Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Nomatec® tunnel insulation sheet

from

NMC Termonova Oy

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:2014 Construction products (version 1.2.5.); c-PCR-005 (to PCR 2019:2014) – Thermal insulation products (EN 16783:2017) (version 2019-12-20)
PCR review was conducted by: The Technical Committee of the International EPD® System. The review panel may be contacted via info@environdec.com.
Life Cycle Assessment (LCA)
Etteplan Finland Oy Laserkatu 6, 53850 Lappeenranta, Finland www.etteplan.com LCA by: Heli Kumpulainen and Jenni Partti
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: Hannu Karppi, Ramboll Finland Oy Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have

equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:
NMC Termonova Oy

Contact:
Johan Lindholm
Sales Manager
johan.lindholm@termonova.fi

Description of the organisation:
Termonova Oy in Inkoo is the only manufacturer of cross-linked foam polyethylene in the Nordic countries.
More information: https://www.termonova.fi/

Product-related or management system-related certifications:
ISO 9001 & 14001

Name and location of production site(s):
NMC Termonova Oy
Torppanummentie 44
10210 Inkoo
Finland

Product information

Product name:
Nomatec® tunnel insulation sheet
This EPD refers to this product (Product specific EPD)

Product description:
Nomatec® tunnel insulation sheet is chemically cross-linked polyethylene foam. Large sheets in foamed polyethylene with closed cells, for frost insulation and prevention of water ingress into road- and rail runnels as well as other rock shelters. The material is assembled against the blasted or excavated rock surface and most often covered by concrete from underneath, including a steel mesh.

UN CPC code: 44411 Continuous-action elevators and conveyors, for goods or materials, specially designed for underground use

LCA information

Declared unit: 1 m^2 of tunnel insulation sheet with 50 mm thickness.

The R-value of tunnel insulation sheet is 1.25 m^2 K/W with λ 0.04 W/m K.

Density of product is 30 kg/m^3

Reference service life: The type of this EPD is cradle to gate with modules C1–C4 and module D and optional modules A4-A5 (A1–A3 + C + D and additional modules A4-A5) and therefore reference service life is not applicable.

Time representativeness: Primary data from the tunnel insulation sheet represents the year 2022. Time representativeness of the secondary data was estimated mainly very good.

Geographical scope: Nomatec® product is manufactured at the site of NMC Termonova Oy located in Inkoo, Finland (module A3). The geographical scope of raw material production and transportation (modules A1 and A2) includes Europe and Asia. The geographical scope of transport of construction stage includes Nordic countries, Finland - Norway (module A4). End of life stage (module C) and resource recovery stage (module D) take place in Norway.

Database(s) and LCA software used:
Of priority, measured and calculated primary data gathered from the production plant and supply chain of studied product is used. Secondly, secondary data gathered from the most up-to-date Sphera and Ecoinvent (3.9.1, cut-off) databases and literature is used. Secondary data was used for upstream and downstream processes for which the tunnel insulation sheet producer has no influence over. As principle, secondary data with maximum 10 years age was used in the modelling when available.
LCA for Experts version 10.8 was used for LCA modelling.

Description of system boundaries:
Cradle to gate with options, modules C1-C4, module D and optional modules A4-A5 (A1-A3 + C +D and additional modules A4-A5).

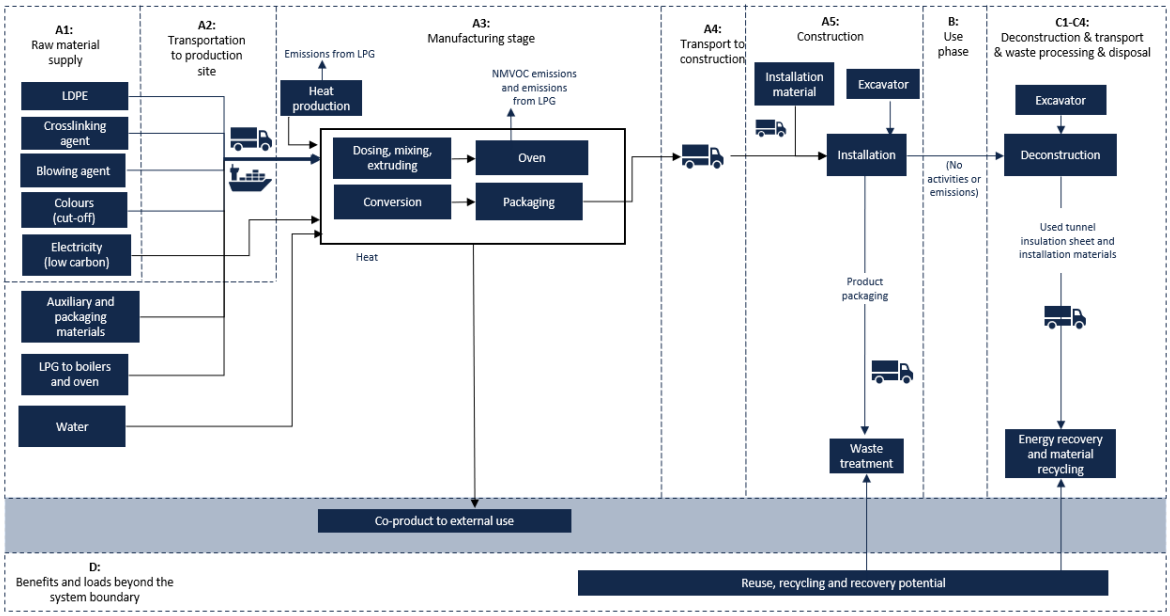

Figure 1. System diagram:

Cut-off rules: Flows accounting less than 1% of the overall input mass or energy flows have been excluded from the study if appropriate LCI data or even proxy data was not available. Additionally, the

sum of excluded flows should not exceed 5% of the total inflows (by mass or by energy). This requirement is fulfilled.

Allocation: The recommended allocation procedure described in PCR, EN 15804+A2 and ISO 14044, section 4.3.4 is followed. As principle, allocation is avoided whenever possible. When allocation is applied, it is ensured that there is no double counting or omissions, and all the environmental impacts are allocated to either product or to co-product). Mass based allocation is used to allocate flows between main product and co-product. Allocation is applied only to raw materials and energy inputs. No burden for production of packaging materials is allocated to co-product, only to tunnel insulation sheet.

Table 1. Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU	EU	FI	EU	EU	ND	ND	ND	ND	ND	ND	ND	NO	NO	NO	NO	NO
Specific data used	1.1%					ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
Variation – products	Not applicable, single product			-	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
Variation – sites	Not applicable, single site.			-	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-

ND = not declared; EU = Europe; FI = Finland; NO = Norway

A1 – Raw-material supply: The raw material supply covers sourcing and production of all raw materials, and grid electricity (low carbon) used in the tunnel insulation sheet manufacturing.

A2 – Transport: Transportation of raw materials, packaging and auxiliary materials to Inkoo plant. Transportation distances and modes of transport are based on the primary data provided by NMC Termonova Oy.

A3 – Manufacturing: This module includes the manufacturing of tunnel insulation sheet in Inkoo plant, starting from receiving the raw materials and ending with the packaging of final product before transportation to customer. A3 module includes also on-site heat production. The supply of packaging and auxiliary materials is also included in module A3.

A4 – Transport: Tunnel insulation sheet transported to Norway by truck. Transportation distance 1 500 km. Route, distance and mode of transportation is obtained from NMC Termonova Oy. No material losses occur during transport, and storage of tunnel insulation sheet is assumed to not require energy or material input. The standard utilization ratio of the transportation is reduced due to the fact, that the tunnel insulation sheet is specifically lightweight, and the volume capacity is reached before the weight

capacity. As the density of the tunnel insulation sheet is 30 kg/m^3 the utilization rate for truck payload is 10.9%.

A5 – Construction/installation: This module comprises of installation of the tunnel insulation sheet with excavation, installation material and transport and waste processing of installation loss and packaging waste. 2% of assembly loss of tunnel insulation sheet is assumed at the construction site. Ancillary installation material (installation bolt) is assumed to applied in installation, mass 0.6 kg/DU transportation distance 100 km. Energy recovery is assumed as EoL treatment option for all wastage and transport distance to waste processing is estimated to be 85 km by road.

B1-B7 – Use stage: No actions or technical operations in this stage.

C1 – Deconstruction/demolition: The de-construction and/or demolition of the tunnel insulation sheet is part of the demolition of the entire construction. The deconstruction is considered to be done by excavation.

C2 – Transport: Transport distance to waste processing is estimated to be 85 km by road.

C3 – Waste processing: Processing, sorting and recycling of deconstructed material.

C4 – Disposal: No waste material treatment is included in this module.

D – Reuse-Recovery/Recycling potential: Incineration of tunnel insulation sheet with energy recovery. Emission credits are obtained from material recycling and energy recovery of waste materials. In energy recovery, it is assumed that heat and electricity from waste incineration substitute average Norwegian district heat mix and average Norwegian electricity grid mix, respectively.

Content information

Table 2. Content information.

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
PE-foam	1.5	0	0
TOTAL	1.5	0	0
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Bed timber	0.058	3.9%	0.025
Polyester (PES) straps	0.003	0.2%	0
TOTAL	0.061	4.1%	0.025

Nomatec® product does not contain dangerous substances from the candidate list of SVHC.

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	7.41E+00	8.50E-01	2.39E+00	ND	1.71E-01	2.21E-02	1.85E-01	0.00E+00	2.65E+00
GWP-biogenic	kg CO_2 eq.	-4.01E-02	-1.24E-02	6.62E-02	ND	0.00E+00	0.00E+00	1.70E-03	0.00E+00	-1.71E+00
GWP-luluc	kg CO_2 eq.	5.60E-03	7.81E-03	3.68E-03	ND	1.49E-03	2.04E-04	6.97E-05	0.00E+00	-1.67E-04
GWP-total	kg CO_2 eq.	7.37E+00	8.46E-01	2.46E+00	ND	1.72E-01	2.23E-02	1.87E-01	0.00E+00	9.41E-01
ODP	kg CFC 11 eq.	1.16E-06	1.10E-13	2.90E-11	ND	1.41E-14	2.86E-15	3.49E-12	0.00E+00	-4.80E-12
AP	mol H^+ eq.	2.28E-01	4.81E-03	6.22E-03	ND	8.25E-04	1.41E-04	5.06E-04	0.00E+00	-2.88E-03
EP-freshwater	kg P eq.	1.58E-03	3.08E-06	4.69E-06	ND	5.87E-07	8.04E-08	7.95E-07	0.00E+00	-9.95E-06
EP-marine	kg N eq.	1.23E-01	2.33E-03	1.91E-03	ND	3.88E-04	6.86E-05	1.39E-04	0.00E+00	-1.09E-03
EP-terrestrial	mol N eq.	1.18E+00	2.59E-02	2.08E-02	ND	4.31E-03	7.62E-04	1.48E-03	0.00E+00	-1.08E-02
POCP	kg NM VOC eq.	2.96E-01	4.58E-03	5.79E-03	ND	1.09E-03	1.33E-04	5.14E-04	0.00E+00	-2.88E-03
ADP-minerals&metals*	kg Sb eq.	6.88E-05	5.59E-08	3.88E-05	ND	1.05E-08	1.46E-09	3.98E-08	0.00E+00	-1.51E-07
ADP-fossil*	MJ	2.35E+02	1.15E+01	2.37E+01	ND	2.19E+00	3.00E-01	2.50E+00	0.00E+00	-6.87E+00
WDP*	m^3	4.68E+00	1.02E-02	8.16E-02	ND	1.86E-03	2.66E-04	2.37E-03	0.00E+00	-1.77E-01
Acronyms	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 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&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

**Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG1	kg CO_2 eq.	7.41E+00	8.58E-01	2.39E+00	ND	1.72E-01	2.23E-02	1.85E-01	0.00E+00	2.65E+00

[1]The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Resource use indicators

Results per 1 m2 of Nomatec tunnel insulation sheet										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1.48E+01	8.36E-01	4.35E+00	ND	1.55E-01	2.18E-02	1.71E+00	0.00E+00	-2.55E+01
PERM	MJ	1.05E+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	1.58E+01	8.36E-01	4.35E+00	ND	1.55E-01	2.18E-02	1.71E+00	0.00E+00	-2.55E+01
PENRE	MJ	1.75E+02	1.15E+01	2.38E+01	ND	2.20E+00	3.01E-01	2.50E+00	0.00E+00	-6.87E+00
PENRM	MJ	6.06E+01	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.36E+02	1.15E+01	2.38E+01	ND	2.20E+00	3.01E-01	2.50E+00	0.00E+00	-6.87E+00
SM	kg	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	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	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.18E-01	9.15E-04	4.72E-03	ND	2.39E-05	8.47E-04	0.00E+00	0.00E+00	-2.58E-02
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

Waste indicators

Results per 1 m2 of Nomatec tunnel insulation sheet										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	6.20E-09	3.57E-11	4.92E-07	ND	8.13E-12	9.31E-13	-2.92E-10	0.00E+00	1.52E-09
Non-hazardous waste disposed	kg	3.59E-02	1.76E-03	7.78E-02	ND	3.16E-04	4.58E-05	1.27E-04	0.00E+00	-3.78E-01
Radioactive waste disposed	kg	1.08E-02	2.16E-05	4.52E-04	ND	2.84E-06	5.63E-07	1.79E-04	0.00E+00	-5.25E-04

Output flow indicators

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	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
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	5.80E-01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	9.14E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	3.40E-01	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.53E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	6.20E-01	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E+01

References

General Programme Instructions of the International EPD® System. Version 4.0.
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EPD®

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