

ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD ref.No. 00000377



ROCKWOOL® Stone Wool Thermal Insulation for buildings produced for Czech market

EPD according to EN 15804 and ISO 14025 and 3rd party verified ROCKWOOL Group EPD rules and LCA model

Manufacturer: Rockwool A.S. (CZ), Rockwool Hungary Kft., Rockwool Polska Sp. z o. o.

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Life Cycle Assessment study

This environmental product declaration is based on a Life Cycle Assessment (LCA) background study according to EN15804:2012, PN-EN 13162+A1:2015-04 and ITB PCR A (PCR based on EN 15804) carried out by: ROCKWOOL® International A/S Hovedgaden 584k, 2640 Hedehusene, Denmark

Verification:

External independent verification of the LCA background report and declaration, according to EN ISO 14025:2010

Third-party verifier:

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ITB is the member of The European Platform for EPD program operators.
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In general, comparison of the environmental performance of construction products using EPDs shall be based on calculations which cover all life cycle stages (A1-D, "cradle to grave"). More information related to rules of comparability of EPDs can be found in EN 15804 clause 5.3.

Product

Declared unit

1 m² ROCKWOOL stone wool thermal insulation product with a thermal resistance of $R_D=1$ m² KW.

Intended application of the Environmental Product Declaration

This EPD is intended to be available to Rockwool A.S. (CZ) customers. The Czech market is supplied by 4 different factories (ITB EPD No. 42/2016, 43/2016, 44/2016, 45/2016) within the ROCKWOOL Group and this EPD covers this. This EPD can also be used in other markets that receive products from these 4 factories. Such markets include but are not limited to: Belarus, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia.

Product description

Stone wool is a widely used material commonly used to thermally insulate buildings. ROCKWOOL® insulation products contribute to the creation of energy-efficient and fire-safe buildings with good acoustics and a comfortable indoor climate.

Stone wool is available in various forms with different characteristics and properties to suit a wide range of applications, ranging from the insulation of roofs, lofts, walls, floors and HVAC systems in buildings to, fire-protection and noise reducing solutions and use in process industry. The ROCKWOOL® products considered in this EPD are boards or rolls used to provide thermal insulation in general building applications, ETICS and flat roofs. The specific product referred to in the declared unit is 39 mm thick and has a density of 28 kg/m³.

The packaging, such as PE film for packaging and palletizing, the pallet out of wood and the labels, are included in the assessment. Any facings, such as glass fleece, aluminium foil or other laminations, are excluded in this EPD. If relevant for a product, their environmental parameter values should be added.

Product specification

ROCKWOOL® stone wool insulation is a firesafe¹ material for insulation against heat, cold, fire, vibrations and noise. It is traditionally made from volcanic rock (typically basalt or dolomite), an increasing proportion of recycled material, and a few percent resin binder (typically 2–3% w/w for external wall and pitched roof products and slightly more for ETICS and flat roof products). The product is wrapped with PE-foil and placed on wooden - or stone wool pallets for further distribution.

The binder is a water-based phenol-formaldehyde resin which is polymerized into solid resin during production of the final stone wool product.

Stone wool insulation from ROCKWOOL for the Czech market is supplied by two production sites in Poland (Cigacice and Malkinia) as well as one site in Hungary (Tapolca) and one site in the Czech Republic (Bohumín). The properties and packaging of the

¹ A1 when tested according to EN 13501-1 (Euroclasses)

ROCKWOOL products from the different production sites are identical. The EPD is based on LCA inventory data from the 4 plants. The reference flow is a weighted average and is calculated using the amount of product by wool weight delivered to the Czech market in 2014 from the 4 production sites.

Reference service life

The reference service life of the insulation products in the building is not relevant in this EPD since the use stage of the building is not considered.

ROCKWOOL® products are durable and usually fulfil their function as thermal insulation as long as the building or construction lasts.

For calculation purposes a reference service life of 50 years has been agreed for as a basis for the EN13162, but could be adapted if a longer service life is assumed for the building's wall and roof in which ROCKWOOL® insulation products are applied. In some calculations, a service life equivalent to the building part life or building lifetime can be applied.

Technical information

The product standard that applies is EN13162:2008 Thermal insulation products for buildings – Factory made mineral wool (MW) products – Specification.

Specific characteristics and additional functionalities shall be taken into account when applying the EPDs in the building context:

- Most ROCKWOOL® stone wool material is classified as non-combustible (Euroclass A1), the best reaction to fire class according to EN13501-1.
- ROCKWOOL® stone wool products are often applied because of their acoustic properties. For example, a well-constructed wall using mineral wool insulation can reduce noise transmission by around 50dB [according to the local building norms]. Specific acoustic properties can be retrieved through the technical consultancy [support](#).
- ROCKWOOL® stone wool products are durable without any ageing of the thermal performance. They are dimensional stable and both water repellent and moisture resistant. Moisture and nutrient are necessary conditions for mould growth. Since more than 95% of the mass of mineral wool products is inorganic, there is little nutrient source to allow fungi/mould growth [ref. Eurima-health-safety].

More specific product information can be found on www.rockwool.cz or through the local ROCKWOOL® sales organizations.

Guidance on safe and effective installation is also provided through the [local organization](#) and at the end of this EPD.

ROCKWOOL® stone wool is approximately 97% recyclable. For waste ROCKWOOL® material that may be generated during installation or at end of life, the local organization is happy to discuss the individual requirements of contractors and users considering returning these materials to ROCKWOOL factories for recycling.

ROCKWOOL® stone wool waste is classified as nonhazardous. ROCKWOOL® insulation waste is covered by the non-hazardous entry (17 06 04) in the



List of Wastes of the European Waste Catalogue. Leaching tests of mineral wool waste by Eurima demonstrate that they comply with the criteria for acceptance of waste at a landfill for non-hazardous waste and with the criteria for acceptance of waste at a landfill for inorganic waste with low organic content [ref. Hjelmer 2004, Abdelghafour, 2004].

Technical data

The environmental impacts and indicators given in the section "Life Cycle Assessment: Results" of this EPD are for 1m² of product, providing a thermal resistance of R_D=1 m² K/W (the declared unit). The reference product is 39 mm thick ROCKWOOL® stone wool with a density of 28 kg/m³. For other specific ROCKWOOL® products, the environmental impacts and indicators are determined by applying the appropriate scaling factors and products R_D-value.

The R_D-values used for scaling give a very good indication of the amount of materials needed to achieve the desired insulation effect of other product types, but it is not an exact measure.

Product specification

Composition of delivered product

Material	% of total weight
Non-scarce natural stone and secondary raw materials	89%
Binder (resin)	3%
Oils	<0,2%
Packaging	8%

Products	Scaling Factor	Products	Scaling Factor	Products	Scaling Factor
AIRROCK HD	2.2	GRANROCK	1.5	ROCKSLAB SONIC	1.6
AIRROCK HD FB1	2.2	HARDROCK 1000	6.0	ROCKSLAB SUPER	1.3
AIRROCK LD	1.4	MEGA FRONTROCK	3.3	ROCKSONIC SUPER	1.3
AIRROCK ND	1.6	MEGAROCK PLUS	1.0	ROCKTON	1.6
AIRROCK ND FB1	1.6	MONROCK MAX	4.6	ROOFROCK 30E	3.3
AIRROCK XD	3.0	MONROCK MAX E	4.5	ROOFROCK 40	4.0
DACHROCK	5.7	MONROCK PRO	4.4	STALROCK	0.9
DACHROCK KSP	6.2	MULTIROCK	1.0	STALROCK MAX	1.8
DACHROCK MAX	5.5	MULTIROCK ROLL	0.9	STALROCK MAX F	1.8
DACHROCK SP	6.2	PANELROCK	2.1	STEPROCK HD	5.0
DELTAROCK	1.2	PANELROCK F	2.1	STEPROCK HD4F	4.5
DUROCK	5.5	ROCKFALL	5.9	STEPROCK ND	4.1
FASROCK	4.8	ROCKMIN PLUS	1.1	SUPERROCK	1.2
FASROCK G	2.4	ROCKROLL	0.9	TOPROCK SUPER	1.3
FASROCK LG1	2.7	ROCKROLL PLUS	1.0	UNIROCK	1.0
FASROCK LG2	2.7	ROCKROLL SUPER	1.3	VENTIMAX	1.8
FASROCK LL	2.9	ROCKSLAB	1.0	VENTIMAX F	1.8
FIXROCK	1.1	ROCKSLAB ACOUSTIC	1.6	WENTIROCK	2.7
FRONTROCK MAX E	2.9	ROCKSLAB PLUS	1.1	WENTIROCK F	2.7

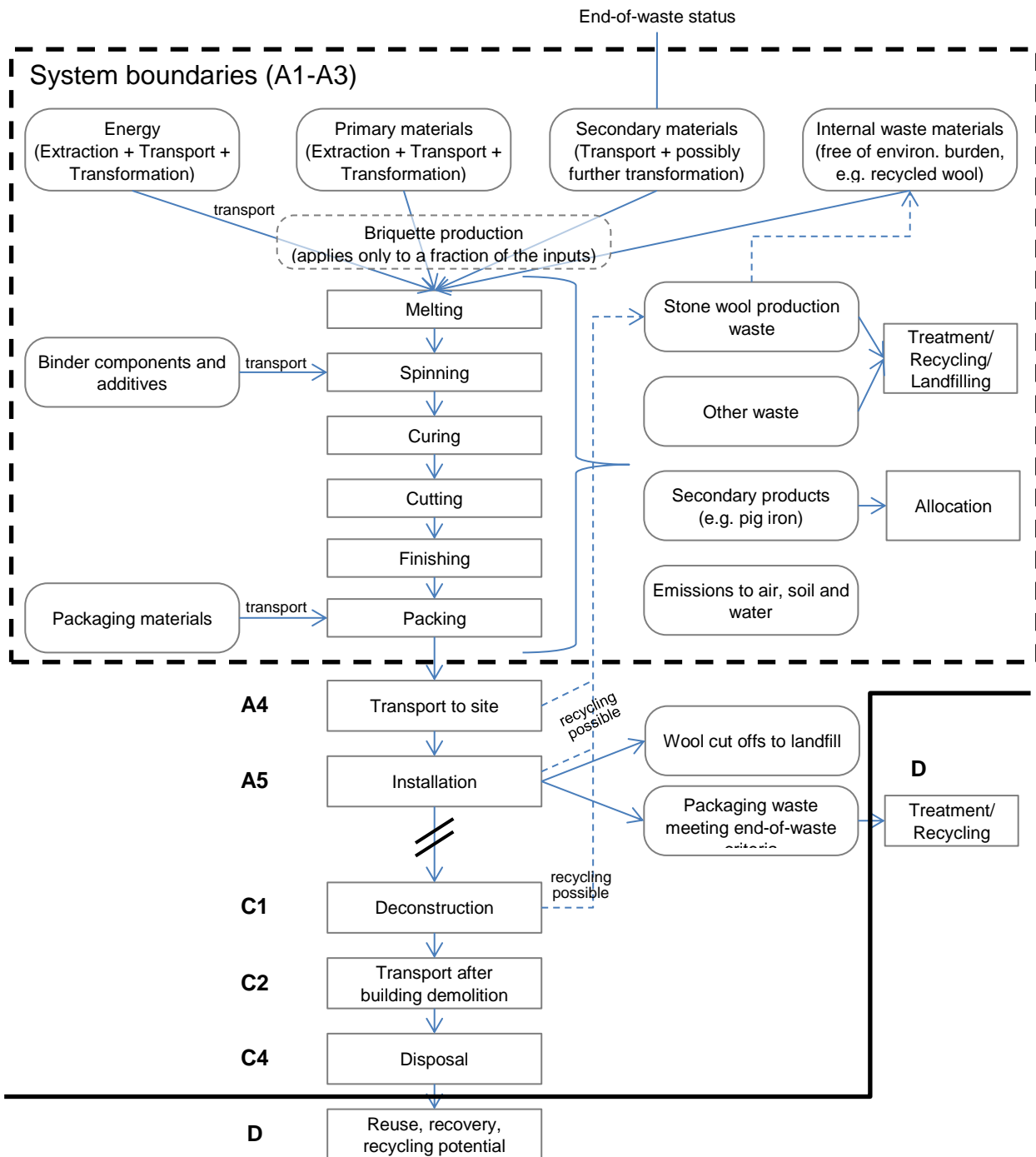


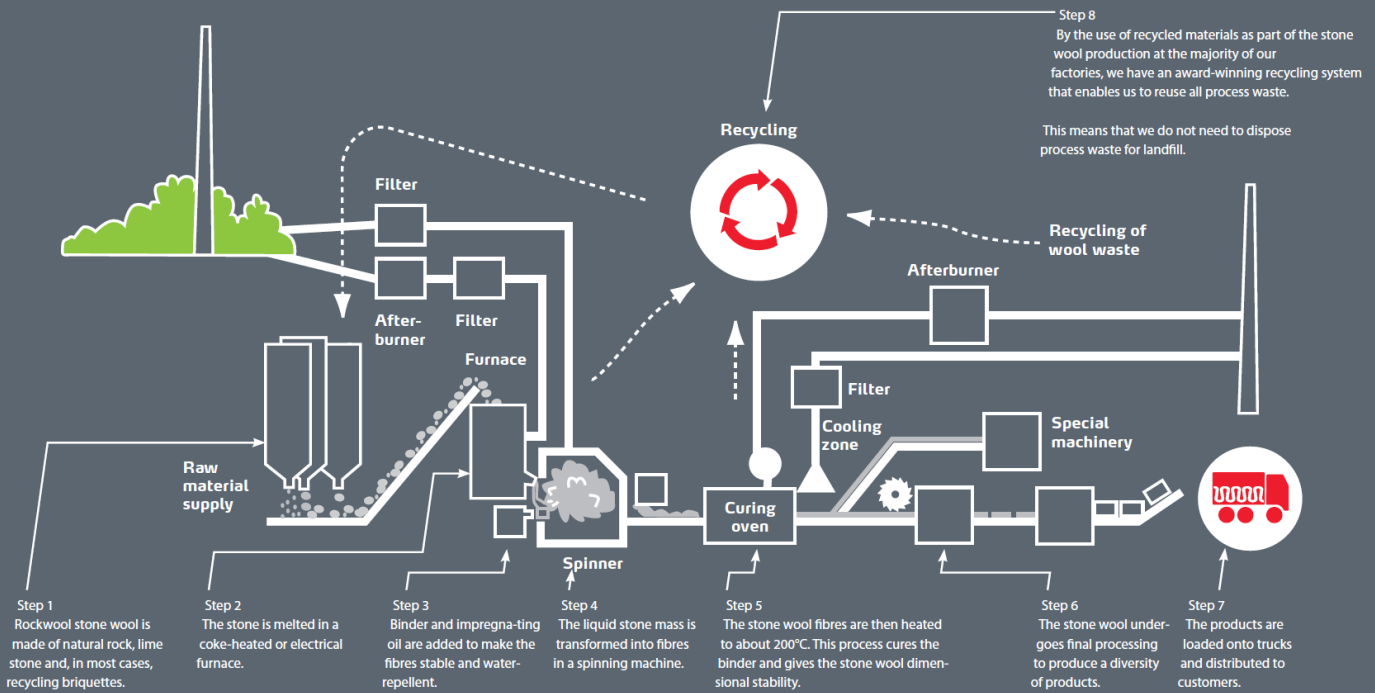
Life Cycle Assessment: Calculation rules

EPD type

Cradle-to-gate. Included is the production stage (modules A1–A3).

Flow diagram system boundaries





Description of production process

A1 module for stone wool (EN 15804)

Rock for (for ROCKWOOL® stone wool) Czech production factories in Bohumin mostly comes from mines in Bilicice, Sulików, Targowica, Gronów, Trzuskawica, Nowa Ruda, Tarnów (100-500 km).

A3 module for stone wool (EN 15804)

Stone wool is produced as follows:

Raw materials, mainly basaltic rocks and secondary raw materials and coke are weighed and lead into the cupola oven where they are melted. The melted mass from the cupola then goes through a spinning machine in order to create fibres. At this stage also, binder is applied and fibres are formed. This “wet” pack of stone wool (uncured binder) is fed into the curing oven where the binder is polymerized. Once removed from the oven, the products are cooled down and go through a series of confectioning stages in order to give each product its final dimensions before packaging.

For cleaning the air of the melting process and the curing oven several after-burners, installations and filters (made of stone wool) are used. Off-cuts and stone wool air filters are all recycled back into the production.

The collected data reflects the actual stone wool produced by the 4 different ROCKWOOL® plants. Throughout its factories, ROCKWOOL® stone wool products are manufactured with the same underlying technology and pass through the same production processes in different production plants.

Cut-off criteria

Included are all the basic materials used as per formulation, utilized thermal energy, internal fuel consumption and electric power consumption, all packaging materials (plastic wrapping, pallets, labels), any direct production waste, and all emission measurements available. Machines and facilities required during production are treated as capital goods and their production is therefore not included in the LCA.

Allocation

Besides stone wool, pig iron is produced during the melting process of raw materials and sold. The iron is considered to be a co-product. Iron as a co-product is allocated by economic value. This is in line with EN15804.

Data quality and assumptions

The quality of the data is assessed as good and appropriate. Data in all 4 plants were collected consistently and based on the financial year 2014.

Adjusted secondary LCIs are taken from the DEAM, Plastics Europe and ecoinvent databases. The country specific power grid mix is applied for all three production countries. The results per plant are weighted based on the amount of product by wool weight delivered to the Czech market in 2014.

The variability in the end results due to the averaging can be up to 50% for some environmental indicators. But the variability in the end results for all impact categories, besides for the abiotic depletion potential, between the 3 plants that delivered 99% of the products to the Czech market in 2014 was less than 11%. These variations are caused by differences in local production (for example the significant



differences in the impact of the electricity grid mix by the production countries), differences in background data availability per country, different measuring and

reporting systems between the plants and uncertainties in background data used in the LCA.

Life Cycle Assessment: Results

Limitations

Conservative choices are made in the LCA as described in the ROCKWOOL® Group LCA rules. Therefore, the results can be considered to be conservative and worst case.

The variability in the end results due to the averaging can be up to 10–20%, depending on the parameter.

Description of the system boundaries

(x=included, MNA = Module not assessed)

Product stage			Construction installation stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
x	x	X	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA

ROCKWOOL® stone wool thermal insulation product for buildings

1 m² stone wool thermal insulation product with a thermal resistance of R_D=1 m² K/W (thickness of 39 mm; density of 28 kg/m³)

Environmental impact

Parameter	Unit	A1-3	A4	A5	C2	C4	D
Global warming <small>The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.</small>	kg CO ₂ eqv	1.7E+00					
Ozone depletion <small>Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.</small>	kg CFC11 eqv	2.9E-08					
Acidification <small>Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.</small>	kg SO ₂ eqv	8.2E-03					
Eutrophication <small>Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.</small>	kg PO ₄ ³⁻ eqv	1.0E-03					
Photochemical ozone creation <small>Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.</small>	kg Ethene eqv	1.3E-03					
Depletion abiotic resources – elements	kg Sb eqv	2.3E-07					
Depletion abiotic resources – fossil fuels <small>Consumption of non-renewable resources, thereby lowering their availability for future generations.</small>	MJ	2.5E+01					



Resource use

Parameter	Unit	A1-3	A4	A5	C2	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	1.9E+00					
Use of renewable primary energy resources used as raw materials	MJ	4.2E-01					
Total use of renewable primary energy resources	MJ	2.3E+00					
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	1.7E+01					
Use of non-renewable primary energy resources used as raw materials	MJ	3.9E+00					
Total use of non-renewable primary energy resources	MJ	2.1E+01					
Use of secondary materials	kg	1.2E-01					
Use of renewable secondary fuels	MJ	-*					
Use of non-renewable secondary fuels	MJ	-*					
Net use of fresh water	m ³	5.2E-03					

* There are no renewable and no non-renewable secondary fuels used in A3. The minor use of secondary fuels as part of the background datasets is not accounted for.

Waste categories

Parameter	Unit	A1-3	A4	A5	C2	C4	D
Hazardous waste disposed	kg	3.4E-03*					
Non-hazardous waste disposed	kg	1.5E-01*					
Radioactive waste disposed	kg	2.0E-07**					

* These hazardous and non-hazardous waste amounts include all waste from the ROCKWOOL plant (A3) before treatment by 3rd parties, but not from the raw material suppliers (A1 & A2).

** There is never radioactive waste from a ROCKWOOL plant (A3), but there might be small amounts associated with the secondary LCI datasets used for the upstream chain (A1 & A2), which are taken into account here.

Output flows

Parameter	Unit	A1-3	A4	A5	C2	C4	D
Component for re-use	kg	5.0E-02*					
Materials for recycling	kg	1.9E-03*					
Materials for energy recovery	kg	2.4E-03*					
Exported energy	MJ	n/a					

* These component for re-use, and materials for recycling as well as for energy recovery amounts include all amounts from the ROCKWOOL plant (A3) before use by 3rd parties, but not from the raw material suppliers (A1 & A2).

Other Information

Dangerous substances

ROCKWOOL® stone wool does not contain substances from the Candidate List of Substances of Very High Concern.

Mineral wool fibres produced by ROCKWOOL® are classified as non-hazardous under REACH (Regulation (EC) No 1272/2008 of the European parliament and of the council of 16 December 2008 on classification, labelling and packaging of substances and mixtures). The ROCKWOOL® fibres are registered with REACH under the following definition: "Man-made vitreous (silicate) fibres with random orientation with alkaline oxide and alkali earth oxide ($\text{Na}_2\text{O}+\text{K}_2\text{O}+\text{CaO}+\text{MgO}+\text{BaO}$) content greater than 18% by weight and fulfilling one of the Note Q conditions".

ROCKWOOL® products produced in Europe fulfil the Note Q requirements [ref. Note Q]. This is certified by the independent certification body EUCEB. More information on EUCEB can be found at www.euceb.org

The International Agency for Research on Cancer (IARC), part of the World Health Organization, revised its classification of mineral wool fibres in October 2001, including them in Group 3 as an agent "not classifiable as to its carcinogenicity to humans".

Indoor air

ROCKWOOL® stone wool products fulfil the national demands in the EU with regard to emission to indoor climate. ROCKWOOL® stone wool products have small impact on emission levels in buildings. Salthammer et al. 2010 notes that "the presence of mineral wool had no influence on the formaldehyde level in the house".

Instruction for safe installation

Due to the well-known mechanical effect of coarse fibres, mineral wool products may cause temporary skin itching. Mineral wool fibres cannot cause a chemical or allergic reaction.

To diminish the mechanical effect of coarse fibres and avoid unnecessary exposure to mineral wool dust, information on good practice is available on the packaging of all mineral wool products with pictograms and/or written information (see pictograms on this page). Safe use instruction sheets are also available from www.rockwool.cz.

Cover exposed skin.

When working in unventilated area wear disposable face mask



Ventilate working area if possible



Rinse in cold water before washing



Waste should be disposed of according to local regulations



Clean area using vacuum equipment



Wear goggles when working overhead



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ITB EPD Program: <http://www.zb.itb.pl/epd>

ECO PLATFORM EPD: <http://www.eco-platform.org/>

Note Q: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:353:0001:1355:EN:PDF>, p. 335. Accessed January 2015

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Salthammer, Tunga; Sibel Mentese, Sibel; & Marutzky, Rainer: Formaldehyde in the indoor environment, Chemical Reviews, 110 (4), 2536–72, 2010; accessed December 2014: <http://pubs.acs.org/doi/abs/10.1021/cr800399g>.

Verification

The process of verification of this EPD is in accordance with EN ISO 14025, clause 8 and ISO 21930, clause 9. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

Assessment was prepared by ROCKWOOL® International A/S , Hovedgaden 584 under the rules of ITB – BUILDING RESEARCH INSTITUTE (www.itb.pl) in compliance with CEN TC 350, EN 15804, PCR ITB, ECO PLATFORM

Verification in comply with ISO 14025 § 8.3.1.

Internal

external

Verification in compliance with Verification Form with requirements of ECO PLATFORM: Ph.D.Eng Halina Prejzner

Verification of data in scope of A1-A3: Ph.D Eng Michał Piasecki, m.piasecki@itb.pl, M.Sc. Eng. Dominik Bekierski, d.bekierski@itb.pl

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