



ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 for

Granirapid (grey & white)

Elastorapid (grey & white)

Kerabond (grey & white)

Isolastic



Programme:
**The International
EPD[®] System;**
www.environdec.com

Programme
operator:
EPD International AB

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International

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1. COMPANY DESCRIPTION / GOAL & SCOPE

Founded in 1937 in Milan, Italy, Mapei produces adhesives and complementary products for laying all types of floor, wall and coating materials, and is also specialized in other chemical products used in the building industry, such as waterproofing products, special mortars, admixtures for concrete, products for underground constructions and for the restoration of concrete and historical buildings.

There are currently 85 subsidiaries in Mapei Group, with a total of 80 production facilities located around the world in 35 different countries and in 5 different continents. Mapei has also 31 central laboratories. Most locations are ISO 9001 and ISO 14001 or EMAS-certified.

Mapei's strategy of internationalization is based on two main objectives: being closer to local needs and the lowest transport costs possible. With the declared objective of being close to buyers and clients, the strength of Mapei in the five continents is to comply the requirements of each single country, and to use only locally-based managers and qualified personnel, without changing the approach of the Company.

Mapei invests 12% of its company's total work-force and 5% of its turnover in Research & Development; in particular, 70% of its R&D efforts are directed to develop eco-sustainable and environmentally friendly products which give important contribution to all main green rating for eco-sustainable buildings such as LEED and BREEAM.

Furthermore, Mapei has developed a sales and technical service network with offices all over the world and offers an efficient Technical Assistance Service that is valued by architects, engineers, contractors and owners.

Mapei Italian plants are located in Robbiano di Mediglia, Latina and Sassuolo.

The goal of the study is to provide necessary data and documentation to produce an EPD according to the requirements of PCR Environdec (version 2.3, 2018-11-15) under EN 15804:2014 and to have more comprehension about the environmental impacts related to Elastorapid (powder + latex), Granirapid (powder + latex), Kerabond (powder) and Isolastic manufactured in Mapei S.p.A. located in Robbiano di Mediglia (MI-ITALY), Latina (LT-ITALY) and Sassuolo (MO-ITALY), in year 2017, including packaging of the finished products (both powder and latex).

Target audiences of the study are customers and other parties with an interest in the environmental impacts of **Granirapid (A+B)**, **Elastorapid (A+B)**, **Kerabond (A)** and **Isolastic**.

This analysis shall not support comparative assertions intended to be disclosed to the public.

2. PRODUCT DESCRIPTION

Granirapid (A+B) is an improved (2), fast-setting (F) cementitious (C), deformable (S1) adhesive classified as C2F S1. It's used for bonding all kinds of interior and exterior ceramic tiles: conglomerates, artificial and natural stones, marble on both walls and floors. The product has very low emission of volatile organic compounds.

Elastorapid (A+B) is a highly deformable (S2), improved (2), fast-setting (F) cementitious (C) adhesive, slip resistant (T) and with extended open time (E), classified as C2FTE S2. It's used for bonding all kinds of interior and exterior ceramic tiles (single-fire, double-fire, porcelain, clinker, ...), natural stones and artificial materials slightly sensitive to humidity.

Kerabond is a normal (1) cementitious adhesive (C) classified as C1. Mixing Kerabond with Isolastic in place of water, improves the characteristics to meet the requirement of class C2E S2. It's used for interior and exterior bonding all kinds of ceramic tiles. **The product contains 2,5% of recycled material.**

Isolastic is a latex additive which gives elasticity to cement based adhesives. Isolastic can be mixed with Kerabond undiluted or diluted 1:1 with water in order to meet the requirements defined in EN 12004.

Product	Classification according to EN 12004	Description
Kerabond + Isolastic	C2ES2	High performance, highly deformable cementitious adhesive with extended open time
Kerabond + Isolastic diluted 1:1 with water	C2ES1	High performance, deformable cementitious adhesive with extended open time

All products are compliant with EN 12004 (Adhesives for tiles. Requirements, evaluation of conformity, classification and designation) and ISO 13007-1 (Ceramic tiles -- Grouts and adhesives -- Part 1: Terms, definitions and specifications for adhesives: definitions and characteristics).



Granirapid (grey & white)
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Products are supplied as follows:

- **Granirapid** (kit A+B): 25 kg (grey version), 22,5 kg (white version) multiplybags for powder and HDPE tank with 5,5 kg for latex
- **Elastorapid** (kit A+B): 25 kg multiplybags for powder and HDPE tank with 6,25 kg for latex
- **Kerabond**: 25 kg multiplybags
- **Isolastic**: HDPE tank with 25 kg or 5 kg

3. CONTENT DECLARATION

The main components and ancillary materials of **Granirapid** (grey & white), **Elastorapid** (grey & white), **Kerabond** (grey & white) and **Isolastic**, are the following:

Table 1a: Composition of powders

Materials	Percentage (%)
Binders	20 – 40
Fillers	50 – 70
Recycled material	< 3%
Other (additives & packaging)	< 5

Table 1b: Composition of latexes

Materials	Percentage (%)
Polymers and additives	< 40
Water	< 60

The products contain neither carcinogenic substances nor substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency, in a concentration higher than 0,1 % (by unit weight).

4. DECLARED UNIT AND REFERENCE SERVICE LIFE

The declared unit is 1 kg of product (powder or latex + packaging) as follows:

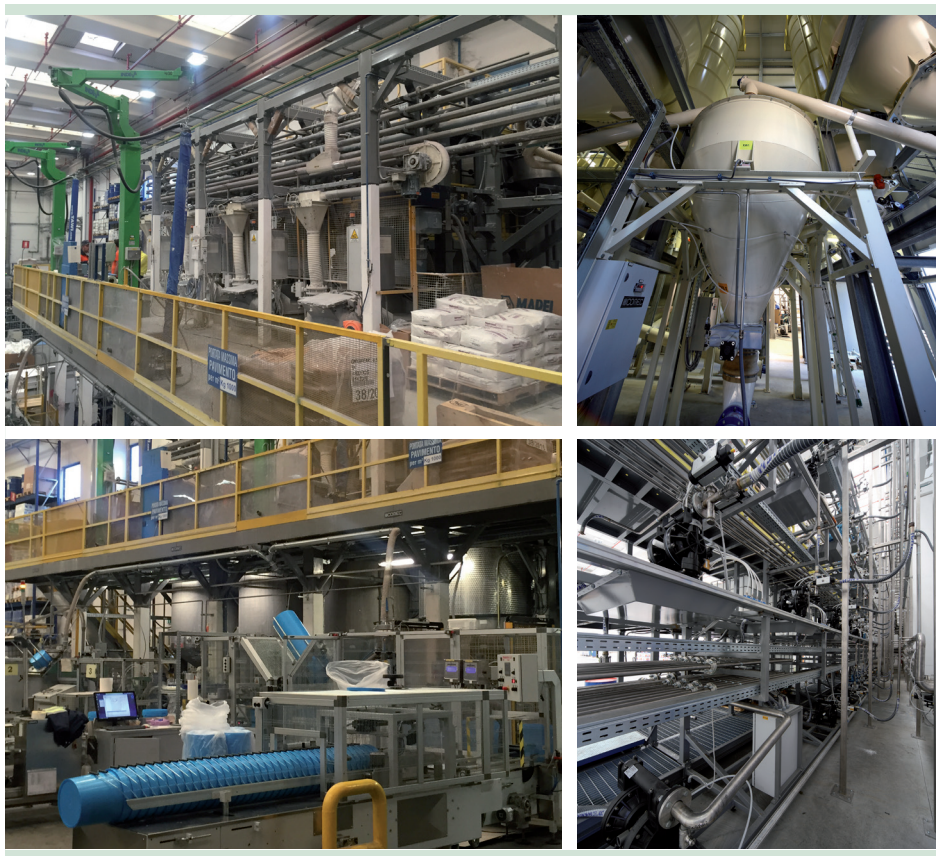
- **Granirapid** (grey): 1 kg powder + 220 g latex
- **Granirapid** (white): 1 kg powder + 240 g latex
- **Elastorapid** (grey&white): 1 kg powder + 250 g latex
- **Kerabond** (grey&white): 1 kg powder + packaging
- **Isolastic**: 1 kg latex + packaging

Packaging materials (both powder and latex) include:

- Wooden pallet
- Multiply bag: paper/PE/paper (used for powders)
- HDPE + PP (used for latex)
- LDPE used as wrapping material

The reference service life of the adhesives, if professionally installed and properly used, is estimated to be the same as the building one.

Figure 1: Production process detail



Granirapid (grey & white)
Elastorapid (grey & white)
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Figure 2: Mediglia Plant



Table 3: Transport to the building site (A4)

Name	Value	Unit
Means of transport : truck euro 3 with 27 tons of payload & Ocean ship with 27500 DWT		
Litres of fuel (truck)	~ 2E-03	l/DU*100km
Litres of fuel (ship)	~ 4E-04	l/DU*100km
Transport distance (weighted average)	~ 400	km
Capacity utilisation (including empty runs)	85	%
Gross density of powder products transported	~ 1400	kg/m ³
Gross density of liquid products transported	~ 1000	kg/m ³
Capacity utilisation volume factor	100	%
DU: declared unit		

5. SYSTEM BOUNDARIES AND ADDITIONAL TECHNICAL INFORMATION

The approach is “cradle to gate” with options. The following modules have been considered:

- A1-A3 (production stage): extraction and transport of raw materials, packaging included, production process.
- A4 (Construction process stage): transport of the finished product to final customers

Table 2: System boundaries

System Boundaries														
A1 – A3			A4 – A5		B1 – B7					C1 – C4				D
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE					END OF LIFE STAGE				
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	
Raw Material Supply	Transport	Manufacturing	Transport	Installation Process	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction/ Demolition	Transport	Waste Processing	Disposal	
					B6	Operational Energy Use								
					B7	Operational Water Use								

included

excluded

 Included  excluded

A brief description of the production process is the following:

The production process starts from raw materials, which are purchased from external and intercompany suppliers and stored in the plant. Bulk raw materials are stored in specific silos and added automatically in the production mixer, according to the formula of the product. Other raw materials, supplied in bags, big bags or tanks, are stored in the warehouse and added automatically or manually in the mixer. During the production of the powder, all the components are mechanically mixed in batches. Raw materials of the latex are mixed, properly diluted and packed into drums. The semi-finished product is then packaged, put on wooden pallets, covered by stretched hoods and stored in the finished products warehouse. The quality of final product is controlled before the sale.

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6. CUT-OFF RULES AND ALLOCATION

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA, information modules and any additional information are intended to support an efficient calculation procedure. They are not applied in order to hide data.

The procedure of exclusion of inputs and outputs is the following:

- All inputs and outputs to a unit process, for which data are available, are included in the calculation
- Cut-off criteria, where applied, are described in Table 4.

Input flows are covered for the whole formula.

Table 4: Cut-off criteria

Process excluded from study	Cut-off criteria	Quantified contribution from process
A3: production (auxiliary materials)	less than 10^{-5} kg/kg of finished product	Sensibility study demonstrates a contribute lower than 0,5%
A3: waste and particle emission	less than 10^{-5} kg/kg of finished product	Sensibility study demonstrates a contribute lower than 0,5%

For the allocation procedure and principles, consider the following table:

Table 5: Allocation procedure and principles

Module	Allocation Principle
A1	All data are referred to 1 kg of powder product A1: electricity is allocated to the whole plant production
A3	All data are referred to 1 kg of powder packaged product A3-wastes: all data are allocated to the whole plant production

7. ENVIRONMENTAL PERFORMANCE AND INTERPRETATION



GWP₁₀₀

Global Warming Potential refers to the emission/presence of GHGs (greenhouse gases) in the atmosphere (mainly CO₂, N₂O, CH₄) which contribute to the increase in the temperature of the planet.



AP

Acidification Potential refers to the emission of specific acidifying substances (i.e. NO_x, SO_x) in the air. These substances decrease the pH of the rainfall with predictable damages to the ecosystem.



EP

Eutrophication Potential refers to the nutrient enrichment of flowing water, which determines unbalance in aquatic ecosystems and causes the death of the aquatic fauna.



ODP

Ozone Depletion Potential refers to the degradation of the stratospheric layer of the ozone involved in blocking the UV component of sunrays. Depletion is due to particularly reactive components that originate from chlorofluorocarbon (CFC) or chlorofluoromethanes (CFM).



POCP

The Photochemical Ozone Creation Potential is the ozone formation in low atmosphere. This is quite common in the cities where a great amount of pollutants (like VOC and NO_x) are emitted every day (industrial emissions and vehicles). It is mainly diffused during the summertime.



ADP_e (elements)

Abiotic Depletion Potential elements refers to the depletion of the mineral resources.



ADP_f (fossil fuel)

Abiotic Depletion Potential fossil fuel refers to the depletion of the fossil fuel resources.








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Following tables show environmental impacts for the products considered according to CML methodology (CML2001 – Jan. 2016, version 4.7). All the results are referred to the declared unit (see § 4).

Granirapid (grey)

Table 6: **Granirapid** (grey) Environmental categories referred to the declared unit

Environmental Category		Unit	A1 – A3	A4
	GWP₁₀₀	(kg CO ₂ eq.)	9,41E-01	3,76E-02
	ADPe (element)	(kg Sb eq.)	6,64E-03	3,11E-09
	ADPf (fossil)	(MJ)	2,29E+01	5,11E-01
	AP	(kg SO ₂ eq.)	4,14E-03	2,23E-04
	EP	(kg (PO ₄) ³ -eq.)	2,66E-04	5,74E-05
	ODP	(kg R-11 eq.)	7,51E-10	1,03E-15
	POCP	(kg ethylene eq.)	3,73E-04	-1,00E-04

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 7: **Granirapid** (grey); other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	8,72E-01	2,83E-02
RPEM	MJ	-	-
TPE	MJ	8,72E-01	2,83E-02
NRPE	MJ	2,35E+01	5,13E-01
NRPM	MJ	-	-
TRPE	MJ	2,35E+01	5,13E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	5,09E-03	6,43E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water

Table 8: **Granirapid** (grey); waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	5,34E-03	-
HW	kg	5,25E-06	-
RW	kg	0,00E00	-
Components for re-use	kg	-	-
Materials for recycling	kg	-	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-








HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

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Granirapid (white)

Table 9: **Granirapid** (white) Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	1,08E+00	3,83E-02
 ADPe (element)	(kg Sb eq.)	6,64E-03	3,17E-09
 ADPf (fossil)	(MJ)	2,19E+01	5,20E-01
 AP	(kg SO ₂ eq.)	5,98E-03	2,27E-04
 EP	(kg (PO ₄) ³⁻ eq.)	3,85E-04	5,84E-05
 ODP	(kg R-11 eq.)	1,09E-07	1,04E-15
 POCP	(kg ethylene eq.)	5,53E-04	-1,02E-04

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 10: **Granirapid** (white): other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	4,33E+00	2,88E-02
RPEM	MJ	-	-
TPE	MJ	4,33E+00	2,88E-02
NRPE	MJ	2,26E+01	5,21E-01
NRPM	MJ	-	-
TRPE	MJ	2,26E+01	5,21E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	5,52E-03	6,54E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water

Table 11: **Granirapid** (white): waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	5,43E-03	-
HW	kg	5,34E-06	-
RW	kg	0,00E00	-
Components for re-use	kg	-	-
Materials for recycling	kg	-	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-








HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

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Elastorapid (grey)

Table 12: **Elastorapid** (grey) Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	1,38E+00	3,86E-02
 ADPe (element)	(kg Sb eq.)	1,02E-02	3,19E-09
 ADPf (fossil)	(MJ)	3,03E+01	5,24E-01
 AP	(kg SO ₂ eq.)	6,89E-03	2,29E-04
 EP	(kg (PO ₄) ³⁻ eq.)	3,95E-04	5,89E-05
 ODP	(kg R-11 eq.)	8,46E-10	1,05E-15
 POCP	(kg ethylene eq.)	6,08E-04	-1,03E-04

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 13: **Elastorapid** (grey): other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	9,36E-01	2,90E-02
RPEM	MJ	-	-
TPE	MJ	9,36E-01	2,90E-02
NRPE	MJ	3,09E+01	5,26E-01
NRPM	MJ	-	-
TRPE	MJ	3,09E+01	5,26E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	5,67E-03	6,60E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water

Table 14: **Elastorapid** (grey): waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	5,48E-03	-
HW	kg	5,39E-06	-
RW	kg	0,00E00	-
Components for re-use	kg	-	-
Materials for recycling	kg	-	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-








HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

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Isolastic



Elastorapid (white)

Table 15: **Elastorapid** (white) Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	1,56E+00	1,27E-02
 ADPe (element)	(kg Sb eq.)	1,02E-02	1,03E-09
 ADPf (fossil)	(MJ)	2,93E+01	1,71E-01
 AP	(kg SO ₂ eq.)	8,97E-03	7,87E-05
 EP	(kg (PO ₄) ³⁻ eq.)	5,37E-04	1,90E-05
 ODP	(kg R-11 eq.)	1,23E-07	3,43E-16
 POCP	(kg ethylene eq.)	8,11E-04	-3,08E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 16: **Elastorapid** (white): other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	4,88E+00	9,32E-03
RPEM	MJ	-	-
TPE	MJ	4,88E+00	9,32E-03
NRPE	MJ	3,00E+01	1,72E-01
NRPM	MJ	-	-
TRPE	MJ	3,00E+01	1,72E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	7,30E-03	2,12E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation;
TPE Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier;
NRPM Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources;
SM Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels;
W Net use of fresh water

Table 17: **Elastorapid** (white): waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	3,20E-03	-
HW	kg	1,04E-04	-
RW	kg	0,00E00	-
Components for re-use	kg	-	-
Materials for recycling	kg	-	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-






HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

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Kerabond (grey)

Table 18: **Kerabond** (grey): Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	3,35E-01	2,03E-02
 ADPe (element)	(kg Sb eq.)	8,88E-08	1,68E-09
 ADPf (fossil)	(MJ)	2,72E+00	2,76E-01
 AP	(kg SO ₂ eq.)	2,42E-04	1,22E-04
 EP	(kg (PO ₄) ³⁻ eq.)	1,24E-04	3,08E-05
 ODP	(kg R-11 eq.)	1,50E-08	5,53E-16
 POCP	(kg ethylene eq.)	1,50E-04	-5,31E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 19: **Kerabond** (grey): other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	5,04E-01	1,52E-02
RPEM	MJ	-	-
TPE	MJ	5,04E-01	1,52E-02
NRPE	MJ	2,78E+00	2,77E-01
NRPM	MJ	-	-
TRPE	MJ	2,78E+00	2,77E-01
SM	kg	2,50E-02	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	1,46E-03	3,46E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water

Table 20: **Kerabond** (grey): waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	1,53E-03	-
HW	kg	2,93E-06	-
RW	kg	0,00E00	-
Components for re-use	kg	-	-
Materials for recycling	kg	-	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-








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Kerabond (white)

Table 21: **Kerabond** (white): Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	3,68E-01	2,09E-02
 ADPe (element)	(kg Sb eq.)	9,48E-08	1,72E-09
 ADPf (fossil)	(MJ)	1,71E+00	2,83E-01
 AP	(kg SO ₂ eq.)	3,48E-04	1,25E-04
 EP	(kg (PO ₄) ³⁻ eq.)	2,11E-04	3,17E-05
 ODP	(kg R-11 eq.)	6,75E-09	5,68E-16
 POCP	(kg ethylene eq.)	1,77E-05	-5,46E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 22: **Kerabond** (white): other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	5,90E-01	1,56E-02
RPEM	MJ	-	-
TPE	MJ	5,90E-01	1,56E-02
NRPE	MJ	1,77E+00	2,84E-01
NRPM	MJ	-	-
TRPE	MJ	1,77E+00	2,84E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	1,23E-03	3,55E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water

Table 23: **Kerabond** (white): waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	1,71E-03	-
HW	kg	3,59E-06	-
RW	kg	0,00E00	-
Components for re-use	kg	-	-
Materials for recycling	kg	-	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-








HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

Granirapid (grey & white)
Elastorapid (grey & white)
Kerabond (grey & white)
Isolastic



Isolastic

Table 24: **Isolastic**: Environmental categories referred to the declared unit

Environmental Category	Unit	A1 – A3	A4
 GWP₁₀₀	(kg CO ₂ eq.)	1,24E+00	3,18E-02
 ADPe (element)	(kg Sb eq.)	1,16E-02	2,63E-09
 ADPf (fossil)	(MJ)	3,10E+01	4,32E-01
 AP	(kg SO ₂ eq.)	6,19E-03	1,89E-04
 EP	(kg (PO ₄) ³⁻ eq.)	3,35E-04	4,86E-05
 ODP	(kg R-11 eq.)	7,75E-18	8,68E-16
 POCP	(kg ethylene eq.)	5,96E-04	-8,49E-05

GWP₁₀₀: Global Warming Potential; **ADPe**: Abiotic Depletion Potential (elements); **EP**: Eutrophication Potential; **AP**: Acidification Potential; **POCP**: Photochemical Ozone Creation Potential; **ODP**: Ozone Depletion Potential; **ADPf**: Abiotic Depletion Potential (fossil)

Table 25: **Isolastic**: other environmental indicators referred to the declared unit

Environmental Indicator	Unit	A1-A3	A4
RPEE	MJ	4,65E-01	2,39E-02
RPEM	MJ	-	-
TPE	MJ	4,65E-01	2,39E-02
NRPE	MJ	3,16E+01	4,34E-01
NRPM	MJ	-	-
TRPE	MJ	3,16E+01	4,34E-01
SM	kg	-	-
RSF	MJ	-	-
NRSF	MJ	-	-
W	m ³	2,06E-03	5,44E-04

RPEE Renewable primary energy as energy carrier; **RPEM** Renewable primary energy as material utilisation; **TPE** Total use of renewable primary energy sources; **NRPE** Non-renewable primary energy as energy carrier; **NRPM** Non-renewable primary energy as material utilization; **TRPE** Total use of non-renewable primary energy sources; **SM** Use of secondary materials; **RSF** Renewable secondary fuels; **NRSF** Non-renewable secondary fuels; **W** Net use of fresh water

Table 26: **Isolastic**: waste production & other output flows referred to the declared unit

Output flow	Unit	A1-A3	A4
NHW	kg	4,53E-03	-
HW	kg	4,46E-06	-
RW	kg	0,00E00	-
Components for re-use	kg	-	-
Materials for recycling	kg	-	-
Materials for energy recovery	kg	-	-
Exported energy	MJ	-	-

HW Hazardous waste disposed; **NHW** Non Hazardous waste disposed; **RW** Radioactive waste disposed

Granirapid (grey & white)
Elastorapid (grey & white)
Kerabond (grey & white)
Isolastic



Tables above show absolute results for every considered environmental impact category. They clearly indicate that module **A1** gives the highest contribution for each of them, up to 99% of the total impact in the whole system boundary. In particular hydraulic binders and organic polymers, which are some of the main components in the formulations, carry a significant impact for all environmental categories. Latexes increase relative contributes of **A1** modules, due to polymers emission factors.

Electricity consumption in the production process does not affect the considered environmental categories.

Modules **A2** and **A4** (transport of raw materials and transport of finished product) give negative contributions to POCP due to NO and NO₂ emission factors (for more details, see the methodology used: HBEFA -Handbook Emission Factors for Road Transport).

Table 27: Environmental Impact as percentage (Granirapid and Elastorapid)

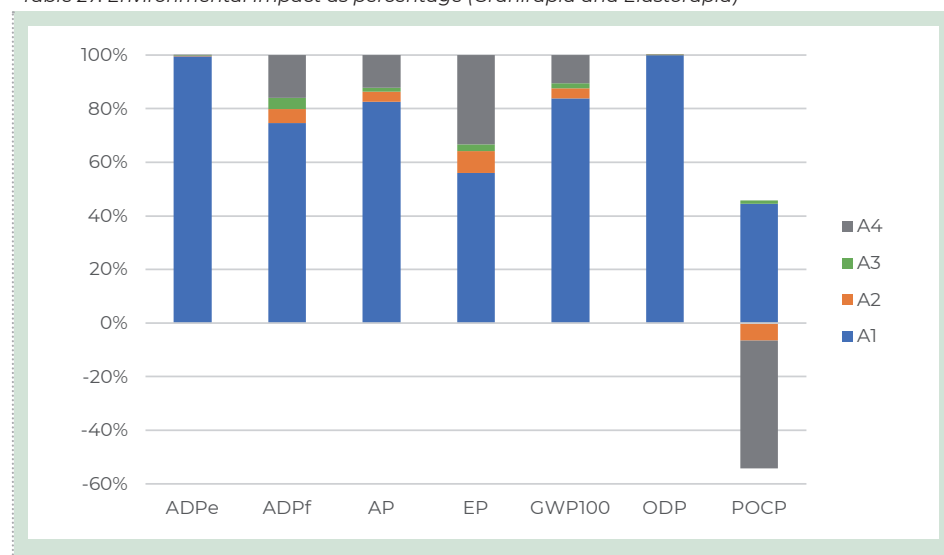
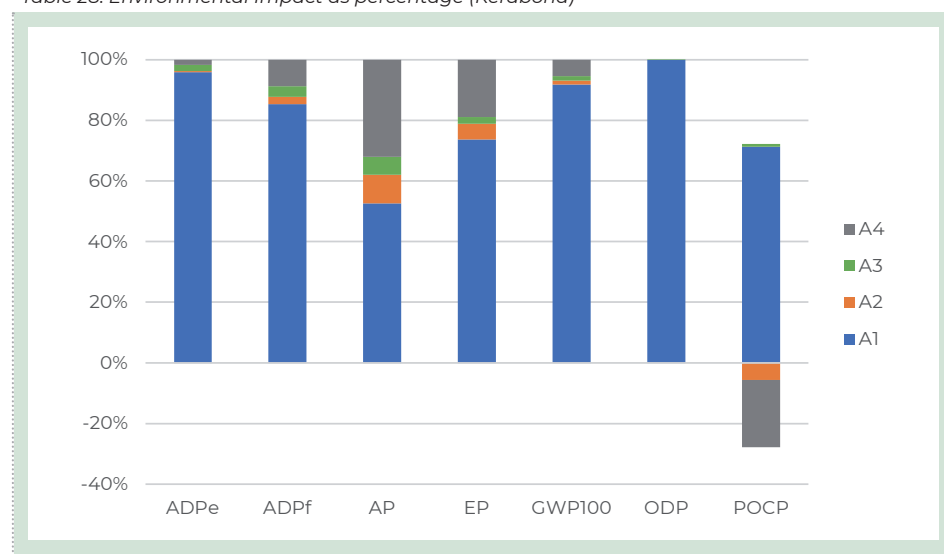


Table 28: Environmental Impact as percentage (Kerabond)



More details about electrical mixes used in this EPD are shown below:

	Data source	Amount	Unit
Electricity grid mix (IT) – 2014	GaBi database	0,4020	kg CO ₂ -eqv/kWh
Electricity from photovoltaic (IT) – 2014	GaBi database	0,0641	kg CO ₂ -eqv/kWh

8. DATA QUALITY

Table 29: Data quality

Dataset & Geographical reference	Database (source)	Temporary reference
A1-A3		
Inorganic Binders (DE)	GaBi Database ecoinvent 3.4 EPD S-P-00880	2015 – 2017
Organic Binders (DE)	GaBi Database	2012
Fillers (EU)	GaBi Database	2017
Additives (EU)	GaBi Database	2012 – 2017
Polymer Dispersions (EU)	EcoProfile EPDLA	2015
Recycled Material (DE)	GaBi Database	2017
Electricity grid mix (IT)	GaBi Database	2014
Electricity from photovoltaic (IT)	GaBi Database	2014
Packaging components (EU)	GaBi Database, Pla- sticsEurope	2005 – 2017
A2-A4		
Truck transport (euro 3, 27t payload – GLO)	GaBi Database	2017
Oceanic ship (27500 DWT)	GaBi Database	2017
Light Train (Gross Ton Weight 500 Tons - GLO)	GaBi Database	2017
Electricity mix (EU)	GaBi Database	2014
Diesel for transport (EU)	GaBi Database	2014
Heavy Fuel Oil (EU)	GaBi Database	2014

Granirapid (grey & white)
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Isolastic



All data included in the table above refer to a period between 2005 and 2017; the most relevant ones are specific from supplier, while the others (i.e. transport and minor contribution dataset), come from European and global databases. All datasets are not more than 10 years old according to EN 15804 § 6.3.7 "Data quality requirements". The only exception is represented by one raw material used for one packaging component production. Primary data concern the year 2017 and represent the whole annual production.

9. REQUISITE EVIDENCE

9.1 VOC emissions

Volatile Organic Compounds (VOC) special tests and evidence have been carried out on **Granirapid** and **Kerabond**, according to ISO 16000 parts 3, 6, 9 and 11 and EN 16516.

Granirapid and **Kerabond** have been evaluated in emission chambers, in order to detect their VOC emissions after 3 and 28 days storage in the ventilated chambers, according to GEV (Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V.) test method.

Granirapid meets the requirements for the emission class Emicode EC1^{PLUS}, as "very low VOC emission", license number 3638 released by GEV.

Kerabond meets the requirements for the emission class Emicode EC1^{PLUS}, as "very low VOC emission", license number 3168 released by GEV.

Next table describes the limits for the Emicode EC1^{PLUS} class

Table 30: EC1^{PLUS} VOC limits

	3 days $\mu\text{g}/\text{m}^3$	28 days $\mu\text{g}/\text{m}^3$
TVOC (C6-C16)	$\leq 750 \mu\text{g}/\text{m}^3$	$\leq 60 \mu\text{g}/\text{m}^3$
TSVOC (C16-C22)		$\leq 40 \mu\text{g}/\text{m}^3$
C1A-C1B substances	Total $\leq 10 \mu\text{g}/\text{m}^3$	Single substance $\leq 1 \mu\text{g}/\text{m}^3$
Formaldehyde/ acetaldehyde	$\leq 50 \mu\text{g}/\text{m}^3$	
Sum of formaldehyde/ acetaldehyde	$\leq 50 \text{ ppb}$	
sum of non-assessable VOCs		≤ 40
R value		≤ 1

9.2 Recycled content

Kerabond contains 2,5% of recycled material.

10. SIGNIFICANT CHANGES FROM THE PREVIOUS VERSION

In this version the environmental impacts of both **Kerabond** and **Isolastic** have been reported in separate tables.

In this revision new content declaration, new primary data (referred to the reference year 2017) have been adopted and the last update of the CML methodology (version 4.7) has been used for calculation. In addition, GPI update to the 3.0 version has been considered.

11. VERIFICATION AND REGISTRATION

EPD of construction products may not be comparable if they do not comply with EN 15804

Environmental product declarations within the same product category from different programs may not be comparable

EPD of construction products may not be comparable if they do not comply with EN 15804

Environmental product declarations within the same product category from different programs may not be comparable

CEN standard EN15804 served as the core PCR

PCR:	PCR 2012:01 Construction products and Construction services, Version 2.3, 2018-11-15
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025	<input checked="" type="checkbox"/> EPD Process Certification (Internal) <input type="checkbox"/> EPD Verification (external)
Third party verifier:	Certiquality S.r.l. Number of accreditation: 003H rev15
Accredited or approved by:	Accredia
Procedure for follow-up of data during EPD validity involves third-party verifier	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No


Granirapid (grey & white)
Elastorapid (grey & white)
Kerabond (grey & white)
Isolastic



12. REFERENCES

- EN 12004 ADHESIVES FOR TILES. REQUIREMENTS, EVALUATION OF CONFORMITY, CLASSIFICATION AND DESIGNATION
- EN 15804:2014 SUSTAINABILITY OF CONSTRUCTION WORKS - ENVIRONMENTAL PRODUCT DECLARATIONS - CORE RULES FOR THE PRODUCT CATEGORY OF CONSTRUCTION PRODUCTS
- GENERAL PROGRAMME INSTRUCTIONS OF THE INTERNATIONAL EPD® SYSTEM. VERSION 3.0
- HBEFA: HANDBOOK EMISSION FACTORS FOR ROAD TRANSPORT
- ISO 13007-1 CERAMIC TILES -- GROUTS AND ADHESIVES -- PART 1: TERMS, DEFINITIONS AND SPECIFICATIONS FOR ADHESIVES: DEFINITIONS AND CHARACTERISTICS
- ISO 14025 ENVIRONMENTAL LABELS AND DECLARATIONS - TYPE III ENVIRONMENTAL DECLARATIONS - PRINCIPLES AND PROCEDURES
- ISO 14044 ENVIRONMENTAL MANAGEMENT -- LIFE CYCLE ASSESSMENT -- REQUIREMENTS AND GUIDELINES
- PCR 2012:01; "PRODUCT GROUP CLASSIFICATION: MULTIPLE UN CPC CODES CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES"; VERSION 2.3

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