



Environmental Product Declaration

for Ravaber Stone Wool Mattress
in accordance with ISO 14025 and EN 15804

Programme: The International EPD® System, www.environdec.com
EPD Turkey, www.epdturkey.org

Programme operator: EPD International AB & EPD Turkey

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EPD Registration Number: S-P-01312



THE INTERNATIONAL EPD® SYSTEM



ENVIRONMENTAL PRODUCT DECLARATIONS

PROGRAMME INFORMATION

Programme	<p>The International EPD® System</p> <p>EPD International AB Box 210 60 SE-100 31 Stockholm Sweden</p> <p>www.environdec.com info@environdec.com</p> <p>Regional Office: EPD Turkey, Nef 09 B Blok 7/15 Kagithane/Istanbul, Turkey, www.epdturkey.org</p>
Product Category Rules (PCR)	<p>Construction Products and Construction Services 2012:01, version 2.3</p> <p>SUB-PCR to PCR 2012:01 Thermal Insulation Products (EN 16783:2017) Versiyon 2.2</p>
PCR Review Was Conducted By	<p>The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com.</p> <p>Contact via: info@environdec.com</p>
Verification	<p>Independent verification of the declaration and data, according to ISO 14025:2006:</p> <p><input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification</p>
Third Party Verifier	<p>Ing. Luca Giacomello, PMP® Corso Gamba 36 C 10144 Torino - Italy</p> <p>Approved by: The International EPD® System Technical Committee, supported by the Secretariat</p>
Data Follow Up	<p>Procedure for follow-up of data during EPD validity involves third party verifier:</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
LCA Study & EPD Design Conducted By	<p>Semtrio Sustainability Consulting AND Plaza No:10-12 Kozyatagi Istanbul/Turkey www.semtrio.com</p>

The EPD owner 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.

COMPANY INFORMATION



RAVABER Kayseri Manufacturing Plant, Turkey

The owner of the EPD - RAVABER - 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. RAVABER 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. RAVABER is the biggest mineral wool manufacturer in the region with an annual production capacity of 120,000 tonnes.

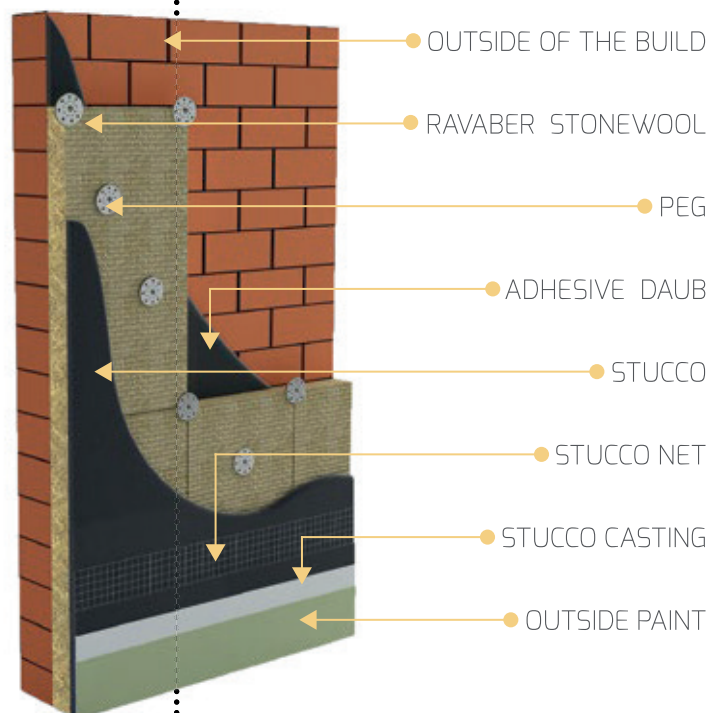
In addition to 25 different types of mineral rockwool products, RAVABER is producing Ceramic Wool and Agro used in soilless agriculture. RAVABER has become the only company in the sector supplying all mineral wool products in the last quarter of 2018 by starting mineral wool production with the new production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

STONEWOOL

Perfect Insulations...



- Bacteria and microorganisms cannot live inside because of its inorganic structure.
- It is an ecological and eco-friendly product produced from natural raw material.
- Stonewool is a water-repellent insulation material because of its saturated (saturated) structure. It does not contain moisture because of its structure with vapour permeability.
- USING stonewool reduces the needs of fossil fuels. Therefore it alleviates global warming and climate change because the usage of stonewool reduces the carbon dioxide emission.
- Thanks to its strong and everlasting structure up to 1000°C Stonewool ensures fire protection which is critically important in life. It saves time for fire teams in fire-fighting, lifesaving and evacuation while it prevents the fire from spreading.
- Stonewool ensures a comfortable ambience because it performs acoustic insulation against negative external factors like sound, noise, etc.



PRODUCT INFORMATION

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 1500-1600 °C. Stone wool performs heat insulation, sound insulation, damp insulation and fire protection in all places like roof of the houses, separating walls, outside walls, ovens, steel doors, vessels, electrical house appliances, entertainment places like cinemas.

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). HS Code: 6806.

Geographical scope: Global.

Stone wool mattress with no facing. Used at Industrial plants, Boilers and central heating systems, Process equipment, Chimneys of boiler and central heating systems, Steel doors and constructions. Ensures heat, sound and fire insulation in industrial areas, industrial equipment like ovens and boilers exposed high temperature. Mounted to the insulation surfaces with pins.



TECHNICAL SPESIFICATIONS

Standard		40 kg/m ³	50 kg/m ³	70 kg/m ³	90 kg/m ³	100 kg/m ³	110 kg/m ³	130 kg/m ³	150 kg/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							

LCA INFORMATION

Functional unit / declared unit: The functional unit is providing a thermal insulation on 1 sqm of product with a thermal resistance of 1 K.m².W⁻¹.

Declared Unit weight for 1 sqm with a thermal resistance of 1 K.m².W⁻¹.

Product	Density, kg/m ³	Thickness, mm	Thermal Conductivity, W/m.K	Weight, kg
Stone Wool Mattress	70	37	0.037	2.59

Reference service life: N/A

EPD Type (System Boundary): Cradle-to-gate

Data Collection: Specific data (primary data) was used for the Core Module and was gathered from the RAVABER Manufacturing Plant. The manufacturing data are monitored and recorded in RAVABER data collection system specifically per unit of product. Data represents the period from 1st January 2018 to 31th October 2018. For secondary data Ecoinvent v3.5 datasets was used. LCA was modelled in SimaPro v9.0.0.31.

Allocation: No allocation conducted for input materials and energy consumption was collected specifically per functional unit.

Calculation Methods: All resource use values are calculated from Cumulative Energy Demand V1.11 in SimaPro outputs; water consumption from inventory. Potential environmental impacts are calculated with the CML-IA baseline V 3.05, in SimaPro software.

Cut-off Rules: Cut-off rule of 1% regarding waste and wastewater treatment was applied. Regarding to material and chemical inputs, no cut-off rule has been applied.

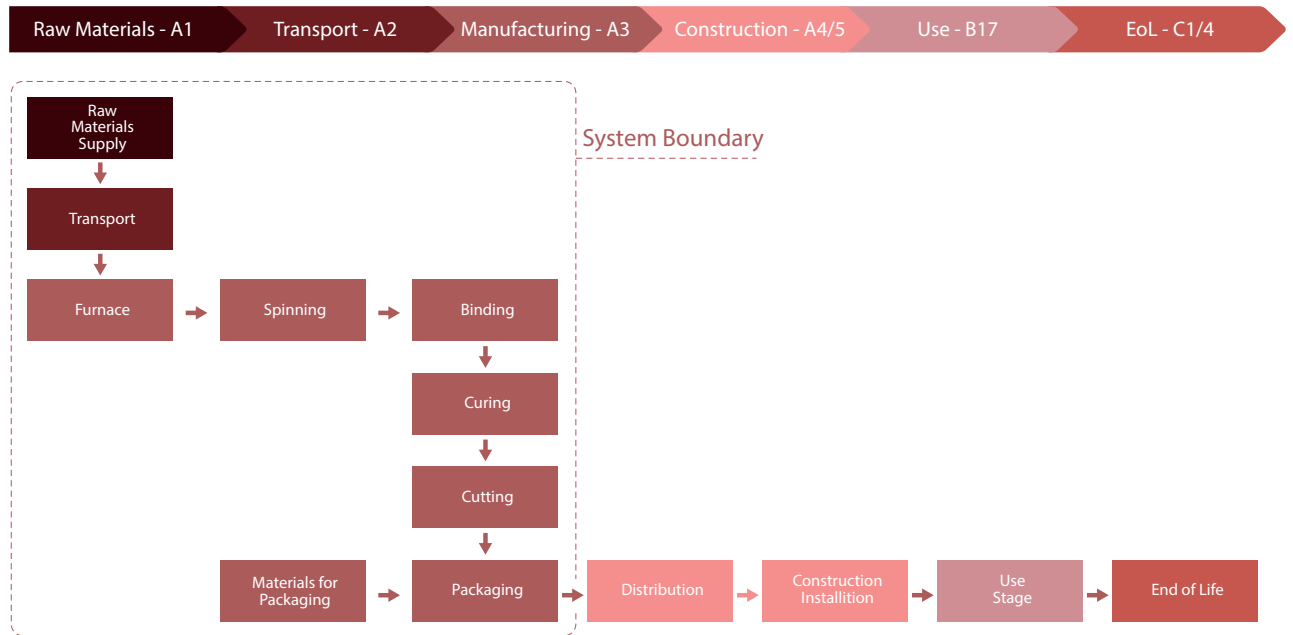
Excluded lifecycle stages: Downstream Processes A4/5, B1/7, C1/4 and module D are not evaluated in this LCA study. The EPD is intended to be as cradle to gate (A1 to A3). This EPD only covers the Cradle to Gate stage because other stages are very dependent on particular scenarios.

Included life cycle stages per EN 15804:

Product stage			Construction stage		Use stage							End of life stage				Resource recovery stage
Raw materials	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
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

MND: Module not declared.

System Diagram:



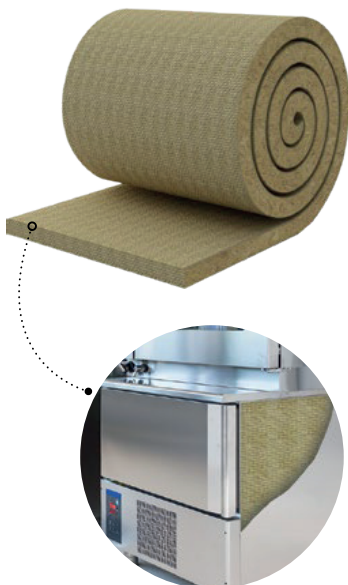
Upstream Processes

A1) Raw material supply:

- Extraction and processing of raw materials (e.g. mining processes)
- Energy generation in the upstream processes

Glass cullet is used as secondary materials in the production system. All elementary flows at resource extraction have been included.

- Packaging materials



Core Processes

The scope of the core module is defined by the organizational boundaries and includes all activities which the manufacturing organization is in control of. In this LCA Study the core process includes transportation of raw materials to production plant, impacts generated by fuel burned in the core process, impacts due to the electricity production according to the country energy mix.

A2) Transportation:

- External transportation to the core processes and internal transport

A3) Manufacturing:

- Manufacturing of the glass wool product
- Packaging materials

CONTENT DECLARATION

Materials	Percentage, %
Basalt, kg	75-90
Limestone, kg	30-45
Cement, kg	1-10
Formaldehyde, kg	1-8

Packaging: PE packaging film is used to cover the end products. Classified as Distribution Packaging: designed for the purposes of transport, handling and/or distribution.

No substances included in the Candidate List of Substances of Very High Concern for authorisation under the REACH regulations are included in composition of RAVABER's products, above the threshold for registration with the European Chemicals Agency or above 0.1 % (wt/wt).

Basalt: Basalt is a mafic extrusive igneous rock formed from the rapid cooling of magnesium-rich and iron-rich lava exposed at or very near the surface of a terrestrial planet or a moon. More than 90% of all volcanic rock on Earth is basalt.

Limestone: Limestone is a carbonate sedimentary rock that is often composed of the skeletal fragments of marine organisms such as coral, foraminifera, and molluscs. Its major materials are the minerals calcite and aragonite, which are different crystal forms of calcium carbonate.

Cement: A cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. There are two main forms of cement: Geopolymer cement and Portland Cement.

Formaldehyde: Formaldehyde is a naturally occurring organic compound with the formula CH_2O . It is the simplest of the aldehydes. The common name of this substance comes from its similarity and relation to formic acid.



ENVIRONMENTAL PERFORMANCE Stone Wool Board / Glass Tissue Facing

PARAMETERS		UNIT	TOTAL A1 to A3
USE OF RESOURCES			
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	43.8
	Used as raw materials	MJ, net calorific value	0.00
	TOTAL	MJ, net calorific value	43.8
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	42.0
	Used as raw materials	MJ, net calorific value	0.00
	TOTAL	MJ, net calorific value	42.0
Secondary material		kg	0.00
Renewable secondary fuels		MJ, net calorific value	0.00
Non-renewable secondary fuels		MJ, net calorific value	0.00
Net use of fresh water		m ³	0.009
POTENTIAL ENVIRONMENTAL IMPACTS			
Global warming potential (GWP)		kg CO ₂ eq.	3.39
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	1.97E-07
Acidification potential (AP)		kg SO ₂ eq.	0.017
Eutrophication potential (EP)		kg PO ₄ ³⁻ eq.	0.001
Formation potential of tropospheric ozone (POCP)		kg C ₂ H ₄ eq.	0.003
Abiotic depletion potential – Elements		kg Sb eq.	3.24E-06
Abiotic depletion potential – Fossil resources		MJ, net calorific value	37.7
WASTE PRODUCTION AND OUTPUT FLOWS			
Hazardous waste disposed		[kg]	1.43E-04
Non-hazardous waste disposed		[kg]	0.045
Radioactive waste disposed		[kg]	0.00
Components for reuse		[kg]	0.00
Material for recycling		[kg]	0.348
Materials for energy recovery		[kg]	0.00
Exported energy, electricity		[MJ]	0.00

THE ENVIRONMENT IMPACTS for the DIFFERENT THICKNESSES

Density, kg/m ³	Thickness, mm	Thermal Conductivity, W/m.K	Multiplication Factor
40	37	0.037	0.5714
45	37	0.037	0.6429
50	37	0.037	0.7143
55	37	0.037	0.7857
60	37	0.037	0.8571
65	37	0.037	0.9286
70	37	0.037	1.0000
75	37	0.037	1.0714
80	37	0.037	1.1429
85	37	0.037	1.2143
90	37	0.037	1.2857
95	37	0.037	1.3571
100	37	0.037	1.4286

The LCA study has been conducted for Stone Wool Mattress and includes the range of different density between 40 kg/m³ and 100 kg/m³. A reference unit has been selected as value of R= 1 m² .K / W for 37 mm. To determine the environmental impacts associated with a given product thickness in the table above, the results specified in this EPD must be multiplied by the corresponding multiplication factor."



CONTACT INFORMATION

Third party verifier:

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Accredited or approved by: The International EPD® System

Owner of the Declaration

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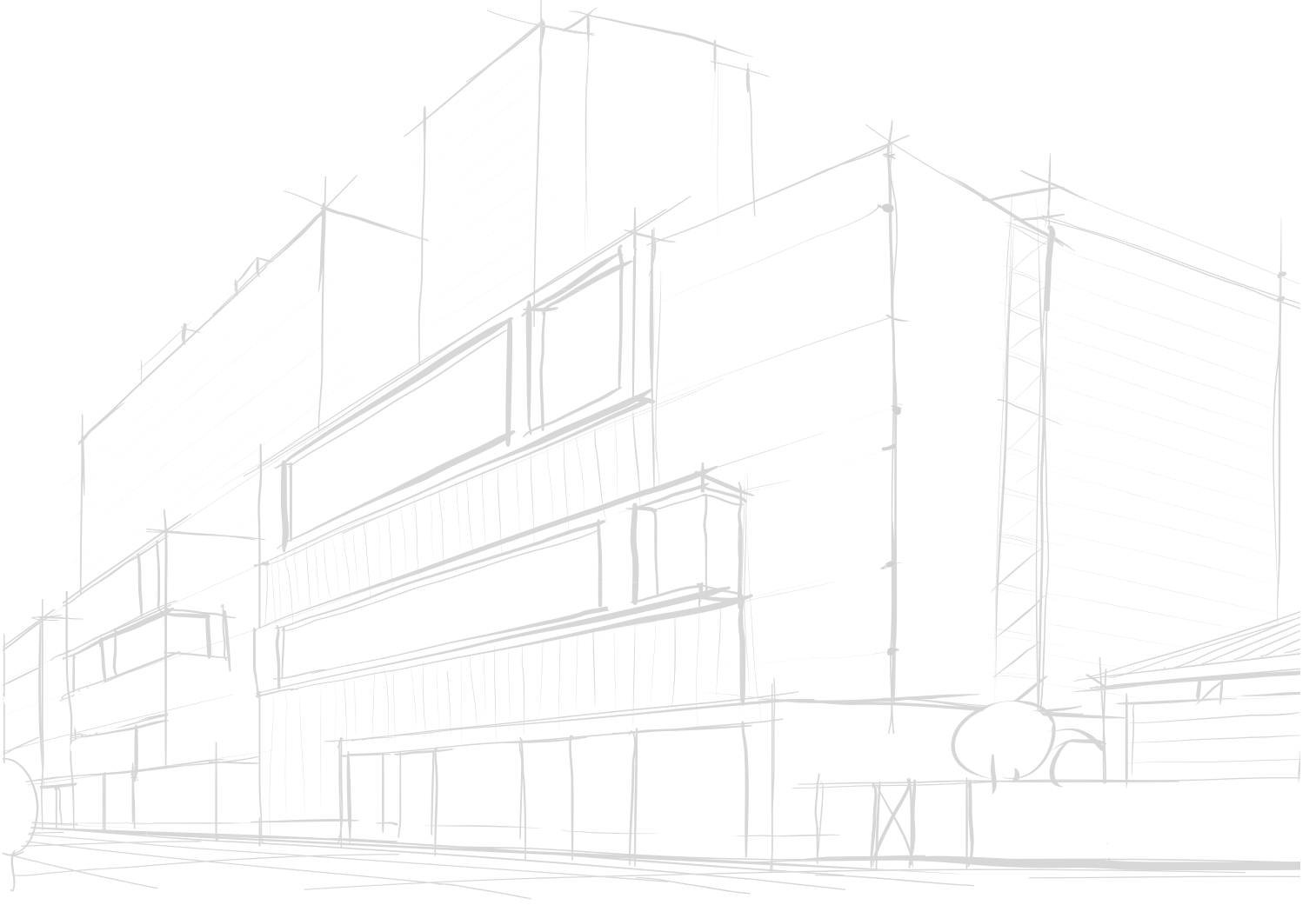
LCA Author & EPD Design

Semtrio Sustainability Consulting
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REFERENCES

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- Eurima - European Insulation Manufacturers Association / <https://www.eurima.org/about-mineral-wool/production-process.html>
- ISO 14040: 2006 Environmental management -- Life cycle assessment -- Principles and framework
- ISO 14044: 2006 Environmental management -- Life cycle assessment -- Requirements and guidelines
- ISO 14025: 2006 Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures
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