DAPHabitat System

www.daphabitat.pt

ENVIRONMENTAL PRODUCT DECLARATION

[according to ISO 14025, EN 15804:2012+A1:2013 and EN 15942]

Registration Number: DAP 001:2019

ECO EPD registration number: 00000909

STONE WOOL

ISSUE DATE: 2019-02-15

VALID UNTIL: 2024-11-14
(extension 9 months)

TERMOLAN – ISOLAMENTOS TERMO-ACÚSTICOS, S.A.

TERMOLAN
ISOLAMENTOS TERMO-ACÚSTICOS, S.A.

centroHabitat
Plataforma para a Construção Sustentável

VERSION 1.1. EDITION JULY 2015

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1. GENERAL INFORMATION

1.1. The DAPHabitat System

Program operator:	Associação Plataforma para a Construção Sustentável www.centrohabitat.net centrohabitat@centrohabitat.net
Address:	Departamento Engenharia Civil Universidade de Aveiro 3810-193 Aveiro
Email address:	deptecnico@centrohabitat.net
Telephone number:	(+351) 234 401 576
Website:	www.daphabitat.pt
Logo:	

1.2. EPD owner

Name of the owner:	TERMOLAN - Isolamentos Termo-Acústicos, S.A.
Production site:	Unit 1: Rua Padre Joaquim Carlos Lemos (Lugar da Barca) | 4795-094 Vila das Aves – Portugal Unit 2: Rua dos 5 Caminhos (Zona Industrial de Argemil) | 4780-382 Santo Tirso - Portugal
Address (head office):	Avenida de Poldrães, nº 10 | 4795-006 Vila das Aves – Portugal
Telephone:	Headquarters: +351 252 820 080
E-mail:	termolan@termolan.pt
Website:	www.termolan.pt
Logo:	
Information concerning the applicable management Systems:	ISO 9001 – Quality Management Systems ISO 14001 – Environmental Management Systems
Specific aspects regarding the production:	$CAE_{Rev.3}$ n. º 23992 – Production of various other non-metallic mineral products, n.e.

Organization's environmental policy:

Aware that the market for the thermal and acoustic insulation industry is increasingly competitive regarding customer requirements and expectations, as well as environmental requirements, we have decided to guide our performance based on a set of principles and guidelines:

We believe that Quality is achieved when we have satisfied customers and faithful to the products manufactured by TERMOLAN.

We consider that we have achieved the excellence of Environmental Performance and Pollution Prevention, in the scope of the adoption of the Best Available Techniques for the Sector (BAT), aligned with the Environmental Licensing, and compliance with all applicable legal and regulatory requirements and subscribed by TERMOLAN.

We assume that Quality is only perceived by all, when we strictly comply with the requirements of our customers, statutory and regulatory.

We disseminate Quality and Environment, committing all employees, suppliers and other stakeholders to our organization.

We recognize that Quality and Environment can be continually improved when we effectively seek the causes of problems/potential problems and act accordingly on them.

We obtain the valorisation of Quality and Environment, when we reduce costs due to waste.

Assuming the Quality and Environment as a management tool, the General Board is committed to the challenge of maintaining, and continuously improve, a system of Quality and Environment in accordance with the requirements under the NP EN ISO 9001 and NP EN ISO 14001.

1.3. Information concerning the EPD

Authors:	1. Centro Tecnológico da Cerâmica e do Vidro 2. TERMOLAN – Isolamentos Termo-Acústicos, S.A.
Contact of the authors:	1. CTCV materials : habitat | iParque - Parque Tecnológico de Coimbra - Lote 6 | 3040-540 Antanhol - Portugal (T) +351 239 499 200 Marisa Almeida: marisa@ctcv.pt 2. TERMOLAN – Isolamentos Termo-Acústicos, S.A. | Avenida de Poldrães, nº10 | 4795-006 Vila das Aves – Portugal (T) +351 252 820 080 António Gonçalves: antoniogoncalves@termolan.pt
Emission date:	2019-02-15
Registration date:	2019-04-08
Registration number:	DAP 001:2019
Valid until:	2024-11-14 (extension 9 months)
Representativity of the EPD (location, manufacturer, group of manufacturers):	DAP of one (1) product class, produced in two (2) industrial units belonging to one (1) sole producer (TERMOLAN - Isolamentos Termo-Acústicos, S.A.).
Where to consult explanatory material:	www.termolan.pt
Type of EPD:	DAP from cradle to gate (A1-A3)

1.4. Demonstration of the verification

External independent verification, accordingly with the standard ISO 14025:2009 and EN 15804:2012+A1:2013

Certification Body	**Verifier**
(CERTIF – Associação para a certificação)	(José Dinis Silvestre)

1.5. EPD Registration

Program Operator

(Plataforma para a Construção Sustentável)

1.6. PCR of reference

Name:	1. PCR: basic module for construction products and services 2. PCR: Thermal Insulation
Emission date:	1. Edition September 2015 2. Edition December 2014
Number of registration on the data base:	1. PCR-mb001 2. PCR004:2014
Version:	1. Version 2.0. 2. Version 1.1.
Identification and contact of the coordinator (s):	1. PCR: Base model for construction products and construction services ○ Luís Arroja | arroja@ua.pt ○ Marisa Almeida | marisa@ctcv.pt ○ José Silvestre | jds@civil.ist.utl.pt 2. PCR: Thermal Insulation ○ José Dinis Silvestre | jds@civil.ist.utl.pt ○ Manuel Duarte Pinheiro | manuel.pinheiro@civil.ist.utl.pt
Identification and contact of the authors:	1. PCR: Base model for construction products and construction services ○ Marisa Almeida | marisa@ctcv.pt ○ Luís Arroja | arroja@ua.pt ○ José Silvestre | jds@civil.ist.utl.pt ○ Fausto Freire | fausto.freire@dem.uc.pt ○ Cristina Rocha | cristina.rocha@lneg.pt ○ Ana Paula Duarte | paula.duarte@lneg.pt ○ Ana Cláudia Dias | acdias@ua.pt ○ Helena Gervásio | hger@dec.uc.pt ○ Victor Ferreira |victorf@ua.pt ○ Ricardo Mateus | ricardomateus@civil.uminho.pt ○ António Baio Dias | baiodias@ctcv.pt 2. PCR: Thermal Insulation ○ José Dinis Silvestre | jds@civil.ist.utl.pt ○ Manuel Duarte Pinheiro | manuel.pinheiro@civil.ist.utl.pt
Composition of the Sector Panel:	RCP: Thermal Insulation: • Amorim Isolamentos • Sofalca-Aglomerados de Cortiça, ACE • Argex-Argila Expandida, S.A. • IberFibran-Poliestireno Extrudido, S.A. • Termolan-Isolamentos Termo-Acústicos, S.A. • Eurofoam-Indústria de Poliestireno Extrudido, Lda • Knauf Insulation
Consultation period:	1. 18/11/2015 - 18/01/2016 2. 01/08/2013 - 30/11/2013
Valid until:	1. January of 2021 2. February of 2019

1.7. Information concerning the product/product class

Identification of the product:

Stone wool panels or blankets for thermal insulation, acoustic and fire protection (density of 30 kg/m^3 and thermal conductivity of 0.037 W/m.K)

Illustration of the product:

Brief description of the product:

Stone wool is produced from a volcanic rock (in this case basalt), being a product of construction, used for thermal and acoustic insulation, that can be available with different densities and thermal conductivities, and it can be used in various constructive solutions (residential buildings, air conditioning and heating), industry, shipbuilding and metalworking.

Table 1: Stone wool product composition.

Component	Percentage (mass)
Basalt	70-85
Limestone	15-30

Main technical characteristics of the product:

Table 2: Technical characteristics declared in DoP – generic Stone wool (30 kg/m^2).

Essential characteristics (EN 13162:2012)	Performance	Value	Units
Reaction to fire, Euroclass	Reaction to fire	A1	Euroclass Letter
Sound Absorption Index	Sound Absorption	α_w = 0.85	It's a factor
Index of sound insulation to percussion sounds (for floors)	Dynamic stiffness	NPD	MN/m^3
	Thickness, Dl	NPD	mm
	Compressibility	NPD	mm
	Resistance to airflow	NPD	kPa.S/m^2
Sound insulation index to aerial driving sounds	Resistance to airflow	NPD	kPa.S/m^2
Thermal resistance	Thermal resistance	see i)	m^2.K/ W
	Thermal conductivity (W / m.K)	0.037	W/m.K
	Thickness	T3	mm
Water permeability	Short-term water absorption by partial immersion	≤ 1	kg/m^2
Permeability to water vapor	Water vapor transmission	NPD	It's a factor
Compressive strength	compressive stress or compressive strength	NPD	kPa
	Point load	NPD	
Durability of heat resistance against heat climatic actions aging/degradation	Thermal Resistance and Conductivity		Not provided, remains constant
	Durability Features		
Tensile/flexural strength	Tensile strength perpendicular to faces	NPD	kPa
Durability of compressive strength against aging/degradation	Compressive creep	NPD	kPa

(see link of the technical datasheets with all data http://termolan.pt/en/products/technical-files/)

NPD = no performance determined

i) – Declared Thermal resistance

Thickness (mm)	30	40	50	60	80	100
Thermal resistance (m^2.K/W)	0.75	1.05	1.30	1.55	2.10	2.60

Description of the products' application:	Thermal and/or acoustic insulation in the following applications: • Pitched roof with insulation on the roof slab • Flat roof with sloped insulation • Traditional flat roof • Green flat roof • Pitched roof with interior insulation between rafters • Traditional pitched roof with steam barrier • Pitched roof with subtile • Disconnection of interior walls • Disconnection of single partitions • Simple partition with insulation • Partition composed with insulation • Double wall with insulation completely filling the cavity • Partition wall with bifacial insulation • Decoupling and filling of the windows core • Filling the core of doors • Elimination of vibrations of heavy machinery • Elimination of HVAC vibrations • Pipes covers • Expansion joints • Stay-in-place formwork system • Electric radiant floor • Traditional radiant floor • Floor box fill • Disconnection of screed mortar to the wall • Floating plate with ceramic cladding • Floating plate with wood cladding • Interior insulation of exterior walls • Ventilated rainscreen facade • Double wall with insulation partially filling the cavity • Exterior uncoated cladding • ETICS – External Thermal Insulation Composite Systems
Reference service life:	Not specified.
Placing on the market / Rules of application in the market / Technical rules of the product:	EN 13162:2012+A1:2015 EN 14303
Quality control:	According to the technical standards of the product.
Special delivery conditions:	Not applicable
Components and substances to declare:	Not applicable
History of the LCA studies:	--

2. ENVIRONMENTAL PERFORMANCE OF THE PRODUCT

2.1. Calculation rules of the LCA

Declared unit:	
Functional unit:	1 m^2 of stone wool panels or blankets (with a thickness of 0.037 m) (including packaging), with a thermal resistance of 1 (m^2.◦C)/W for a reference lifespan of 50 years.
System boundaries:	EPD from cradle to gate
Criteria for the exclusion:	According to paragraph 6.3.5 of EN 15804, the exclusion criterion for unitary processes is 1% of the total energy consumed and 1% of the total mass of the inputs, paying particular attention not to exceed a total of 5% of energy and mass flows excluded in the product step. The following cases were not considered in this study: • Environmental loads associated with the construction of industrial infrastructures and the manufacture of machinery and equipment; • Environmental loads relating to infrastructure (vehicle and road production and maintenance) for the transport of pre-products.
Assumption and limitations:	For processes over which producers have no influence or specific information, such as the extraction of raw materials, generic data from the Ecoinvent v3.3 databases were used. The dataset used to model the production of electricity and natural gas was adapted to the national reality. The electric mix was updated for the year 2016 through information from the National Energy Networks (REN), the Energy Services Regulatory Authority (ERSE) and the General Board of Energy and Geology (DGEG) in order to obtain more current results regarding the environmental impacts generated by the electricity grid in Portugal. The natural gas process was modelled according to the information provided by the DGEG Energy Report in Portugal (2015), regarding the countries where the importation comes from. The environmental impacts indicated in this EPD are a weighted average between the impacts of the production of stone wool in the industrial units of Vila das Aves and Santo Tirso, using the production values of each of the installations for the year 2016.
Quality and other characteristics about the information used in the LCA:	The production data collected correspond to the year 2016 and are in line with reality. The generic data used belong to the Ecoinvent v3.3 databases and meet the quality criteria (age, geographical and technological coverage, plausibility, etc.) of generic data.
Allocation rules:	The production of stone wool occurs in a similar way, so the results obtained are valid for all the final forms (panel, blanket and wool in bulk), considering a mass allocation.
Comparability of EPD for construction products:	The EPDs for construction products and services may not be comparable if they are not produced in accordance with EN 15804 and EN 15942 and in accordance with the comparability conditions determined by ISO 14025. For other TERMOLAN stone wool products, environmental impacts can be determined by multiplying the results of this study with scale factors. These scale factors allow to estimate the proportion of environmental impacts generated by the manufacture of products with different thicknesses, densities and thermal conductibility.

Table 3: Scaling factors for other stone wool products of TERMOLAN.

Internal Reference	Density (kg/m²)	Thickness (m)	*Thermal conductibility (W/m.°C)*	*Scaling Factor*
(PN-PK-PA)/30-(MA-MK-MN-VF-Venticlad)/230	1.10	0.037	0.037	1
(PN-PK-PA)/40-(MA-MK-MN)/40, T40VF, WA40, Isole+, PI40 e AC40/60	1.40	0.035	0.035	1.3
(PN)/55-(MA-MK-MN)/50, T55VFe PI55	1.70	0.034	0.034	1.6
PN 70, T70VF, WA70, R70, (MK-MA-MN/70), GC,PI70 e Chaminé	2.30	0.033	0.033	2.1
LF90-GC90-PI90	3.00	0.033	0.033	2.7
PN 100, PI100 e r100	3.30	0.033	0.033	3
LF 110	3.60	0.033	0.033	3.3
Recoat+, LF110+	4.00	0.036	0.036	3.7
PI120 e r120	4.60	0.038	0.038	4.2
Recoat, PI145	5.50	0.038	0.038	5
Cobpw	4.80	0.037	0.037	4.4
CobN50-,B50, PI 150	5.70	0.038	0.038	5.2
CobN50F- B50F-C-CS	5.70	0.039	0.039	5.2
Cobn75, PI 180	6.70	0.038	0.038	6.1

2.1.1. Flow diagram of input and output of the processes

Figure 1 shows steps A1-A3 of the production of stone wool.

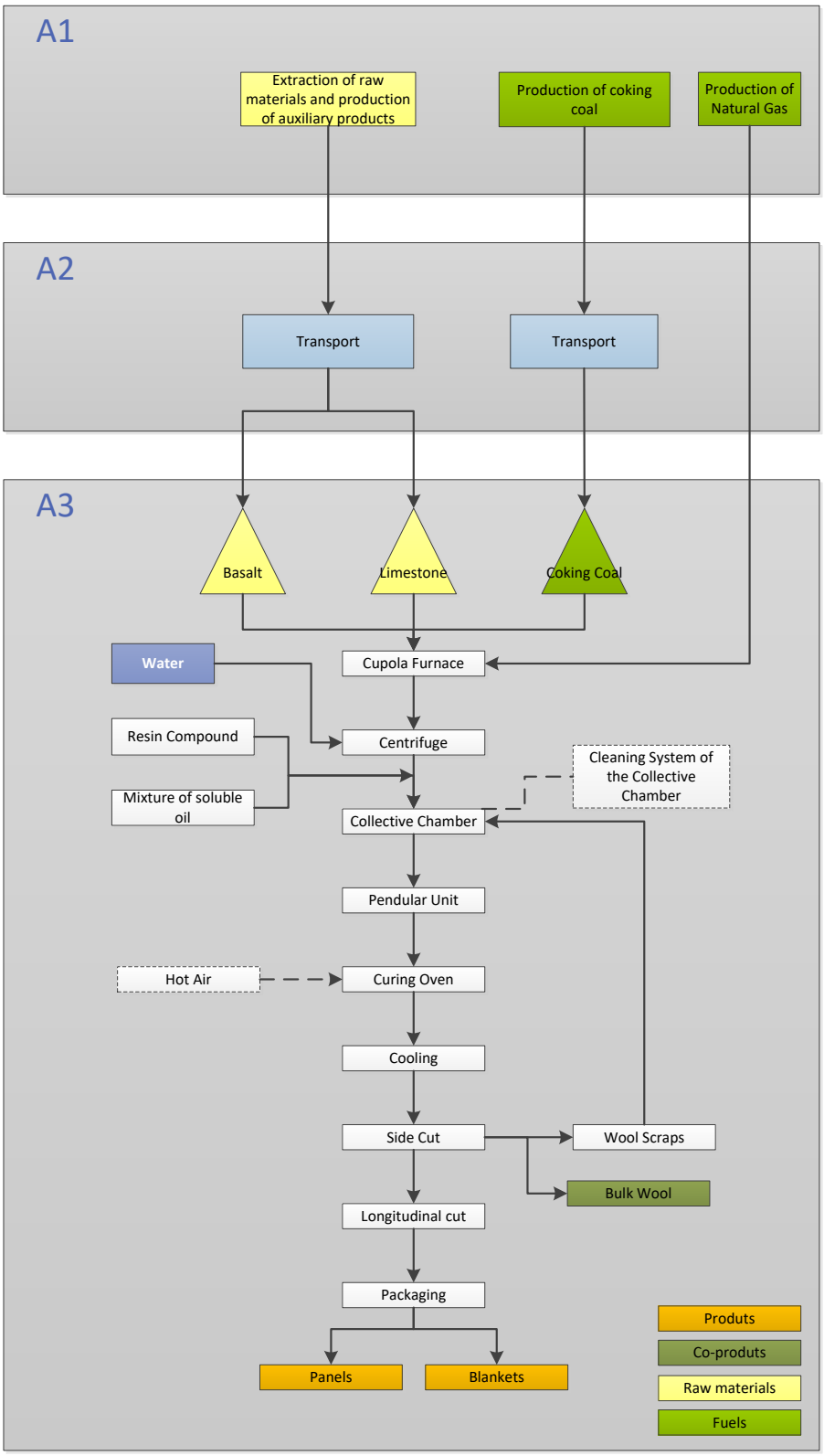

Figure 1. Life cycle stages of stone wool (A1-A3) (source: TERMOLAN)

2.1.2. Description of the system boundaries

(✓= included; ✖ = module not declared)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction installation process	Use	Maintenance	Repair	Replacement	Rehabilitation	Operational energy use	Operational water use	De-constructions, demolition	Transport	Waste processing	Disposal	Re-use, recovery, recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
✓	✓	✓	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖	✖

The main material used in the production of stone wool is basalt. Basalt is transported from the warehouse to the silo at the beginning of the line where, if necessary, it is possible to add limestone in order to correct any deviations in the chemical composition of basalt.

The mixture is transported from the storage silo to a dispenser by a conveyor belt. Then the material is weighed and thrown into the cupola furnace, where the stone is melted.

The cupola furnace is one of the main elements of the whole process, of last generation and, therefore, of high yield and efficiency. It consists of three parts, one at the top, where the furnace is loaded, an intermediate part consisting of an inner shell enclosed in water for cooling and a lower part, also refrigerated, where the melting takes place. The fuel used in the furnace is coal coke, natural gas also being used only for indoor air heating. Oxygen is also introduced into the furnace for the combustion process.

After melting, molten basalt upon falling on a spinning disk, such as a centrifuge, with the adding of additive binders (resin and oil mix), causes the formation of fibres. The fibres are drawn from the spinning wheels through a jet of air and are thrown into a collection chamber. In the collection chamber, the fibres are cooled by means of an air exhaust system and form a primary layer of mineral wool as it passes through a roller.

This primary layer of stone wool is transferred to a pendulum unit and layered by a pendulum onto a conveyor belt, until the desired density is achieved.

The layer of stone wool then enters the curing oven. In this oven, the wool is exposed to hot air and compressed by a cylinder to the exact thickness. The air used in this step is heated through natural gas burners. Subsequently, the stone wool rug moves to an air cooling zone.

In this process, for the width of the blanket or panel to be uniform, it is trimmed, then the chips are forwarded to the collection chamber through a suction system.

After going through the cooling zone and already at the end of the conveyor belt, the material is cut.

If webs are being produced, a retractor picks up the web, which is cut automatically when it reaches a predetermined length.

Finally, the product is packed with plastic in wood pallets and placed in the finished products warehouse.

Figure 2 schematically shows the productive process of stone wool.

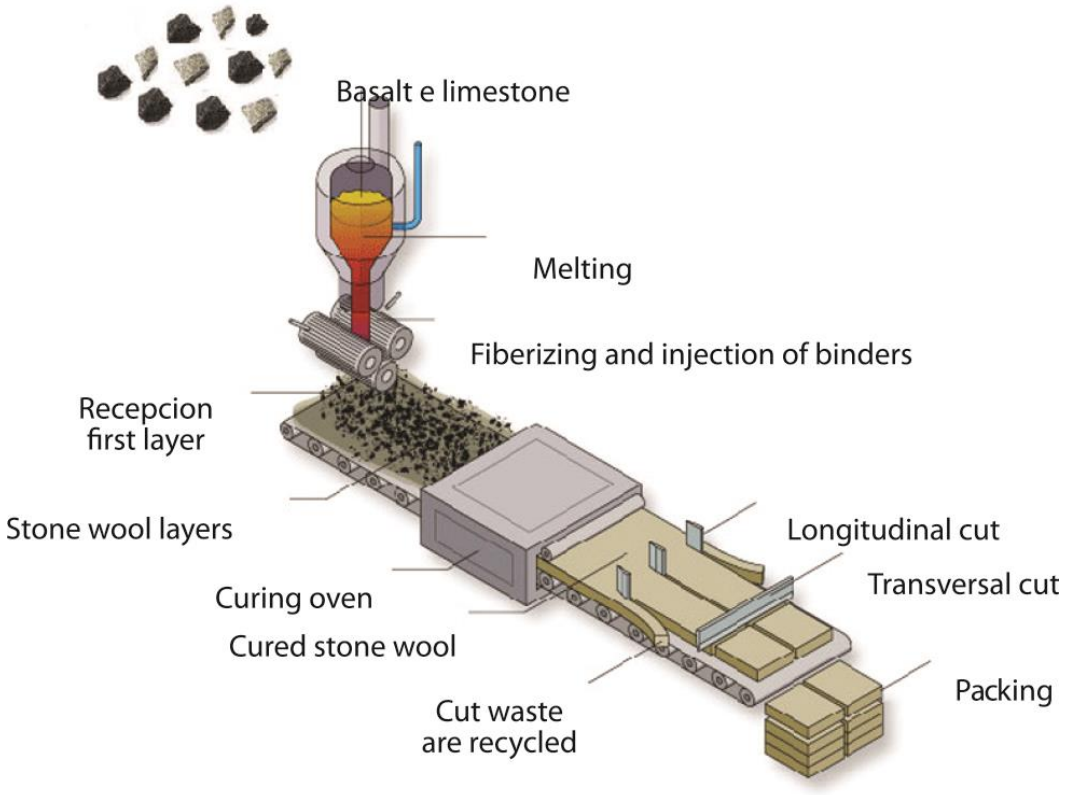

Figure 2 - Production stages of stone wool (source: TERMOLAN).

2.2. PARAMETERS DESCRIBING ENVIRONMENTAL IMPACTS

		Global warming potential; GWP kg CO_2 equiv.	Depletion potential of the stratospheric ozone layer; ODP kg CFC 11 equiv.	Acidification potential of soil and water, AP kg SO_2 equiv.	Eutrophication potential, EP kg $(PO_4)^{3-}$ equiv.	Formation potential of tropospheric ozone, POCP kg C_2H_4 equiv.	Abiotic depletion potential for non-fossil resources kg Sb equiv.	Abiotic depletion potential for fossil resources MJ, P.C.I.
Raw material supply Transport Manufacturing	**A1 – A3**	1.44E+00	7.56E-08	4.01E-03	4.02E-04	2.87E-04	4.36E-08	1.85E+01
Total	**Total**	1.44E+00	7.56E-08	4.01E-03	4.02E-04	2.87E-04	4.36E-08	1.85E+01

LEGEND:
Product stage

NOTES:
LHV - lower heating value
Values expressed by functional unit (1 m^2 of stone wool).

2.3. Parameters describing resource use

		Primary energy						Secondary materials and fuels, and use of water			
		EPR MJ, P.C.I.	RR MJ, P.C.I.	TRR MJ, P.C.I.	EPNR MJ, P.C.I.	RNR MJ, P.C.I.	TRNR MJ, P.C.I.	MS kg	CSR MJ, P.C.I.	CSNR MJ, P.C.I.	Net use of fresh water m^3
Raw material supply Transport Manufacturing	**A1 – A3**	1.25E+00	4.56E-01	1.71E+00	1.50E+01	4.14E+00	1.92E+01	0.00E+00	0.00E+00	0.00E+00	3.32E-04
Total	**Total**	1.25E+00	4.56E-01	1.71E+00	1.50E+01	4.14E+00	1.92E+01	0.00E+00	0.00E+00	0.00E+00	3.32E-04

Values expressed by functional unit (1 m^2 of stone wool)
LEGEND:
Product stage

EPR = use of renewable primary energy excluding renewable primary energy resources used as raw materials;
RR = use of renewable primary energy resources used as raw materials;
TRR = total use of renewable primary energy resources (EPR + RR);
EPNR = use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
RNR = use of non-renewable primary energy resources used as raw materials;
TRNR = total use of non-renewable primary energy resources (EPRN + RNR);
MS = use of secondary material;
CSR = use of renewable secondary fuels;
CSNR = use of non-renewable secondary fuels.
Net use of fresh water = net use of fresh water
P.C.I. = lower heating value

2.4. Other environmental information describing different waste categories

		Hazardous waste disposed kg	Non-hazardous waste disposed kg	Radioactive waste disposed ** kg
Raw material supply Transport Manufacturing	**A1 –A3**	3.91E-06	0.00E+00	2.61E-05
Total	**Total**	3.91E-06	0.00E+00	2.61E-05

Values expressed by functional unit (1 m^2 of stone wool)

LEGEND:

Product stage

** The radioactive waste component does not come from the activity of Termolan (A3). It is a component derived from the upstream activities (A1 and A2), namely from the production of electricity.

2.5. Other environmental information describing output flows

Parameters	Units*	Results
Components for re-use	kg	**N/A**
Materials for recycling	kg	**9.08E-03**
Materials for energy recovery	kg	**8.15E-05**
Exported energy	MJ by energy carrier	**N/A**

* expressed by functional unit or declared unit (1 m^2 of stone wool)

3. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

3.1. A4 Transport to the construction site - Construction step

Parameter	Units*	Results
Type of fuel, fuel consumption, type of vehicle used for transport (e.g. long-distance truck, boat, etc.)	Litre of fuel by distance, type of vehicle, Directive 2007/37 / EC (European Emission Standard)	N/A
Distance	km	N/A
Container capacity (including return trip without load)	% (useful load)	N/A
Density of transported products	kg/m^3	N/A
Volume capacity factor (factor=1 or < 1 or >1 for compressed or packaged products)	Not applicable	N/A
* expressed per functional unit		

3.2. A5 Product installation in building - Construction step

Parameter	Units*	Results
Installation accessory materials (specified by material)	kg or other units, as appropriate	N/A
Water use	m^3	N/A
Use of other resources	kg	N/A
Quantitative description of energy sources (regional mix) and consumption during the installation process	kWh or MJ	N/A
On-site waste materials prior to the processing of waste generated by the product installation (specified by type)	kg	N/A
Material output (specified by type) as a result of waste processing at the construction site, for example collection for recycling, energy recovery, disposal	kg	N/A
Direct emissions to air, soil and water	kg	N/A
* expressed per functional unit		

3.3. B1 Usage Step

(Relevant information on the use of the product) if applicable

3.4. B2 Maintenance

Maintenance process (Description or place where the information can be found)

Process	Units*	Results
Maintenance cycle	Number of cycles per lifespan of reference or per year	N/A
Auxiliary maintenance materials, for example, cleaning detergents	kg/cycle	N/A
Waste resulted from maintenance operations (specify materials)	kg	N/A
Fresh water consumed during maintenance	m^3	N/A
Consumption of energy during maintenance operations, for example, vacuum cleaning	kWh	N/A
Description of other scenarios to consider	Appropriate units	N/A
* expressed per functional unit		

3.5. B3 Repair

Repair process (Description or place where the information can be found)

Inspection process (Description or place where the information can be found)

Process	Units*	Results
Repair cycle	Number of cycles per lifespan of reference or per year	N/A
Auxiliary materials, e.g. Lubricants, specify the materials	kg or kg/cycle	N/A
Waste resulting from the repair process (specify type of materials)	kg	N/A
Water consumed during repair processes	m^3	N/A
Consumption of energy during repairs, such as machinery operations, etc.	kWh/lifespan of reference, kWh/cycle	N/A
Description of other scenarios to consider	Appropriate units	N/A
* expressed per functional unit		

3.6. B4 Replacement

Process	Units*	Results
Replacement cycle	Number of cycles per lifespan of reference or per year	N/A
Energy consumption during material replacements, such as machinery operations, etc.	kWh	N/A
Exchange of worn parts during the life cycle of the product, for example, zinc, galvanized steel	kg	N/A
Description of other scenarios to consider	Appropriate units	N/A
* expressed per functional unit		

3.7. B5 Rehabilitation

Rehabilitation process (Description or place where the information can be found)

Process	Units*	Results
Rehabilitation cycle	Number of cycles per lifespan of reference or per year	N/A
Energy consumption during rehabilitation operations, such as machinery operations, etc.	kWh	N/A
Consumption of rehabilitation materials such as bricks, including other auxiliary materials for the process, lubricants, etc.	kg or kg/cycle	N/A
Waste resulting from rehabilitation operations	kg	N/A
Other assumptions for the development of scenarios, such as frequency and time, period of use, number of occupants	Appropriate units	N/A
* expressed per functional unit		

3.8. B6 Operational energy use

Parameter	Units*	Results
Accessory materials specified per kg of material	kg or appropriate units	N/A
Fresh water consumption	m^3	N/A
Type of energy resource, for example, electricity, natural gas	kWh	N/A
Equipment power	kW	N/A
Performance characteristic, for example, energy efficiency, emissions, variation of performance with usage capacity, etc.	Appropriate units	N/A
Additional assumptions for the development of scenarios, for example, frequency and period of use, number of occupants	Appropriate units	N/A
* expressed per functional unit		

3.9. B7 Operational water use

Parameter	Units*	Results
Accessory materials specified per kg of material	kg or appropriate units	N/A
Fresh water consumption	m^3	N/A
Type of energy resource, for example, electricity, natural gas	kWh	N/A
Equipment power	kW	N/A
Performance characteristic, for example, energy efficiency, emissions, variation of performance with usage capacity, etc.	Appropriate units	N/A
Additional assumptions for the development of scenarios, for example, frequency and period of use, number of occupants	Appropriate units	N/A
* expressed per functional unit		

3.10. End of Life Stage [C1 - C4]

Parameter	Units*	Results
Collection processes specified by type	kg collected separately	N/A
	kg collected in the mix of construction waste	N/A
Recovery system specified by type	kg for reuse	N/A
	kg for reuse	N/A
	kg for energy recovery	N/A
Final deposition specified by type	kg of product or material for final deposition	N/A
Assumptions for development scenarios (ex: transport)	Appropriate units	N/A
Scenario definition	Appropriate units	N/A
* expressed per functional unit		

3.11. Additional environmental information about the release of dangerous substances

Title of the scenario	Parameters	Units*	Results
Emissions scenario for indoor air	**Test results according to CEN/TC 351**		N/A
	Scenario description 1[7]	Appropriate units	N/A
	Scenario description n[7]	Appropriate units	N/A
Soil release scenario	**Test results according to CEN/TC 351**		N/A
	Scenario description 1[7]	Appropriate units	N/A
	Scenario description n[7]	Appropriate units	N/A
Water release scenario	**Test results according to CEN/TC 351**	(…)	N/A
	Scenario description 1[7]	Appropriate units	N/A
	Scenario description n[7]	Appropriate units	N/A
* expressed per functional unit **Note: Whenever horizontal standards exist for measuring the release of regulated hazardous substances using harmonized test methods in accordance with the provisions of the Technical Committees responsible for European Product Standards or national regulations.**			

REFERENCES

✓ **Ecoinvent database v3.3** (2016). (www.ecoinvent.org);

✓ **EN 15804:2012+A1:2013** Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products;

✓ **EN 15942:2011** Sustainability of construction works – Environmental product declarations – Communication format business-to-business;

✓ **Energy Services Regulatory Authority (ERSE)** – Special Regime Production (PRE) (2016) (in http://www.erse.pt/pt/desempenhoambiental/prodregesp/2016/Paginas/2016.aspx);

✓ **General Board of Energy and Geology (DGEG)** – Energy in Portugal Report (2015);

✓ **General Board of Energy and Geology (DGEG)** – Monthly Data of Electrical Energy (2016). (in http://www.dgeg.gov.pt?cr=15125);

✓ **Instruções Gerais do Sistema DAPHabitat**, Version 1.0, March 2013 (in www.daphabitat.pt);

✓ **National Energy Networks (REN)** – Information Centre – Monthly Statistics (2016). (in http://www.centrodeinformacao.ren.pt/PT/InformacaoExploracao/Paginas/EstatisticaMensal.aspx);

✓ **NP ISO 14025:2009** Rótulos e declarações ambientais – Declarações ambientais Tipo III – Princípios e procedimentos;

✓ **RCP – isolamento térmico**. DAPHabitat System. Version 1.0, December of 2014 (in www.daphabitat.pt);

✓ **RCP – modelo base para produtos e serviços de construção**. DAPHabitat System. Version 2.0, September of 2015 (in www.daphabitat.pt);

✓ **TERMOLAN - Isolamentos Termo-Acústicos, S.A.** (2017). (in http://termolan.pt/en/).