ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025

Owner of the Declaration	EUROROC - European & International Federation of Natural Stone Industries
Author of the Life Cycle Assessment	PE INTERNATIONAL AG
Technical Research	DNV (Deutscher Naturwerkstein Verband)
Declaration number	12-09-2002
Issue date	01.01.2023
Valid to	31.12.2028

NATURAL STONE

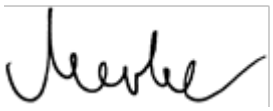
Natural stone – Massive slabs
EUROROC

McKeon Stone Ltd. Brockley Park , Stradbally, Co. Laois, Ireland .

EUROROC

www.mckeonstone.ie

1 Summary

EUROROC - European & International Federation of Natural Stone Industries	Natural stone - Massive slabs
Author of the Life Cycle Assessment **PE INTERNATIONAL AG** Hauptstraße 111-113 70771 Leinfelden-Echterdingen	**Owner of the Declaration** EUROROC Gluckstrasse 10, D-65193 Wiesbaden Germany
Declaration number [14-09-1465]	**Declared product / Declared unit** Natural Stone massive slabs / 1 tonne
This Declaration is based on the Product Category Rules: Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report, version 09-2011 Part B: Requirements on the EPD for Dimension stone for roof, wall and floor applications, version 06-2011	**Scope:** This documentation includes information related to 1 tonne of natural stone massive slabs which are produced by the EUROROC member companies. Collected data in purpose of Life Cycle Assessment are based in the year of 2009/2010. EROROC association EPD is a weighted average, means it must be refered to the production volumes of participants (production tonnage is considered in the year 2010).
Issue date 01.09.2016 **Valid to** 31.12.2028	
 Prof. Dr.jur. Gerd Merke LL.M. (University of Illinois)	**Verification** The CEN standard EN 15804 serves as the core PCR. Verification of the EPD by an independent third party as per ISO 14025 ☐ internally ☒ externally

2 Product

2.1 Product description

Natural stone massive slabs are largely with thickness > 80 mm. They are sawn or splitted from a hard rock block - (EN 12059 and EN 1341)

At the quarry, natural stones are mined and later go through block sawing, calibration, polishing, and sizing in order to meet the costumer request on surface quality.

2.2 Application

Natural stone massive slabs are used for slabs, monuments, and cubic building elements.

Natural stones with their unique physical and aesthetic properties comprise an ideal raw material for the construction industry.

Natural stones find numerous uses in the construction industry in indoor and outdoor applications and they significantly contribute to the improvement of the quality and the overall aesthetics and performance of buildings and open spaces.

The European stone sector has a leading position in the global stone and equipment market.

From outdoor applications including stone patios, pool decks/coping, steps, walkways and stone walls to interior flooring, bathroom/kitchen renovations, and fireplace re-faces, or manufactured veneers.

2.3 Technical Data

Compressive strength (EN 1926)

a) 100 – 300 MPa

b) 20 – 240 MPa

c) 100 – 280 MPa

Bending strength (EN 12372)

a) 5 – 25 MPa

b) 1 – 20 MPa

c) 5 – 40 MPa

Water absorption (EN 13755)

a) 0.1 – 1 M.-%

b) 0.1 – 10 M.-%

c) 0.3 – 2 M.-%

2.4 Base materials / Ancillary materials

a) Igneous rock

b) Sedimentary rock

c) Metamorphic rock

2.5 Reference service life

More than 50 years

3 LCA: Calculation rules

3.1 Declared unit

This EPD refers to 1 tonne of natural stone massive slabs. Results refer to a weighted average of EUROROC member companies.

Average thickness of product is 0.04m.

Average density of product is 2800 kg/m³

It means 1 tonne of product is equal to 8.93 m²

3.2 System boundary

The study is a cradle-to-gate LCI Study including the transport to costumers; it covers all of the production steps from raw materials in the earth (i.e. the cradle) to finished products (i.e. the gate) ready to be installed at the costumers (including the transportation to installation site).

This definition includes all the activities associated with the production at stone manufacturing sites and upstream activities; from the mining and the processing of raw materials, transport to site and the consumption of any material or energy resources during any of these production stages.

Some activities are not considered in this study on the basis that their influence on the environmental impact is negligibly small (a concept known as materiality). Such activities include capital equipment, business travel, administration, cleaning services etc.

Downstream processing into manufactured products and their use has not been included in the inventory.

This EPD describes the production of 1 tonne of natural stone massive slabs, from mining, transporting, and production/treatment of surface. Lengths, widths and thicknesses are available to meet the various design specifications and requirements.

3.3 Comparability

This EPD is comparable to other EPDs. LCA model is made according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

4 LCA: Scenarios and additional technical information

This EPD is applicable to homogeneous EUROROC's products in this category – massive slabs – which are used in the construction and building industry.

The analysis of the product life cycle includes production of the basic materials, transport of the basic materials, manufacture of the product and the packaging materials and is declared in module A1-A3.

On site waste treatment is also declared in module A3

Neither use-phase nor end-of-life is included in the LCA calculation. This needs to be considered on next level by the evaluation of buildings.

Natural stones with their unique physical and aesthetic properties comprise an ideal raw material for the construction industry.
Natural stones find numerous uses in the construction industry from outdoor applications including stone patios, pool decks/coping, steps, walkways and stone walls to interior applications for flooring, bathroom/kitchen renovations, stairs, fireplace re-faces, or manufactured veneers and they significantly contribute to the improvement of the quality and the overall aesthetics and performance of buildings and open spaces.
The European stone sector has a leading position in the global stone and equipment market.

Specifications for products of natural stone are:

- **/EN 771-6**, Specification for masonry units - Part 6: Natural stone masonry units/
- **/EN 1341**, Slabs of natural stone - Requirements and test methods/
- **/EN 1342**, Sets of natural stone - Requirements and test methods/
- **/EN 1343**, Kerbs of natural stone - Requirements and test methods/
- **/EN 1467**, Natural stone - Rough blocks - Specifications./
- **/EN 1468**, Natural stone - Rough slabs - Specifications./
- **/EN 1469**, Natural stone - Finished products, slabs for claddings - Specifications/
- **/EN 12057**, Natural stone - Finished products, modular tiles
- – Specifications/
- **/EN 12058**, Natural stone - Finished products, slabs for floors and stairs. Specifications./
- **/EN 12059**, Natural stone - Dimensional stone work - Specifications./

Transport to the construction site (A4)

Litres of fuel	[truck]: [0.001350] l/100 km
Litres of fuel	[train]: [0.000474] l/100 km
Transport distance	[180] km*

**80% distance with truck & 20% distance with train*

Capacity utilisation (including empty runs)	[85] %
Gross density of products transported	[2800] kg/m³

5 LCA: Results

[In Table 1 "Description of the system boundary", all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND". In the following tables 2, 3 and 4, columns may be deleted for modules that are not declared. Indicator values should be declared with three valid digits (eventually exponential form (e.g. 1,23E-5 = 0,0000123). A uniform format should be used for all values of one indicator. If indicators on primary energy input or on the use of secondary materials or secondary fuels as integrated value for modules A1-A3, this should be made apparent by respective setting of the frames. If several modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names, while the readability and clear arrangement should be preserved; the legends can then be deleted.]

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	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	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

1) The modules Replacement (B4) and Refurbishment (B5) are normally not relevant on the product. For clarity reasons, those two modules have been deleted in the following tables. If one or both modules are declared respective columns can be inserted.

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 ton of natural stone – massive slabs

		Manufacturing			Installation
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**
GWP	[kg CO_2-Äq.]	-99.37	0.43	385.89	6.80
ODP	[kg CFC11-Äq.]	4.28E-08	1.58E-10	4.80E-06	2.52E-09
AP	[kg SO_2-Äq.]	8.54E-02	2.66E-03	7.52E-01	4.27E-02
EP	[kg PO_4^{3-}- Äq.]	1.26E-02	6.38E-04	2.21E-01	1.02E-02
POCP	[kg Ethen Äq.]	1.52E-02	-1.08E-03	6.91E-02	-1.68E-02
ADPE	[kg Sb Äq.]	3.99E-06	1.68E-08	5.41E-05	2.68E-07
ADPF	[MJ]	442.75	5.88	4780.62	93.92
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources				

RESULTS OF THE LCA - RESOURCE USE: 1 ton of natural stone – massive slabs

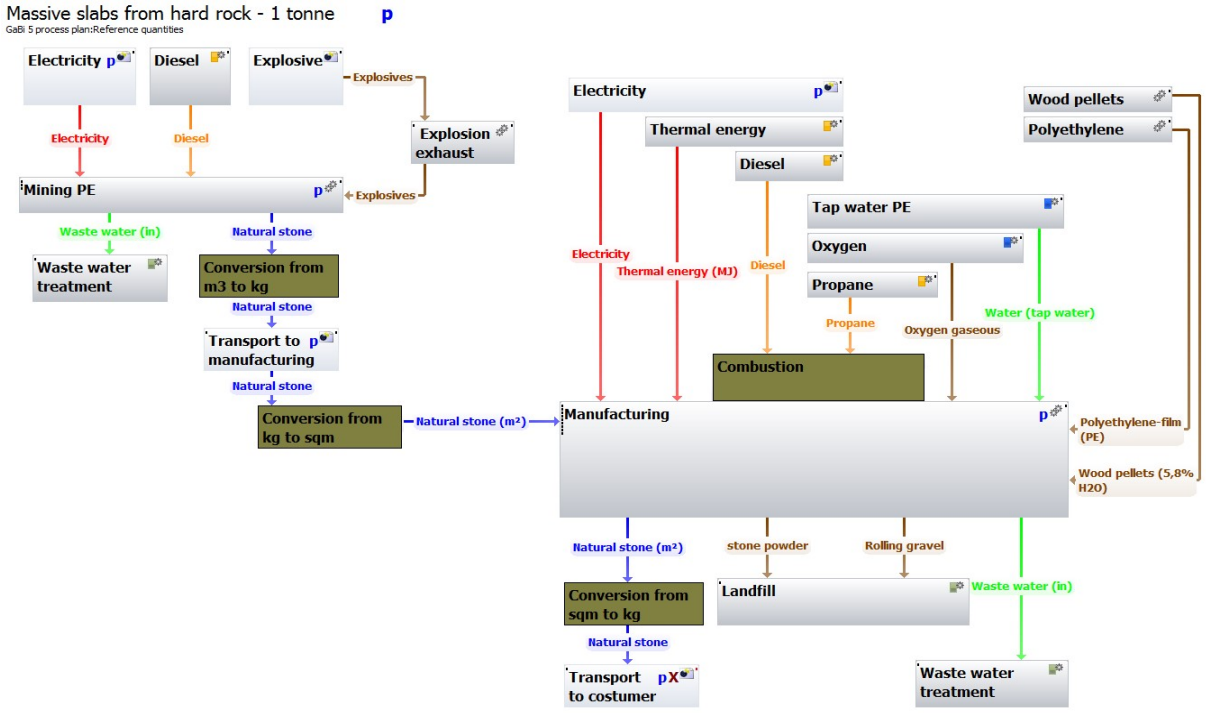
		Manufacturing			Installation
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**
PERE	[MJ]	11.69	0.23	2189.82	3.68
PERM	[MJ]	-	-	-	-
PERT	[MJ]	11.69	0.23	2189.82	3.68
PENRE	[MJ]	318.26	5.90	5357.08	94.26
PENRM	[MJ]	-	-	-	-
PENRT	[MJ]	318.26	5.90	5357.08	94.26
SM	[kg]	-	-	-	-
RSF	[MJ]	0.12	0.00	0.12	0.00
NRSF	[MJ]	1.26	0.00	1.06	0.01
FW	[m^3]	28.27	0.02	1564.85	0.35
Caption	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				

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 ton of natural stone – massive slabs

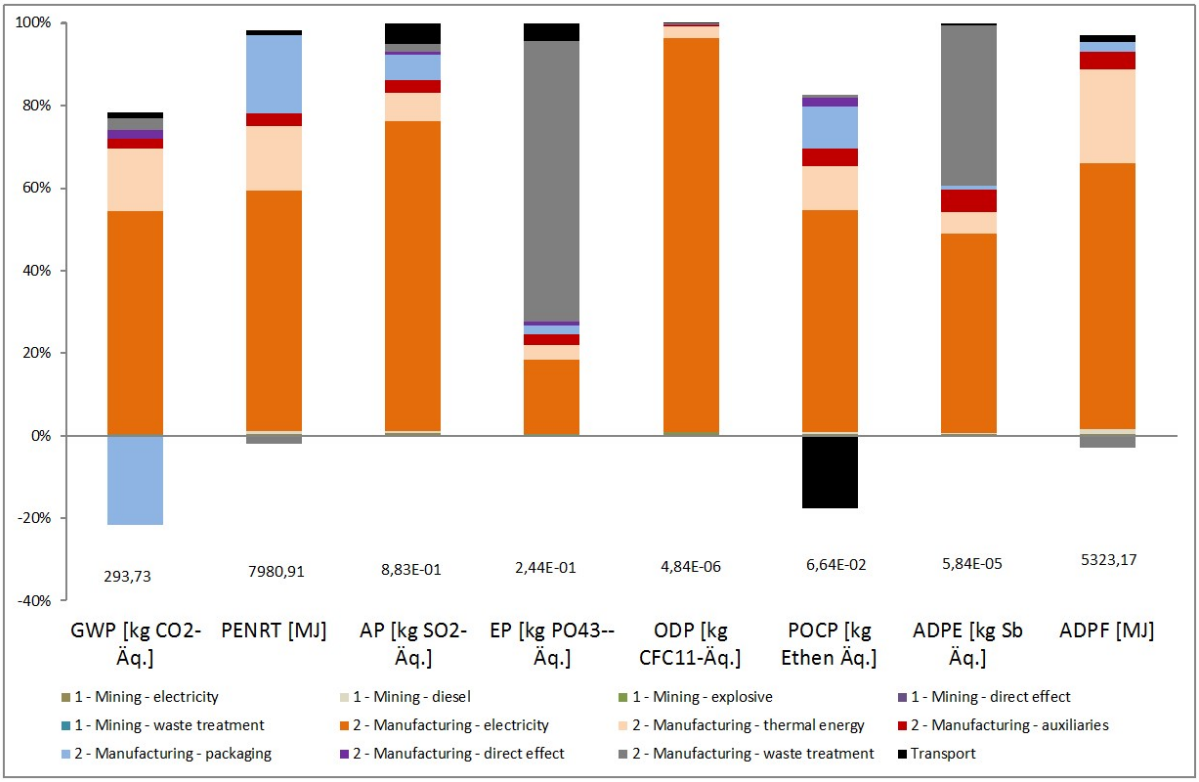
		Manufacturing			Installation
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4**
HWD	[kg]	-	-	-	-
NHWD	[kg]	15.48	0.02	408.72	0.33
RWD	[kg]	2.24E-03	8.21E-06	1.82E-01	1.31E-04
CRU	[kg]	-	-	-	-
MFR	[kg]	-	-	-	-
MER	[kg]	-	-	-	-
EE [Typ]	[MJ]	-	-	-	-
Caption	HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy per energy carrier				

6 LCA: Interpretation (overal impacts)

At the quarry, marbles are mined and later go through block sawing, calibration, polishing, and sizing in order to meet the costumer request on surface quality. The exact model presenting mentioned processes is presented in the figure below. Data is collected and completed for massive slab stone produced by Euroroc company members in Austria, Finland and Italy.



The relative environmental impacts of the production of 1 tonne of massive slab stone, for each of the impact categories analysed, are presented in Figure below. The contribution of each process / materials to the total impact category is displayed. The total impact values for the impact category are shown at the bottom of each column (e.g. 294 kg CO_2 eq.).



Manufacturing electricity, thermal energy are the two elements dominating almost all impact categories. Eutrophication and Abiotic depletion have a remarkable contribution from waste treatment

PENRT – Primary energy demand

7980 MJ is recorded as total primary energy demand for 1 tonne of massive slab stone production.

- 72% of this figure is non-renewable energy resources, which are caused mainly by electricity production (50%) and thermal energy production (16%)
- 27% of this figure is renewable resources which are due to the production of electricity with 9,5% and the uptake by biomass of packaging wood pallets with 18%

Auxiliary materials are responsible for 10% primary energy demand in totals

GWP – global warming potential

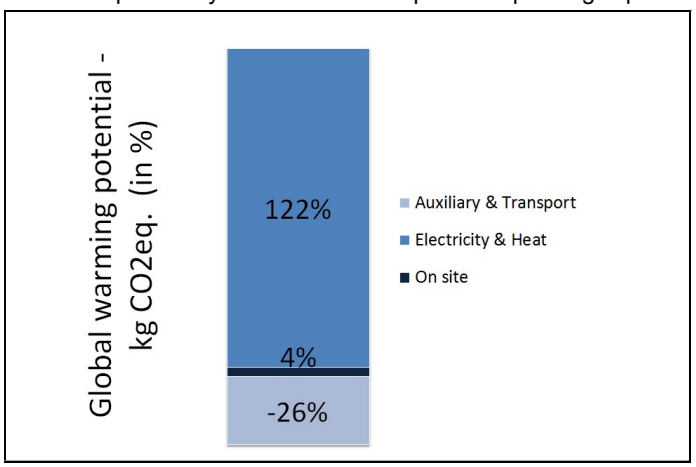
Total resul is 294 kg CO_2 eq. The **global warming potential** is basically determined by the manufacturing process – due to the use of electricity and thermal energy.

- Electrcity use in this process causes an impact of 277 CO_2 eq. which contributes 94% to the total result of this impact category.
- Thermal energy use in this process causes an impact of 7,5kg CO_2eq. which contributes 27% to the total result of this impact category.
- Using wooden pallets for packaging creates a credit of 112 kg of CO_2 eq. per tonne of massive slabs produced. This is the amount of CO_2 which is kept in the wood and it's accounted as CO_2 uptake by biomass.

Transport defines 2% of the total results (the sum of modul A2 and A4 in table: "RESULTS OF THE LCA - ENVIRONMENTAL IMPACT").

The above results represent the total cradle to gate environmental impact of massive slab stone production. However, only a percentage of this impact arises from direct, on-site activities. The remainder of the impact occurs off-site, either in the form of electricity/heat production, or the production of auxiliaries and raw materials by suppliers. The global warming potential of massive slab stone, broken down into three mentioned sectors, is displayed below.

(-26% reflects the amount of CO_2 uptaken by wood from which pallet for packing is produced)



7 References

The Declaration of Performance (DoP) is the key concept in the Construction Products Regulation (CPR).

The DoP serves to deliver the information about the essential characteristics of the product that a manufacturer wants to make available on the market.

CPR 2013

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 9 March 2011

laying down harmonized conditions for the marketing of construction products and repealing

Council Directive 89/106/EEC

ISO 14025

DIN EN ISO 14025:2009-11: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804

EN 15804:2012-04: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

GaBi 6 2013B

Software and Database for Life Cycle Engineering, IKP [Institute for Polymer Testing and Polymer Science] University of Stuttgart and PE Europe AG, Leinfelden-Echterdingen, 1992-2013

ISO 14040

DIN EN ISO 14040:2009-11: Environmental management - Life cycle assessment - Principles and framework

ISO 14044

DIN EN ISO 14044:2006-10: Environmental management - Life cycle assessment - Requirements and guidelines

EN 12524

Building materials and products

EN 12059:

Natural stone products — Dimensional stone work — Requirements

EN 1926

Natural stone test methods - Determination of uniaxial compressive strength

EN 12372

Natural stone test methods - Determination of flexural strength under concentrated load

EN 1341

Slabs of natural stone for external paving - Requirements and test methods

EN ISO 14025

2011-10, Environmental labels and declarations – Type III environmental declarations – Principles and

EN 776-6

2011-07, Specification for masonry units – Part 6: Natural stone masonry units

EN 1341

2013-03, Slabs of natural stone– Requirements and test methods

EN 1342

2013-03, Sets of natural stone - Requirements and test methods

EN 1343

2013-03, Kerbs of natural stone – Requirements and test methods

EN 1467, EN 1468, EN1469

2012-06, Natural stone – Rough blocks, rough slabs, finished products, slabs for claddings, Specifications

EN 12057, EN 12058, EN 12059-

2005-01, Natural Stone – Finished products, modular tiles etc. - Specifications

ISO 14040

DIN EN ISO 14040 2009-11: Environmental management – Life cycle assessment – Principles and framework

ISO 15944

EIN EN ISO 144044: 2016-10: Environmental management – Life cycle assessment – Requirements and guidelines

Natural stone test methods: **EN 1926, EN 12372, EN 13755, EN 14157 , EN 1936.**

Technical Research
DNV
Sanderstrasse 4
97070 Würzburg
Germany

Tel. +49 (0)9131-12061
Fax +49 (0)9131-14549
info@natursteinverband.de
www.natursteinverband.de

Owner of the Declaration
EUROROC
Gluckstrasse 10
D-65193 Wiesbaden
Germany

Tel. +49.611.97712.11
Fax: +49.611.97712.48
E-mail: office@euroroc.net
Web **www.Euroroc.net**

Author of the Life Cycle Assessment
PE INTERNATIONAL AG
Hauptstraße 111-113
70771 Leinfelden-Echterdingen
Germany

Tel. +49 (0)711 341817-0
Fax: +49 (0)711 341817-25
E-mail:d.russ@pe-international.com
Web www.pe-international.com