substrate of non-woven or scrim, and applying print to one side. The manufacturing process flowchart is shown below:





# IZOPERM PLUS Vapour Control Membrane



## 4.1.A. LCA results - IZOPERM PLUS

### Core Environmental impact per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> eq.]	3.86E-01	1.18E-02	1.68E-02	4.14E-01	3.50E-03	2.64E-02	ND	0.00E+00	8.14E-04	0.00E+00	5.26E-03	0.00E+00						
GWP-fossil	[kg CO <sub>2</sub> eq.]	3.92E-01	1.18E-02	1.68E-02	4.20E-01	3.50E-03	2.69E-02	ND	0.00E+00	8.14E-04	0.00E+00	5.27E-03	0.00E+00						
GWP-biogenic	[kg CO <sub>2</sub> eq.]	-6.72E-03	8.89E-06	-8.99E-06	-6.72E-03	1.88E-06	-4.94E-04	ND	0.00E+00	2.43E-07	0.00E+00	3.47E-06	0.00E+00						
GWP-luluc	[kg CO <sub>2</sub> eq.]	5.17E-04	5.14E-06	5.81E-06	5.28E-04	1.25E-06	2.25E-05	ND	0.00E+00	2.42E-07	0.00E+00	2.72E-07	0.00E+00						
ODP	[kg CFC-11 eq.]	1.86E-08	2.52E-09	2.79E-09	2.39E-08	7.97E-10	1.34E-09	ND	0.00E+00	1.87E-10	0.00E+00	1.48E-10	0.00E+00						
AP	[mol H+ eq.]	1.86E-03	1.55E-04	1.66E-04	2.18E-03	1.01E-05	1.26E-04	ND	0.00E+00	2.34E-06	0.00E+00	4.37E-06	0.00E+00						
EP-freshwater <sup>[1]</sup>	[kg P eq.]	1.17E-05	1.42E-07	1.45E-07	1.20E-05	2.80E-08	7.80E-07	ND	0.00E+00	1.23E-08	0.00E+00	9.53E-09	0.00E+00						
EP-marine	[kg N eq.]	2.93E-04	3.04E-05	4.35E-05	3.67E-04	1.99E-06	2.17E-05	ND	0.00E+00	4.37E-07	0.00E+00	6.75E-06	0.00E+00						
EP-terrestrial	[mol N eq.]	3.31E-03	3.42E-04	4.83E-04	4.13E-03	2.23E-05	2.44E-04	ND	0.00E+00	4.99E-06	0.00E+00	1.57E-05	0.00E+00						
POCP	[kg NMVOC eq.]	1.22E-03	9.50E-05	1.74E-04	1.49E-03	8.53E-06	9.22E-05	ND	0.00E+00	1.90E-06	0.00E+00	5.61E-06	0.00E+00						
ADP-minerals&metals <sup>[2]</sup>	[kg Sb eq.]	4.05E-06	1.79E-07	3.20E-07	4.55E-06	9.67E-08	3.17E-07	ND	0.00E+00	2.47E-09	0.00E+00	5.16E-09	0.00E+00						
ADP-fossils <sup>[2]</sup>	[MJ] ncv	9.38E+00	1.74E-01	2.36E-01	9.79E+00	5.29E-02	6.90E-01	ND	0.00E+00	1.24E-02	0.00E+00	1.15E-02	0.00E+00						
WDP <sup>[2]</sup>	m <sup>3</sup> world eq. deprived	3.77E-01	9.05E-04	8.13E-04	3.78E-01	1.50E-04	2.03E-02	ND	0.00E+00	9.49E-05	0.00E+00	4.86E-04	0.00E+00						

GWP-total = Global Warming Potential total; GWP-fossil= Global Warming Potential fossil fuels (GWP-fossil; 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 Exceedance; 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 Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&fossils = Abiotic depletion potential for non-fossil resources; ADP-fossils= Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.

The measurement of environmental impacts uses the recommended default LCIA methods for the PEF 3.0 method. These methods include amongst others: USEtox® 2.0, ReCiPe (2016), CML-2001, EDIP 2003, IPCC.

<sup>[1]</sup>To express EP freshwater as kg of PO43- eq, multiply the value for kg P eq. by 3.067

<sup>[2]</sup>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 experienced with the indicator.

ND = Module not declared; INA = Indicator not assessed.



## 4.1.B. LCA results - IZOPERM PLUS

### Resource use per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	3.97E-01	3.16E-03	1.93E-01	5.93E-01	7.58E-04	3.03E-02	ND	0.00E+00	1.32E-04	0.00E+00	2.28E-04	0.00E+00						
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
PERT	[MJ]	3.97E-01	3.16E-03	1.93E-01	5.93E-01	7.58E-04	3.03E-02	ND	0.00E+00	1.32E-04	0.00E+00	2.28E-04	0.00E+00						
PENRE	[MJ]	4.82E+00	1.85E-01	2.55E-01	5.26E+00	5.62E-02	7.39E-01	ND	0.00E+00	1.32E-02	0.00E+00	1.22E-02	0.00E+00						
PENRM	[MJ]	5.23E+00	0.00E+00	0.00E+00	5.23E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
PENRT	[MJ]	1.01E+01	1.85E-01	2.55E-01	1.05E+01	5.62E-02	7.39E-01	ND	0.00E+00	1.32E-02	0.00E+00	1.22E-02	0.00E+00						
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
FW	[m <sup>3</sup> ]	9.19E-03	2.47E-05	2.58E-05	9.24E-03	5.66E-06	4.91E-04	ND	0.00E+00	2.03E-06	0.00E+00	1.19E-05	0.00E+00						

PERE = Use of renewable primary energy excluding renewable primary energy resources 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 excluding non-renewable primary 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 material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.

ND = Module not declared; INA = Indicator not assessed.



### 4.1.C. LCA results - IZOPERM PLUS

#### Output flows and waste categories per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	2.46E-06	3.00E-07	3.69E-07	3.12E-06	1.39E-07	1.97E-07	ND	0.00E+00	7.93E-09	0.00E+00	1.72E-08	0.00E+00						
NHWD	[kg]	2.72E-02	4.85E-03	5.29E-03	3.73E-02	2.57E-03	2.25E-03	ND	0.00E+00	5.95E-04	0.00E+00	4.50E-02	0.00E+00						
RWD	[kg]	9.47E-06	1.16E-06	9.14E-07	1.16E-05	3.61E-07	7.38E-07	ND	0.00E+00	8.41E-08	0.00E+00	6.77E-08	0.00E+00						
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy.

CRU, MFR, MER, EEE, EET are not calculated by the EcoChain software.

ND = Module not declared; INA = Indicator not assessed.



## 4.1.D. LCA results - IZOPERM PLUS

### Additional Environmental impact per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	1.58E-08	5.71E-10	7.85E-10	1.72E-08	2.23E-10	1.02E-09	ND	0.00E+00	5.20E-11	0.00E+00	7.87E-11	0.00E+00						
IRP <sup>[1]</sup>	kBq U235 eq	9.89E-03	7.71E-04	5.87E-04	1.12E-02	2.31E-04	7.60E-04	ND	0.00E+00	5.31E-05	0.00E+00	4.51E-05	0.00E+00						
ETP-fw <sup>[2]</sup>	CTUe	5.61E+00	1.30E-01	2.17E-01	5.96E+00	4.26E-02	3.70E-01	ND	0.00E+00	8.81E-03	0.00E+00	2.43E-02	0.00E+00						
HTP-c <sup>[2]</sup>	CTUe	1.17E-10	3.90E-12	9.84E-12	1.31E-10	1.19E-12	9.12E-12	ND	0.00E+00	2.58E-13	0.00E+00	3.36E-13	0.00E+00						
HTP-nc <sup>[2]</sup>	CTUe	3.49E-09	1.21E-10	2.45E-10	3.85E-09	4.49E-11	2.48E-10	ND	0.00E+00	9.86E-12	0.00E+00	1.10E-11	0.00E+00						
SQP <sup>[2]</sup>	dimensionless	1.67E+00	8.00E-02	9.71E-02	1.85E+00	3.70E-02	1.12E-01	ND	0.00E+00	8.50E-03	0.00E+00	2.67E-02	0.00E+00						

PM = Potential incidence of disease due to PM emissions, IRP = Potential Human exposure efficiency relative to U235, ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c: Potential Comparative Toxic Unit for humans, HTP-nc = Potential Comparative Toxic Unit for humans, SQP = Potential soil quality index.

<sup>[1]</sup> 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.

<sup>[2]</sup> 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.

ND = Module not declared; INA = Indicator not assessed.



# VARA PLUS

## Smart Vapour Control Layer



## 4.2.A. LCA results - VARA PLUS

### Core Environmental impact per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	[kg CO <sub>2</sub> eq.]	3.19E-01	1.23E-02	2.02E-02	3.52E-01	3.60E-03	2.52E-02	ND	0.00E+00	9.77E-04	0.00E+00	3.27E-03	0.00E+00						
GWP-fossil	[kg CO <sub>2</sub> eq.]	3.40E-01	1.23E-02	2.02E-02	3.72E-01	3.59E-03	2.58E-02	ND	0.00E+00	9.77E-04	0.00E+00	3.27E-03	0.00E+00						
GWP-biogenic	[kg CO <sub>2</sub> eq.]	-2.06E-02	9.64E-06	-1.59E-05	-2.06E-02	1.93E-06	-5.33E-04	ND	0.00E+00	2.91E-07	0.00E+00	2.15E-06	0.00E+00						
GWP-luluc	[kg CO <sub>2</sub> eq.]	2.21E-04	5.49E-06	4.83E-06	2.31E-04	1.28E-06	1.63E-05	ND	0.00E+00	2.90E-07	0.00E+00	1.69E-07	0.00E+00						
ODP	[kg CFC-11 eq.]	1.18E-08	2.59E-09	3.05E-09	1.75E-08	8.17E-10	1.21E-09	ND	0.00E+00	2.25E-10	0.00E+00	9.19E-11	0.00E+00						
AP	[mol H+ eq.]	1.44E-03	1.80E-04	8.94E-05	1.71E-03	1.03E-05	1.16E-04	ND	0.00E+00	2.81E-06	0.00E+00	2.71E-06	0.00E+00						
EP-freshwater <sup>[1]</sup>	[kg P eq.]	9.48E-06	1.55E-07	1.81E-07	9.82E-06	2.87E-08	7.27E-07	ND	0.00E+00	1.47E-08	0.00E+00	5.92E-09	0.00E+00						
EP-marine	[kg N eq.]	2.56E-04	3.54E-05	2.17E-05	3.14E-04	2.04E-06	2.04E-05	ND	0.00E+00	5.24E-07	0.00E+00	4.19E-06	0.00E+00						
EP-terrestrial	[mol N eq.]	2.87E-03	3.98E-04	2.42E-04	3.51E-03	2.29E-05	2.30E-04	ND	0.00E+00	5.99E-06	0.00E+00	9.76E-06	0.00E+00						
POCP	[kg NMVOC eq.]	1.08E-03	1.09E-04	8.23E-04	2.01E-03	8.76E-06	1.02E-04	ND	0.00E+00	2.28E-06	0.00E+00	3.48E-06	0.00E+00						
ADP-minerals&metals <sup>[2]</sup>	[kg Sb eq.]	3.34E-06	1.62E-07	3.90E-07	3.90E-06	9.92E-08	3.03E-07	ND	0.00E+00	2.96E-09	0.00E+00	3.21E-09	0.00E+00						
ADP-fossils <sup>[2]</sup>	[MJ] ncv	9.36E+00	1.80E-01	3.03E-01	9.85E+00	5.43E-02	6.89E-01	ND	0.00E+00	1.49E-02	0.00E+00	7.15E-03	0.00E+00						
WDP <sup>[2]</sup>	m <sup>3</sup> world eq. deprived	1.97E-01	1.00E-03	1.05E-03	1.99E-01	1.54E-04	1.66E-02	ND	0.00E+00	1.14E-04	0.00E+00	3.02E-04	0.00E+00						

GWP-total = Global Warming Potential total; GWP-fossil= Global Warming Potential fossil fuels (GWP-fossil; 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 Exceedance; 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 Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&fossils = Abiotic depletion potential for non-fossil resources; ADP-fossils= Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.

The measurement of environmental impacts uses the recommended default LCIA methods for the PEF 3.0 method. These methods include amongst others: USEtox® 2.0, ReCiPe (2016), CML-2001, EDIP 2003, IPCC.

<sup>[1]</sup>To express EP freshwater as kg of PO4<sup>3-</sup> eq, multiply the value for kg P eq. by 3.067

<sup>[2]</sup>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 experienced with the indicator.

ND = Module not declared; INA = Indicator not assessed.



## 4.2.B. LCA results - VARA PLUS

### Resource use per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	[MJ]	4.72E-01	3.38E-03	3.47E-01	8.22E-01	7.78E-04	3.20E-02	ND	0.00E+00	1.59E-04	0.00E+00	1.41E-04	0.00E+00						
PERM	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
PERT	[MJ]	4.72E-01	3.38E-03	3.47E-01	8.22E-01	7.78E-04	3.20E-02	ND	0.00E+00	1.59E-04	0.00E+00	1.41E-04	0.00E+00						
PENRE	[MJ]	4.59E+00	1.91E-01	3.32E-01	5.11E+00	5.77E-02	7.39E-01	ND	0.00E+00	1.59E-02	0.00E+00	7.59E-03	0.00E+00						
PENRM	[MJ]	5.45E+00	0.00E+00	0.00E+00	5.45E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
PENRT	[MJ]	1.00E+01	1.91E-01	3.32E-01	1.06E+01	5.77E-02	7.39E-01	ND	0.00E+00	1.59E-02	0.00E+00	7.59E-03	0.00E+00						
SM	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
NRSF	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
FW	[m <sup>3</sup> ]	4.80E-03	2.66E-05	3.31E-05	4.86E-03	5.81E-06	4.02E-04	ND	0.00E+00	2.44E-06	0.00E+00	7.39E-06	0.00E+00						

PERE = Use of renewable primary energy excluding renewable primary energy resources 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 excluding non-renewable primary 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 material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.

ND = Module not declared; INA = Indicator not assessed.



## 4.2.C. LCA results - VARA PLUS

### Output flows and waste categories per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	[kg]	1.92E-06	2.85E-07	4.29E-07	2.63E-06	1.42E-07	1.86E-07	ND	0.00E+00	9.51E-09	0.00E+00	1.07E-08	0.00E+00						
NHWD	[kg]	2.45E-02	4.43E-03	3.87E-03	3.28E-02	2.64E-03	2.15E-03	ND	0.00E+00	7.14E-04	0.00E+00	2.80E-02	0.00E+00						
RWD	[kg]	7.25E-06	1.20E-06	6.14E-07	9.07E-06	3.70E-07	6.81E-07	ND	0.00E+00	1.01E-07	0.00E+00	4.21E-08	0.00E+00						
CRU	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
MFR	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
MER	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
EEE	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						
EET	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00						

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy.

CRU, MFR, MER, EEE, EET are not calculated by the EcoChain software.

ND = Module not declared; INA = Indicator not assessed.



## 4.2.D. LCA results - VARA PLUS

### Additional Environmental impact per 1 m<sup>2</sup>

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	1.22E-08	5.65E-10	5.53E-10	1.33E-08	2.28E-10	9.31E-10	ND	0.00E+00	6.24E-11	0.00E+00	4.89E-11	0.00E+00						
IRP <sup>[1]</sup>	kBq U235 eq	8.28E-03	7.99E-04	4.12E-04	9.49E-03	2.37E-04	7.16E-04	ND	0.00E+00	6.38E-05	0.00E+00	2.80E-05	0.00E+00						
ETP-fw <sup>[2]</sup>	CTUe	4.23E+00	1.33E-01	2.49E-01	4.61E+00	4.38E-02	3.40E-01	ND	0.00E+00	1.06E-02	0.00E+00	1.51E-02	0.00E+00						
HTP-c <sup>[2]</sup>	CTUe	9.88E-11	4.04E-12	1.22E-11	1.15E-10	1.22E-12	8.75E-12	ND	0.00E+00	3.10E-13	0.00E+00	2.09E-13	0.00E+00						
HTP-nc <sup>[2]</sup>	CTUe	2.75E-09	1.21E-10	3.03E-10	3.17E-09	4.61E-11	2.33E-10	ND	0.00E+00	1.18E-11	0.00E+00	6.81E-12	0.00E+00						
SQP <sup>[2]</sup>	dimensionless	2.16E+00	7.60E-02	8.90E-02	2.33E+00	3.80E-02	1.05E-01	ND	0.00E+00	1.02E-02	0.00E+00	1.66E-02	0.00E+00						

PM = Potential incidence of disease due to PM emissions, IRP = Potential Human exposure efficiency relative to U235, ETP-fw = Potential Comparative Toxic Unit for ecosystems; HTP-c: Potential Comparative Toxic Unit for humans, HTP-nc = Potential Comparative Toxic Unit for humans, SQP = Potential soil quality index.

<sup>[1]</sup> This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuelcycle. 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.

<sup>[2]</sup> 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 experienced with the indicator.

ND = Module not declared; INA = Indicator not assessed.

## 5. Calculation rules

The measurement of environmental impacts in this EPD uses the LCIA methodologies recommended for PEF3.0.

The process descriptions and input quantities detailed and used in this study are a true representation of the actual processes and quantities used in the manufacturing and use of the products. The references of all sources, both primary and public sources and literature, have been documented in the LCA report. The ‘polluter pays’ and ‘modularity’ principles have been followed.

In addition, to facilitate the reproducibility of this LCA, a full set of data records has been generated which can be accessed via the LCA tool. This data portfolio contains a summary of all the data used in this LCA.

### Cut-off criteria

The cut-off criteria of section 6.3.6 of EN15804:2012+A2:2019 have been followed, where 99% of the total energy and materials are included, and the total neglected input flows for the modules reported on in the LCA are less than 5% of the energy usage and mass.

### Data Quality

The dataset is representative for the production processes used in 2019, in the countries of production: Belgium and Finland. The data Quality Level, according to Table E.1 of EN 15804 +A2, Annex E, is as follows:

Geographical representativeness: Very Good.

Technical representativeness: Good.

Time representativeness: Very Good.

### Allocations

Allocation of energy and electricity types and amounts to the various manufacturing processes has been provided by the manufacturers along with production waste. Allocation of impacts to the products is based on the product composition mass.

Flows related to human activities such as employee transport are excluded. The construction of capital assets such as buildings, manufacture of machines and transportation systems are also excluded since the related flows are assumed to be negligible compared to the manufacture of the building material when compared to these systems over a full lifetime of operation.

## 6. Scenarios and additional technical information

### A4. Transport to site

The transport to market is based on the transport from the Partel depot in Galway, by a distance of 200km to the construction site, which is the default value in the PCR for EPD Ireland [5].

Parameter	Value / Description
Road transport	Transport, freight, lorry 16-32 metric ton, EURO6 engine
Distance, road	200 km
Capacity utilisation road freight	46% (% assumed in the Ecoinvent V 3.6 database)

## A5. Installation on site

Partel estimates the use of approx. 0.6m of adhesive plastic tape per m<sup>2</sup> of installed membrane (i.e. a recommended 50m of tape per 75m<sup>2</sup> roll membrane). Use of this amount of tape is included in the installation stage.

On-site construction losses have been confirmed from Partel as being approximately 2%. This value is used rather than the default value in the PCR for EPD Ireland [5].

## C1. De-construction demolition

In the deconstruction/demolition phase C1 it is assumed that the membranes are removed manually from the building, thus no energy or materials are required for module C1, and the impacts are assumed to be zero in C1.

## C2. Transport

In the transport phase C2, it is assumed that the removed materials travel 50km to landfill.

## C3. Waste processing

N/A.

## C4. Disposal

The end of life processing scenario is assumed to be landfill, C4. This is the default scenario for mixed materials in the Product Category Rules PCR for EPD Ireland [5], where 100% of mixed materials are assumed to go to landfill. This scenario is confirmed by Partel.

## D. Reuse – Recovery – Recycling potential

N/A.

## Declaration of biogenic carbon content at the production gate

The biogenic carbon (C) for product raw materials (A1) is given in the table below:

BIOGENIC CARBON PER DELCARED UNIT	IZOPERM PLUS	VARA PLUS
Biogenic carbon content in product (kg C per m <sup>2</sup> )	1.36E-03	5.61E-03
Biogenic carbon content in packaging (kg C per m <sup>2</sup> )	ND	ND

*The weight of packaging is << than 5% of the mas of the products, and is not declared.*

## Additional Technical Information

N/A.

## 7. Mandatory additional information on release of dangerous substances to indoor air, soil and water

None of the substances contained in the product are listed in the “Candidate List of Substances of Very High Concern for authorisation”, or they do not exceed the limit for registration with the European Chemicals Agency.

## 8. Other optional additional environmental information

N/A.

## 9. References

- [1] ISO 14040: Environmental management - Life cycle assessment – Principles and Framework', International Organization for Standardization, ISO 14040:2006.
- [2] ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines', International Organization for Standardization, ISO 14044:2006.
- [3] ISO 14025: Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures', International Organization for Standardization, ISO 14025:2006.
- [4] I.S. EN 15804:2012+A2:2019,; Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products', EN 15804:2012+A2:2019.
- [5] Ecochain, Version 3.5.13 (2022), web: <http://app.ecochain.com>.
- [6] Product Category Rules : Part A Implementation and use of I.S. EN 15804:2012+A1 and + A2, and CEN TR 16970:2016 in Ireland for the development of Environmental Product Declarations (issued 05.03.2022), version 2.1.
- [7] CML - Department of Industrial Ecology, CML-IA Characterisation Factors, Dated August 2016, Leiden University, Leiden, Netherlands Available at: <https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors>
- [8] Ministerie van Verkeer en Waterstaat, 8 maart 2004, Toxiciteit heeft z'n prijs, Schaduwpreizen voor (eco-) toxiciteit en uitputting van abiotische grondstoffen binnen DuboCalc.
- [9] PEF methodology final draft.pdf (europa.eu)

## 10. Annex

N/A.