

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804:2012+A2:2019

Stone Wool Mattress

from

RBS Ravago



PROGRAMME

The International EPD® System
www.environdec.com

PROGRAMME OPERATOR

EPD International AB & EPD Turkey

LOCAL OPERATOR

Global

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PROGRAMME INFORMATION

Programme Information

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Information about verification and reference PCR:

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product category rules (PCR)

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 c-PCR005 Thermal insulation products (EN 16783: 2017)

PCR review was conducted by

The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members.
 Review chair: Claudia A. Peña, University of Concepción, Chile.
 The review panel may be contacted via the Secretariat www.environdec.com/contact.

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EPD process verification EPD verification

Third party verifier

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Approved by

International EPD System Technical Commiee,
 supported by the Secretariat

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No

LCA Study & EDP Design Conducted by

Semtrio Sustainability Consulting
 BUDOTEK Teknopark, No 8/27
 Umraniye / Istanbul Turkey
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RBS Ravago has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

COMPANY INFORMATION

Owner of the EPD

RBS RAVAGO İNŞAAT YALITIM ÜRÜNLERİ A.Ş.

Organize San. Böl. 20. Cad. No: 54
Kayseri / TURKEY

Contact

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The owner of the EPD - RBS RAVAGO - operates in more than 350 locations in 40 countries, being a member of the Belgium-based Ravago Group and a leader in the insulation industry by meeting the mineral rockwool requirement of an area of 20,000,000 sqm annually with its wide product range for thermal insulation, sound insulation and fire safety. RBS RAVAGO is located in Kayseri Organized Industrial Zone with its high technology equipment investments in a total area of 80,000 sqm with 56,000 sqm indoor area. RBS RAVAGO is the biggest mineral wool manufacturer in the region with an annual production capacity of 120,000 tonnes.

In addition to 25 different types of mineral rockwool products, RBS RAVAGO is producing Ceramic Wool and Agro used in soilless agriculture. RBS RAVAGO has become the only company in the sector supplying all mineral wool products in the last quarter of 2018 by starting mineral wool production with the new production line of glass wool. RBS RAVAGO, the only manufacturer that can produce all mineralwool insulation materials under the same roof, offers a wide range of products with new RBS RAVAGO bio according to various application areas.



Production Site

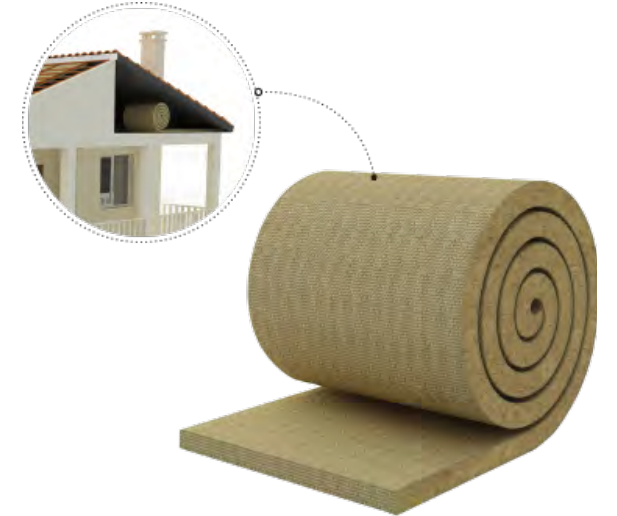
Kayseri
Organize San. Böl. 20. Cad. No: 54
Kayseri / TURKEY

PRODUCT INFORMATION

Product Name

Stone Wool Mattress

Stone wool is an insulation material which contains %98 natural fibre and obtained by transforming the minerals and inorganic volcanic stones into natural fibre by melting them at high temperatures.



Production

Inputs: The raw materials are measured and sent to a melting furnace. For stone wool these are basalt, cement and limestone.

Furnace: The raw materials are melted in a furnace at very high temperatures, typically between 1300°C to 1500°C. The smoke created during this process is filtered and flue gases are cleaned to minimise any environmental impact.

Spinning: The droplets of melt exiting the furnace are spun into fibres. Droplets fall onto rapidly rotating flywheels or the mixture is drawn through tiny holes in rapidly rotating spinners. This process shapes it into fibres.

Binding: Small quantities of binding agents are added to the fibres. The structure and density of the product will be adapted according to its final usage.

Curing: The mineral wool is then hardened in a curing oven at around 200°C.

Cutting: The mineral wool is cut to the required size and shape, for example into rolls, batts, boards or it can be customised for use with other products. Off-cuts and other mineral wool scraps are recycled back into the production process, which further reduces inputs and energy requirements.

Packaging: Due to its impressive elasticity, mineral wool can be compressed during packaging to reduce its volume.

Technical Specification

Standard		80kg/m ³							
EN 882	Legend (tolerance)	1200 mm							
EN 882	Width (tolerance)	600 mm							
EN 824	Determination of Squareness Maximum 5 mm	1 mm max.							
EN 825	Determination of Flatness Maximum 6 mm	2 mm max.							
EN 826	Compressive Strength (10% deformation)	-	-	-	-	>15	>25	>35	>45
EN 1604	Determination of Dimensional Stability	0	0	0	0	0	0	0	0
EN 1667	Determination of Tensile Strength Vertical to Faces	-	-	-	-	>7.5	>10	>15	>15
EN 1609	Short Term Water Absorption WP	>1							
EN 12037	Long Term Water Absorption WP	>3							
EN 12086	Water Vapor Diffusion Resistance Coefficient μ	>1							
EN 12667	Declared Thermal Conductivity (max. 0.04 W/(m.K))	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
EN 12667	Thermal Resistance (m ² K/W) R	1.39							
EN 13501-1	Reaction to Fire	A1 Class							
	Melting Point	C 1000							

UN CPC Code: 37990, Non-metallic mineral products n.e.c. (including mineral wool, expanded mineral materials, worked mica, articles of mica, non-electrical articles of graphite or other carbon and articles of peat).



LCA Information

Functional unit

1 m² of Stonewool Mattress with a thermal resistance of 1 K. m² .W⁻¹ manufactured in RBS RAVAGO Manufacturing plant in Kayseri (TR).

Reference service life

Stonewool mattress is the lifetime of the building equipment is at least 50 years.

Time representatives

The production data in this LCA study represents the period of 1st January 2021-30th June 2021

Database(s) and LCA software used

Simpro v9.2 and Ecoinvent v3.7.1

Description of system boundaries

This EPD covers the cradle to grave and module D stages.

Data quality and data collection

According to EN 15804:2012+A2:2019 specific data was used for module A3 (Processes the manufacturer has influence over) and was gathered from the RBS Ravago manufacturing plant. Specific data includes actual product weights, amounts of raw materials used, product content, energy consumption, transport figures, water consumption and amounts of wastes. Data represents the period from 1st January 2021-30th June 2021. For secondary data Ecoinvent v3.7.1 data sets was used. LCA was modelled in SimaPro v9.2.

Allocation

Allocation of impacts among co-products was not applied.

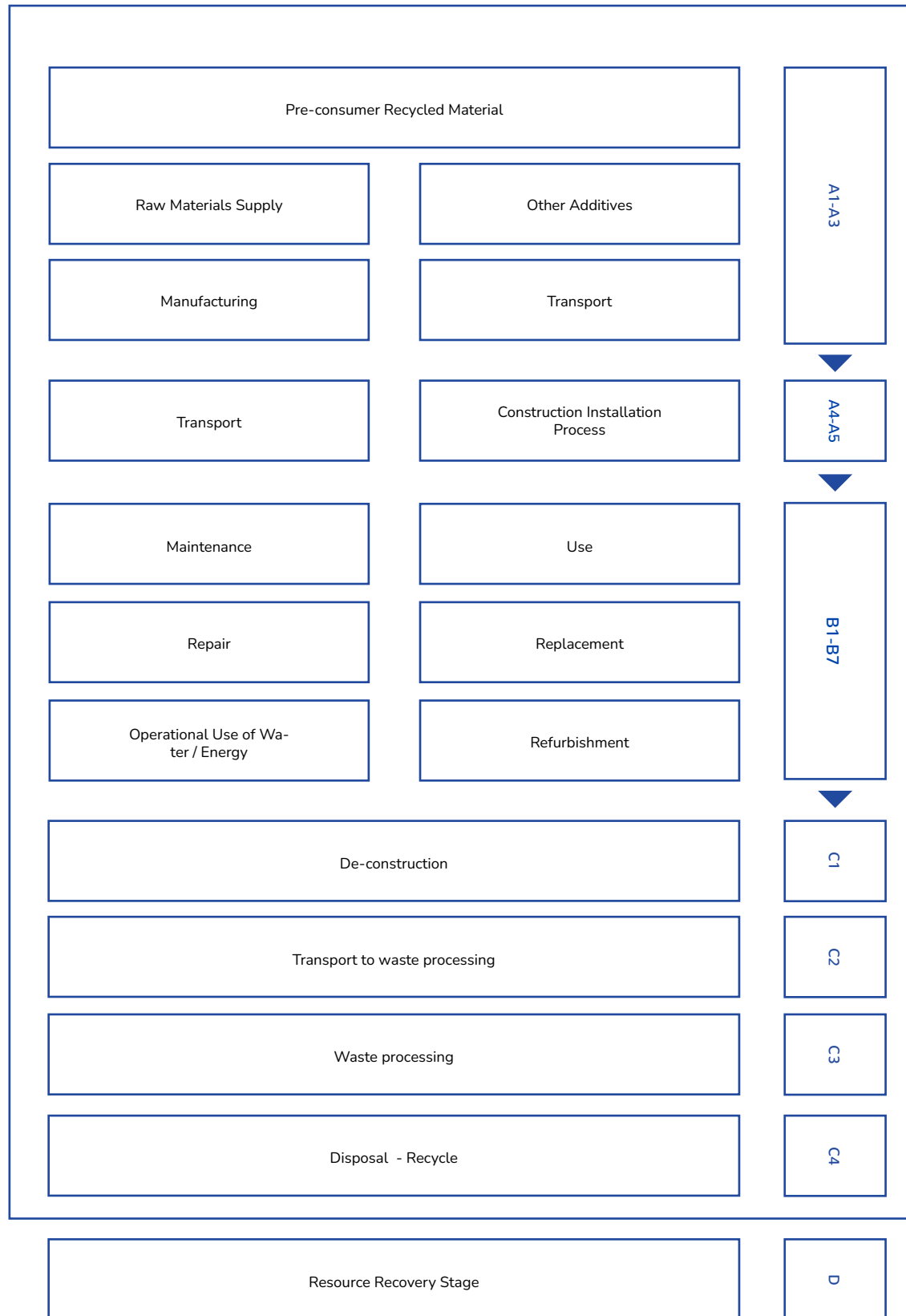
Cut-off rules

Life Cycle Inventory data for a minimum of 99% of total inflows to the three life cycle stages have been included and a cut-off rule of 1% regarding energy, mass and environmental relevance was applied. Impacts caused by treatment operations have been calculated lower than 1% environmental relevance.

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Resource Recovery Stage	
	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	Transport	Disposal	Waste Processing	Reuse - Recovery - Recycling Potential	
X Declared																		
ND Not Declared																		
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
Modules Declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Geography	GLO	GLO	TR	TR	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	GLO	
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Variation-products	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Variation-sites	Not Relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-	

System Diagram



Description of Raw Materials

A1 - Raw Materials Supply

This module takes into account raw material extraction, processing and energy used in the production process.

A2 - Transport to the Manufacturer

This module includes transportation of the raw materials from supplier to factory gate. Transportation types are considered as seaway and roadway.

A3 - Manufacturing

This module includes energy and water consumption during the manufacturing process. Additionally, packaging materials are covered in this module. Followed production processes are as;

- Mixing
- Melting
- Spinning
- Binding
- Curing
- Cutting
- Packaging

A4- Transport to the Construction Site

Transport to the construction site is calculated on the basis of a scenario with the parameters described in the attached table.

Parameters A4 Module	
Average Transport distance (km)	500

Type of fuel and vehicle consumption or type of vehicle used for transport.	Transport, freight, lorry >32 metric ton, EURO6
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A5 - Installation into the Building

Installation into the Building is calculated on the basis of a scenario with the parameters described in the attached table. The treatment of the packaging waste after the installation of the product has been considered.

Parameters A5 Module	
Loss of materials in construction site	2%
Packaging Wooden pallet	100% incinerated
Packaging Plastic sheet	40% recycled, 60% landfill

B1-B7 The Use Stage

- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6: Operational Energy Use
- B7: Operational Water Use

After Stone wool board installation is complete, no actions or technical operations are required during the use stages until the end of life. Therefore, the stone wool board has no impact on this stage.

C1 - De-construction

The common manual dismantling impact of stone wool board is considered as very small and can be neglected in C1. Given the scenario that is assumed, environmental impact of de-construction process is not considered in this study.

C2 - Transport to Waste Processing

An average distance of 100 km has been assumed for the transport to sorting facility. Transport is calculated on the basis of a scenario with the parameters described in the attached table.

Parameters C2 Module	
Transport by road*	Lorry. 16-32 metric ton
Distance (km)	100
Database	Ecoinvent v3.7.1

C3 - Waste Processing for Reuse, Recovery and/or Recycling

The material and energy expenses required for Module C3 are negligible. It is assumed that there is no sorting or processing required for Stone wool board.

C4 - Final disposal

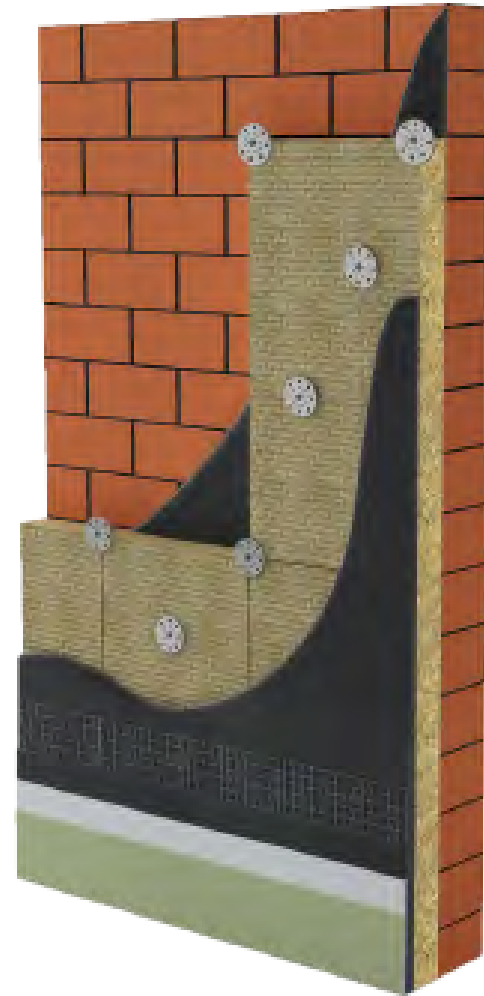
Although Stone wool board products are partly recycled at their end-of-life, an established collection system does not yet exist. Therefore, the assumption chosen in this study, 100% landfill after the use phase, is the most conservative approach.

D - Reuse, Recovery or Recycling Potential

Benefits considered in this module originate from stonewool boards packaging recycling or incineration.

Information on which life cycle stages are not considered

This EPD covers the cradle to grave and module D stages. After Stonewool Mattress installation is complete, no actions or technical operations are required during the use stages until the end of life. Therefore, the mineral wool has no impact on B1-B7 modules.



Content Declaration

Content Declaration of Stone Wool Mattress

Product	Basalt, weight-%	Limestone, weight-%	Pre-consumer recycled materials, weight-%	Additives, weight-%	Renewable material, weight-%	Biogenic carbon, weight-%
Stone Wool Board	60-65	25-20	10-15	5-10	0	0

Content Declaration of Packaging Material

Product	Weight, %	Biogenic carbon, kg C
Stone Wool Board		
Packaging Nylon	<1	-
Wood	<1	0.0098106

Environmental Performance

Potential Environmental Impact

Mandatory Indicators According to EN 15804

Results for 1 m2 of Stone Wool Mattress											
Indicator	Unit	Total	A1-3 Total	A4	A5	B1-7	C1	C2	C3	C4	D
							De-construction demolition	Transport	Waste processing	Disposal	Recycling-potential
GWP-fossil	kg CO2 eq	4.71	4.48	0.13	0.05	0	0	0.03	0	0.02	-0.01
GWP-biogenic	kg CO2 eq	5.16	-0.02	2.4E-04	5.18	0	0	4.7E-05	0	4.8E-05	-1.2E-05
GWP-luluc	kg CO2 eq	0.01	0.01	4.1E-05	9.5E-06	0	0	8.1E-06	0	4.2E-06	-1.8E-06
GWP-total	kg CO2 eq	9.88	4.47	0.13	5.24	0	0	0.03	0	0.02	-0.01
ODP	kg CFC11 eq	2.8E-07	2.3E-07	3.1E-08	3.7E-09	0	0	6.3E-09	0	6.4E-09	-1.3E-10
AP	mol H+ eq	0.04	0.04	4.3E-04	5.8E-04	0	0	8.6E-05	0	1.5E-04	-2.0E-05
EP-freshwater	kg PO43-	3.0E-03	2.8E-03	4.7E-05	1.5E-04	0	0	9.5E-06	0	2.0E-05	-1.7E-06
EP-aquatic freshwater	kg P eq	2.4E-04	2.4E-04	1.2E-06	7.3E-07	0	0	2.3E-07	0	1.6E-07	-9.9E-08
EP-marine	kg N eq	4.7E-03	4.3E-03	9.5E-05	2.7E-04	0	0	1.9E-05	0	5.1E-05	-3.8E-06
EP-terrestrial	mol N eq	0.07	0.07	1.1E-03	2.9E-03	0	0	2.1E-04	0	5.6E-04	-4.2E-05
POCP	kg NMVOC eq	0.02	0.02	4.1E-04	7.2E-04	0	0	8.2E-05	0	1.6E-04	-1.8E-05
ADP-minerals & metals	kg Sb eq	7.1E-06	6.6E-06	3.2E-07	1.1E-07	0	0	6.4E-08	0	3.5E-08	-3.2E-08
ADP-fossil*	MJ, net calorific value	54.4	51.1	2.12	0.45	0	0	0.42	0	0.44	-0.16
WDP	m3 world eq. deprived	0.87	0.88	0.01	-0.04	0	0	1.6E-03	0	0.02	-2.3E-03

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.



Potential Environmental Impact

Additional Mandatory and Voluntary Indicators

Results according to PCR2019:14 for 1 m2 of Stone Wool Matress											
Indicator	Unit	Total	A1-3 Total	A4	A5	B1-7	C1	C2	C3	C4	D
							De-construction demolition	Transport	Waste processing	Disposal	Recycling-potential
GWP - GHG ¹	kg CO2 eq	4.56	4.34	0.13	0.05	0	0	0.03	0	0.02	-4.8E-03

Results according to EN 15804+A2 for 1 m2 of Stone Wool Matress											
Indicator	Unit	Total	A1-3 Total	A4	A5	B1-7	C1	C2	C3	C4	D
							De-construction demolition	Transport	Waste processing	Disposal	Recycling-potential
PM/RI	disease inc.	3.9E-07	3.7E-07	1.1E-08	5.9E-09	0	0	2.3E-09	0	2.9E-09	-1.7E-10
IRP	kBq U-235 eq	0.05	0.04	0.01	6.6E-04	0	0	1.8E-03	0	1.8E-03	-7.3E-05
ET-freshwater	CTUe	85.4	82.2	1.76	0.80	0	0	0.35	0	0.27	-0.05
HT-cancer	CTUh	2.4E-08	2.4E-08	5.0E-11	1.6E-10	0	0	1.0E-11	0	8.1E-12	1.7E-11
HT-non-cancer	CTUh	4.1E-08	3.1E-08	1.7E-09	7.4E-09	0	0	3.4E-10	0	1.7E-10	4.8E-10
SQP	Pt	23.5	19.5	2.40	0.15	0	0	0.48	0	0.91	-0.01

Acronyms GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology; IRP = Ionizing radiation, human health; ET-freshwater = Eco-toxicity (freshwater); HT-cancer = Human toxicity, cancer effects; HT-non-cancer = Human toxicity, non-cancer effects; SQP = Potential soil quality index (SQP)

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.

Use of Resources

Results for 1 m2 of Stone Wool Matress											
Indicator	Unit	Total	A1-3 Total	A4	A5	B1-7	C1	C2	C3	C4	D
							De-construction demolition	Transport	Waste processing	Disposal	Recycling-potential
PERE	MJ	3.66	3.62	0.02	0.01	0	0	4.6E-03	0	3.5E-03	-2.1E-03
PERM	MJ	0	0	0	0	0	0	0	0	0	0
PERT	MJ	3.66	3.62	0.02	0.01	0	0	4.6E-03	0	3.5E-03	0
PENRE	MJ	35.2	31.7	2.25	0.49	0	0	0.45	0	0.46	-0.17
PENRM	MJ	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	58.4	54.9	2.25	0.49	0	0	0.45	0	0.46	-0.17
SM	kg	1	1	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m ³	0.15	0.14	1.8E-03	2.3E-03	0	0	3.6E-04	0	6.9E-04	-2.0E-04

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 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

Waste Production

Results for 1 m ² of Stone Wool Mattress											
Indicator	Unit	Total	A1-3 Total	A4	A5	B1-7	C1	C3	C3	C4	D
							De-construction demolition	Transport	Waste processing	Disposal	Recycling-potential
Hazardous waste disposed	kg	1.1E-04	1.1E-04	0	0	0	0	0	0	0	0
Non-hazardous waste disposed	kg	1	0	0	1.1E-03	0	0	0	0	1.00	0
Radioactive waste disposed	kg	0	0	0	0	0	0	0	0	0	0

Output Flows

Results for 1 m ² of Stone Wool Mattress											
Indicator	Unit	Total	A1-3 Total	A4	A5	B1-7	C1	C3	C3	C4	D
							De-construction demolition	Transport	Waste processing	Disposal	Recycling-potential
Components for re-use	kg	0	0	0	0	0	0	0	0	0	0
Material for recycling	kg	0	0	0	7.1E-04	0	0	0	0	0	-7.1E-04
Materials for energy recovery	kg	4	0	0	3.54	0	0	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0	0	0	0	0

References

ISO 14040: 2021

Environmental management - Life cycle assessment - Principles and framework

ISO 14044: 2021

Environmental management - Life cycle assessment - Requirements and guidelines

ISO 14025: 2006

Environmental labels and declarations - Type III environmental declarations - Principles and procedures

ISO 14020: 2000

Environmental labels and declarations - General principles

EN 15804:2012+A2: 2019

Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

c-PCR005

Thermal insulation products

EN 16783: 2017

Thermal insulation products — Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations

The International EPD® System

www.environdec.com

The International EPD® System

The General Programme Instructions v4.0

The International EPD® System

PCR 2019:14 Construction products v1.1 (EN 15804:A2)

Ecoinvent 3.7.1

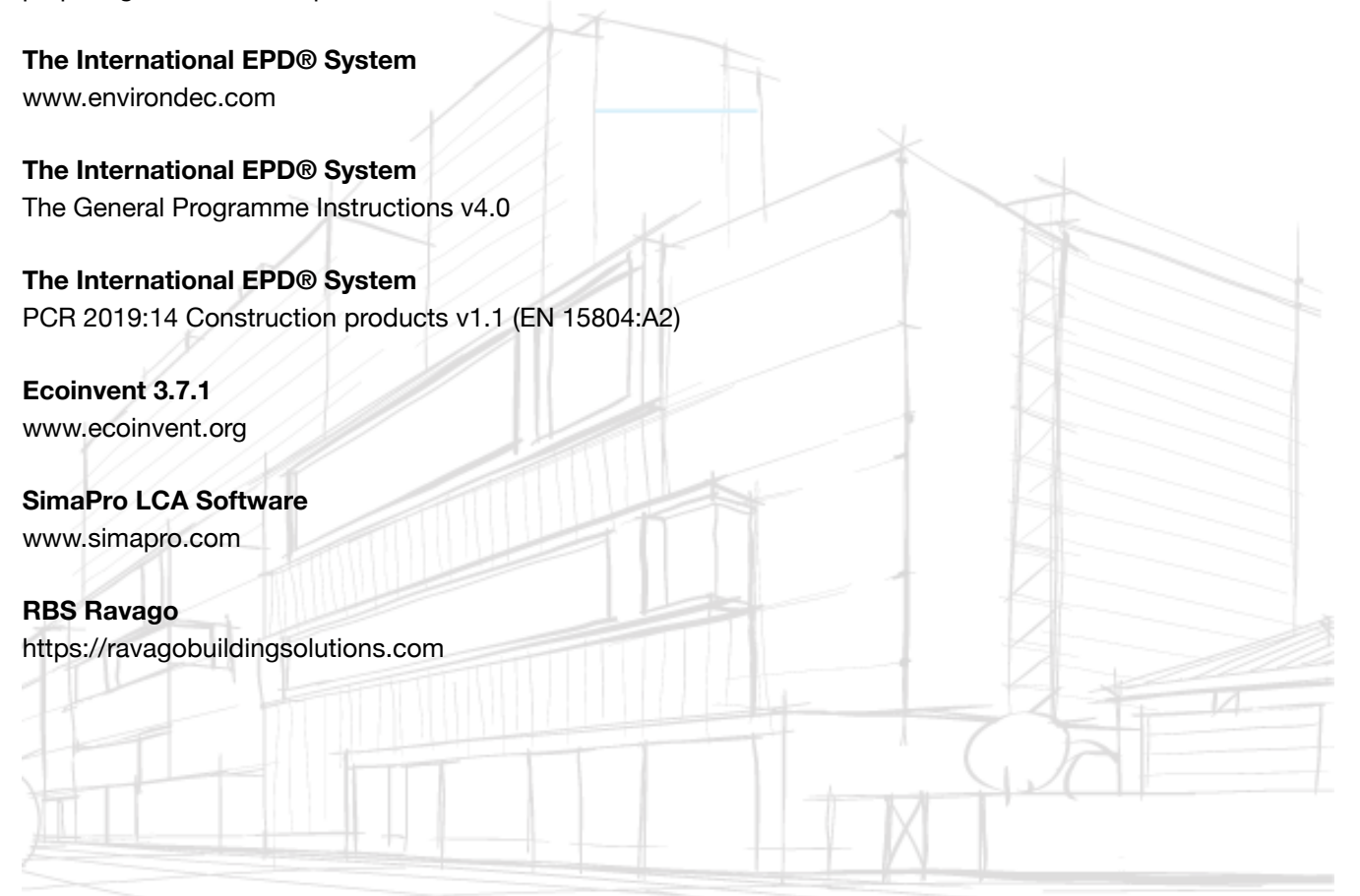
www.ecoinvent.org

SimaPro LCA Software

www.simapro.com

RBS Ravago

<https://ravagobuildingsolutions.com>



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