

**Rakennustietosäätiö RTS  
Building Information  
Foundation RTS**

RTS EPD,  
No.RTS\_33\_19

Norrapro® I RBSO®-drainage system for tunneling including NorraproCONNECT service-unit as an option

**RAKENNUSTIETO >**

**Scope of the declaration**

This environmental product declaration covers the environmental impacts of product Norrapro® I RBSO® -drainage system for tunneling including NorraproCONNECT service-unit as an option. The declaration has been prepared in accordance with EN 15804:2012+A1:2013 and ISO 14025 standards and the additional requirements stated in the RTS PCR (English version, 14.6.2018). This declaration covers the life cycle stages from cradle-to-gate with options including transportation and installation at building site deconstruction, transportation, treatment and recovery of the product at its end-of-life.

14.11.2019  
Building Information Foundation  
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Malminkatu 16 A  
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<http://epd.rts.fi>

  
Laura Sariola  
Committee secretary

  
Markku Hedman  
RTS General Director





## General information, declaration scope and verification (7.1)

### 1. Owner of the declaration, manufacturer

Norrapro Oy  
Joensuun Tiedepuisto Länsikatu 15  
80110 Joensuu, Finland  
Petri Turunen  
+358 400 166 260  
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### 2. Product name and number

Norrapro® I RBSO® -drainage system for tunneling including NorraproCONNECT service-unit as an option

### 3. Place of production

Tuusula, Finland

### 4. Additional information

[www.norrapro.fi](http://www.norrapro.fi)

### 5. Product Category Rules and the scope of the declaration

This EPD has been prepared in accordance with EN 15804:2012+A1:2013 and ISO 14025 standards together with the RTS PCR (English version, 2.6.2016). Product specific category rules have not been applied in this EPD. EPD of construction materials may not be comparable if they do not comply with EN 15804 and seen in a building context.

### 6. Author of the life-cycle assessment and declaration

Bionova Oy, Anastasia Sipari  
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+358 40 548 9475, [www.bionova.fi](http://www.bionova.fi)

### 7. Verification

This EPD has been verified according to the requirements of ISO 14025:2010, EN 15804: 2012+A1:2013 and RTS PCR by a third party. The verification has been carried out by Vahanen Environment Oy, Teija Käpynen according to the above mentioned PCR. Linnoitustie 5, 02600

### 8. Declaration issue date and validity

14.11.2019 - 6.9.2024

**European standard EN 15804: 2014 A1 serves as the core PCR**

Independent verification of the declaration and data, according to ISO14025:2010

Internal

External

Third party verifier:

Teija Käpynen, Vahanen Environment Oy



## Product information

### 9. Product description

This EPD represents product Norrapro® I RBSO®- drainage system for tunneling including NorraproCONNECT service-unit as option. Studied system includes drainage strip, service hatch and all components necessary for a suitable installation. Typical systematic installation space between Norrapro® I RBSO®- drainage strips in tunnel is on average 5 m. NorraproCONNECT service-unit, included in this calculation, is not a standard equipment of the drainage system and can be installed according to need. In case of application, the service unit is typically installed every 100m of tunnel that is equal approximately to 1 unit per 270 m<sup>2</sup> of Norrapro® I RBSO®-water drainage system.

### 10. Technical specifications

Norrapro® I RBSO®- drainage system consists of PE-foam strip with water pipe going at the middle of the strip and components necessary for installation like steel mesh and steel nails. Norrapro® I RBSO®- drainage system is mounted vertically from top to the bottom of tunnel and fixed to the surface with help of steel mesh and steel nails punched into attached surface and folded over the strip. Studied drainage system is equipped with NorraproCONNECT service unit as option in order to lead drain water out of the system. The service unit includes a steel hatch and a rubber seal.

### 11. Product standards

VTT\_C\_11595-16

### 12. Physical properties

Dimensions of the Norrapro PE-foam drainage strip are 12mX0,5m. Mass of installed system including NorraproCONNECT service-unit is 4,7 kg/m<sup>2</sup>.

### 13. Raw-materials of the product

Product structure / composition / raw-material	Amount %
Steel mesh	64%
Galvanized steel nail	13%
PE foam	12%
PVC water pipe	6%
Annealed wire	5%
Service unit	0,2%

### 14. Substances under European Chemicals Agency's REACH, SVHC restrictions

Name	EC Number	CAS Number
The product does not contain REACH SVHC substances.		

## 15. Functional / declared unit

1 m<sup>2</sup> of Norrapro® I RBSO®- drainage system for tunneling including NorraproCONNECT service-unit as option

## 16. System boundary

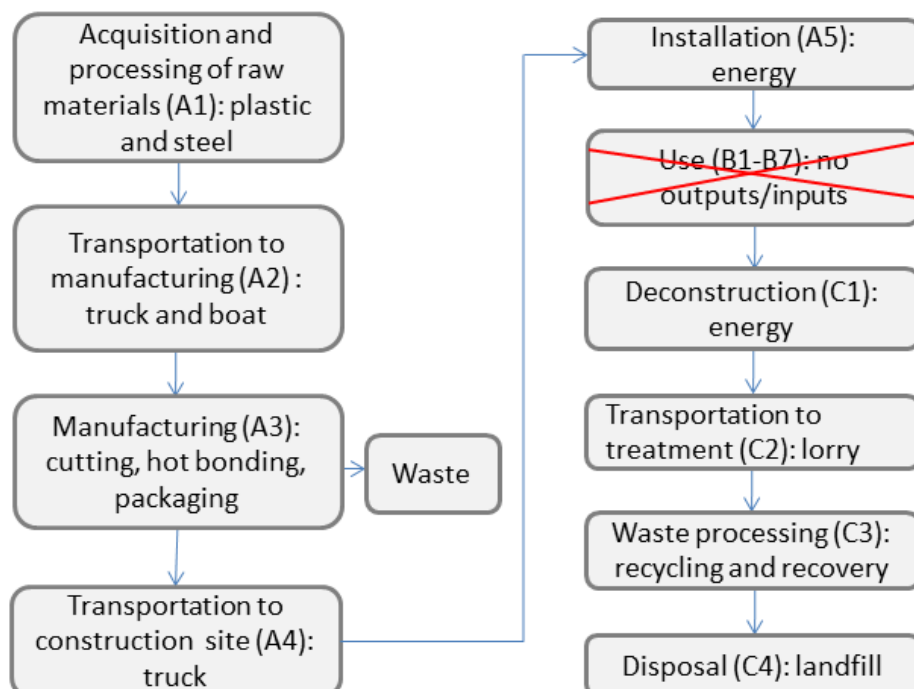
This EPD covers the following modules; A1 (Raw material supply), A2 (Transport), A3 (Manufacturing), A4 (Transportation of the product to the building site) Installation (A5) as well as C1 (Deconstruction), C2 (Transport at end-of-life), C3 (Waste processing) and C4 (Disposal). In addition, module D - benefits and loads beyond the system boundary - have been included.

## 17. Cut-off criteria

A1 raw material supply, A2 transportation, A3 manufacturing. All used materials, energy, packing and transportation until the end-of-waste state have been included. A1-A3 results have been provided as an aggregate. A4 transportation has been estimated to be 30 km, the return trip has not been considered. A5 installation includes energy and water consumption as well as waste transportation and treatment until the end-of-waste state. Module B information has not been presented or included in the LCA calculation. Of module C all impacts have been calculated (C1-C4). C1 includes the deconstruction energy consumption. The distance for C2 has been estimated to be 20 km to landfill and 250 km to waste recycling facility. C3 covers sorting and shredding of steel parts as well as incineration of plastic materials, including the landfilling of the formed slag and ash. C4 includes the landfilling of waste. Module D considers the benefits of metal recycling and energy recovery which replaces district heat.

## 18. Production process

Manufacturing process include cutting of PE-foam to desired size, hot bonding of border and PVC pipe to the back of drainage strip. Finished products are rolled and bound with plastic packaging straps. Use of energy and raw materials in production is optimized. Formed waste is sent for recycling or energy recovery.



## Scope of the Life-Cycle Assessment (7.2.1-2)

Mark all the covered modules of the EPD with X. Mandatory modules are marked with blue in the table below. This declaration covers “cradle-to-gate with options”. For other fields mark MND (module not declared) or MNR (module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x	x	x	x	x	MNR	MNR	MNR	MNR	MNR	MNR	MNR	x	x	x	x	x	x	x
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

	Mandatory modules
	Mandatory as per the RTS PCR section 6.2.1 rules and terms
	Optional modules based on scenarios

## Environmental impacts and raw-material use (7.2.3-7.2.4)

### 19. Environmental impacts

The results of a life cycle assessment are relative. They do not predict impact on category endpoints, exceeding of limit values, safety margins, or risks. The impacts are presented per declared unit, 1 m<sup>2</sup> of product. The impacts are mainly caused by the manufacturing process (A3).

Environmental impact									
Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Global warming potential	kg CO <sub>2</sub> -eqv	5,61E+00	1,75E-02	2,36E-01	2,03E-01	5,71E-02	1,46E+00	1,38E-02	-2,30E+00
Depletion of stratospheric ozone layer	kg CFC11-eqv	3,19E-07	3,34E-09	3,81E-08	3,50E-08	1,25E-08	3,84E-09	3,54E-09	-1,17E-07
Formation of photochemical ozone	kg C <sub>2</sub> H <sub>4</sub> -eqv	4,44E-03	3,40E-06	3,80E-05	3,11E-05	8,80E-06	7,32E-06	4,42E-06	-1,15E-03
Acidification	kg SO <sub>2</sub> -eqv	1,32E-02	8,15E-05	4,82E-04	3,22E-04	2,89E-04	2,50E-03	9,49E-05	-1,10E-02
Eutrophication	kg PO <sub>4</sub> 3--eqv	2,27E-03	2,02E-05	1,42E-04	6,40E-05	6,68E-05	1,99E-04	2,86E-05	-1,35E-03
Abiotic depletion of non fossil resources	kg Sb-eqv	1,00E-04	1,18E-07	1,30E-07	3,03E-08	1,63E-07	6,51E-08	1,82E-08	-1,66E-06
Abiotic depletion of fossil resources	MJ	1,05E+02	4,37E-01	2,98E+00	2,66E+00	1,54E+00	3,33E-01	3,25E-01	-2,67E+01



## Scenarios and additional technical information (7.3)

### 23. Energy in the manufacturing phase (7.3. A3)

Object	Value	Data quality
A3 data quality of electricity and CO2 emission kg CO2 eq. / kWh	Finland 0,23	Based on country specific fuel mixes for the production year 2017 from Statistics Finland and Finnish Energy.  Imported electricity has been considered. The environmental impacts of the fuels are based on ecoinvent 3.4 database. The impacts include all upstream processes as well as transmission losses.

### 24. End-of-life process description (7.3.4)

Processes	Unit (expressed per functional unit or per declared unit of components products or materials and by type of material)	Amount kg/m2 Data quality
Collection process specified by type	kg collected separately	3,42
	kg collected with mixed construction waste	1,27
Recovery system specified by type	kg for re-use	0
	kg for recycling	2,81
	kg for energy recovery	0,61
Disposal specified by type	kg product or material for final deposition	1,27
Assumptions for scenario development, e.g. transportation	units as appropriate	It was assumed that deconstruction process consume electricity 0,04 kWh/m2 and diesel 0,06 l/m2. Transportation distance to landfilling is 20 km and to recycling facility 250 km. Estimation based on average landfill and recycling facility location. Amount of replaced primary steel as the result of steel recycling is 0,6 kg/m2. Heat generated in energy recovery process replace district heating 4,2 kWh/m2.



## 26. Additional technical information

More information about Norrapro® I RBSO® can be found at company website [www.norrapro.fi](http://www.norrapro.fi)

## 27. Product data sheet

Available through manufacturer.

## 28. Additional information (7.4)

Air, soil and water impacts during the use phase have not been studied.

## 29. Bibliography

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations

Principles and procedures. ISO 14040:2006 Environmental management. Life cycle assessment.

Principles and frameworks. ISO 14044:2006 Environmental management. Life cycle assessment.

Requirements and guidelines. EN 15804:2012+A1 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.

RTS (2016) RTS PCR protocol: EPDs published by the Building Information Foundation RTS sr. PT 18 RT EPD Committee. (English version)

Finnish energy. Sähkön tuontidata 2017. [XLSX-file] Available:

[https://energia.fi/ajankohtaista\\_ja\\_materiaalipankki/materiaalipankki/sahkon\\_tuntidata.html#material-view](https://energia.fi/ajankohtaista_ja_materiaalipankki/materiaalipankki/sahkon_tuntidata.html#material-view) [Last accessed 2.3.2019].

Statistics Finland Sähkön ja lämmön tuotanto tuotantomuodoittain ja polttoaineittain 2017. Available: [http://www.stat.fi/til/salatuo/2017/salatuo\\_2017\\_2018-11-01\\_tau\\_001\\_fi.html](http://www.stat.fi/til/salatuo/2017/salatuo_2017_2018-11-01_tau_001_fi.html) [Last accessed 2.3.2019].