

Environmental Product Declaration

In accordance with ISO 14025 and EN
15804:2012+A2:2019 for:

Calce Storica, Thermo M10, Rebuild⁴⁰ R4

From **DIASEN SRL**



Programme:

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General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): <i>PCR 2019:14 Construction products, Version 1.1</i>
PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact .
Independent third-party verification of the declaration and data, according to ISO 14025:2006: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier: Certiquality S.r.l. Via Gaetano Giardino, 4 20123 - Milan Tel. +39 02 806 9171 www.certiquality.it Accredited by: <i>Accredia (Accreditation Number: n.003H Rev. 15)</i>
Procedure for follow-up of data during EPD validity involves third party verifier: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

DIASEN ITALIA, as EPD owner, has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.



Company information

Owner of the EPD: Diasen Srl

Contact: Davide Tomassoni

Description of the organisation:

Diasen is an Italian company operating in the ecological building sector, which oriented its production target towards innovative, low environmental impact, high technological content and quality products. For the purpose, the company provides high performance and green solutions in terms of thermal and acoustic insulating systems, waterproofing systems, coatings and coverings for the public, private and sport building sector.

The respect of the legislation, regulations and prescriptions applicable to the environmental protection, as well as to the reduction and control of environmental impacts, are the basic principles that characterize each single project. Since 2007 Diasen has carried out a certified Environmental Management System in compliance with the standard EN ISO 14001. Moreover, **LEED mapping** for 14 key products has been pursued.

Specific attention is paid to the reduction of waste production through a careful and effective activity of monitoring and control, by favouring, when possible, the production of recoverable waste.

Research and Development activity, is focused on the possibility of using raw materials deriving from manufacturing waste or from recoverable waste. The planning phases is oriented to thermo-insulating products to reduce the energy use and consumption inside the house.

Product-related or management system-related certifications: ISO 9001:2015 - EN ISO 14001:2015 – OHSAS 18001

Name and location of production site(s): DIASEN SRL - Zona Ind. Berbentina, 5 - 60041 Sassoferrato (AN) - Italy

Manufacturing

The manufacturing process starts from raw materials storage as they are received from suppliers. For this purpose, some raw materials arrive in big bags, while others come with no packages, thus are stored inside specific silos. These materials are automatically fed in the production mixer. Other materials arrive in their package and are stored in the warehouse. Afterwards, they are sent to the mixer by mean of an electric forklift or fed to the mixer. The production is a discontinuous process, in which all the components are mechanically mixed in batches. The product is then packaged in bags, placed on wooden pallets, protected with a hooding polymer film and stored in the Finished Products' warehouse. The quality of final product is controlled during the production phase and also before the sale. This manufacturing process does not involve water and it is almost a close-loop process, without scraps and wastes. Most of the residual dust collected in the filter system during production are returned to the production process.

1. Product name: CALCE STORICA

Product identification: see table 1

Product description: One-component concrete-free structural mortar, formulated with natural hydraulic lime (NHL 5), hydrated lime and natural mineral aggregates. The product is ideal for the consolidation of masonry structures, as it does not release water-soluble salts and avoids the formation of efflorescence.

UN CPC code: 37410 – Plaster

DIASEN PRODUCT CODE: 1441301;



2. Product name: THERMO M10

Product identification: see table 2

Product description: Thermal insulating cement-based mortar, characterized by low specific gravity. It is ideal for applications in seismic zones. It is designed for the installation of masonry blocks.

UN CPC code: 37410 - Mortar

DIASEN PRODUCT CODE: 2007102;



3. Product name: REBUILD⁴⁰ R4
Product identification: see table 3
Product description: One-component, thixotropic and premixed structural mortar. The product is ideal for the restoration of reinforced concrete and for application in seismic areas. It is designed to perform well with all types of repairs and rebuilding of concrete that need to be carried out quickly.
UN CPC code: 37410 – Mortar
DIASEN PRODUCT CODE: 1641300;



Table 1: Calce Storica.

Property	Value	Test methodology	Technical specification
Thermal Conductivity (W/mK)	0.124	UNI EN 1745	EN 998-2
Compression Strength (N/mm ²)	M15	UNI EN 998-2	
Fire reaction	Class A1	UNI EN 13501-1	
Capillarity water absorption (kg/m ² h ^{0.5})	0.30	UNI EN 1015-18	
Adhesion (N/mm ²)	≥ 1.00 – FP:B	UNI EN 1015-12	
Specific weight (kg/m ³)	1700 ± 20	UNI EN 1015-15	
Vapour permeability coefficient - μ	12	UNI EN 1015-19	
Cl Content (%)	0.004	UNI EN 1015-17	
Hazardous substances	Lime (chemical) - Hydraulic method; Calcium Di-hydroxide	CE Regulation 1272/2008	

Table 2: Thermo M10.

Property	Value	Test methodology	Technical specification
Thermal Conductivity (W/mK)	0.244	UNI EN 1745	EN 998-2
Compression Strength (N/mm ²)	M10	UNI EN 998-2	
Fire reaction	Class A1	UNI EN 13501-1	
Capillarity water absorption (kg/m ² h ^{0.5})	0.50	UNI EN 1015-18	
Adhesion (N/mm ²)	ND	UNI EN 1015-12	
Specific weight (kg/m ³)	1300 ± 30	UNI EN 1015-15	
Vapour permeability coefficient - μ	< 15	UNI EN 1015-19	
Cl Content (%)	ND	UNI EN 1015-17	
Hazardous substances	Lime (chemical) - Hydraulic method; Calcium Di-hydroxide	CE Regulation 1272/2008	

Table 3: Rebuild⁴⁰ R4.

Property	Value	Test methodology	Technical specification
Thermal Conductivity (W/mK)	0.225	UNI EN 1745	EN 998-2
Compression Strength (N/mm ²)	M45	UNI EN 998-2	
Fire reaction	Class A1	UNI EN 13501-1	
Capillarity water absorption (kg/m ² h ^{0.5})	0.40	UNI EN 1015-18	
Adhesion (N/mm ²)	≥ 1.50 – FP:B	UNI EN 1015-12	
Specific weight (kg/m ³)	1950 ± 50	UNI EN 1015-15	
Vapour permeability coefficient - μ	25	UNI EN 1015-19	
Cl Content (%)	0.002	UNI EN 1015-17	
Hazardous substances	Portland concrete, chemical products	CE Regulation 1272/2008	

All the products (Calce Storica, Thermo M10 and Rebuild⁴⁰ R4) are supplied in 25 kg bag. These bags are paper and plastic-based according to a weight ratio of about 80:20. Over a single euro-pallet, Calce Storica and Thermo M10 are supplied with 56 bags, while the other product (Rebuild⁴⁰ R4) is supplied with 48 bags.

Content information

Table 4: Content declaration and substances list for the system Calce Storica.

Components	Weight (%)	EC No.	CAS No.	Recycled material (%)	Renawable material (%)
Hydraulic Lime	0.16 ÷ 0.20	285-561-1	85117-09-5	0	-
Hydrated Lime	0.08 ÷ 0.12	215-137-3	1305-62-0	0	-
Carbonates	0.65 ÷ 0.75	207-439-9	471-34-1	0	-
Organic Additives	0.01 ÷ 0.03	-	9004-65-3	0	-
Inorganic Additives	< 0.01	143-22-6	205-592-53	0	-

Table 5: Content declaration and substances list for the system Thermo M10.

Components	Weight (%)	EC No.	CAS No.	Recycled material (%)	Renawable material (%)
Hydrated Lime	0.20 ÷ 0.25	215-137-3	1305-62-0	0	-
Concrete	0.13 ÷ 0.18	266-043-4	65997-15-1	0	-
Perlite	0.08 ÷ 0.12	-	130885-09-5	0	-
Carbonates	0.60 ÷ 0.70	207-439-9	471-34-1	0	-
Organic Additives	0.01 ÷ 0.03	-	9004-65-3	0	-
Inorganic Additives	< 0.01	143-22-6	205-592-53	0	-

Table 6: Content declaration and substances list for the system Rebuild⁴⁰ R4.

Components	Weight (%)	EC No.	CAS No.	Recycled material (%)	Renawable material (%)
Hydrated Lime	0.10 ÷ 0.14	215-137-3	1305-62-0	0	-
Concrete	0.22 ÷ 0.27	266-043-4	65997-15-1	0	-
Carbonates	0.58 ÷ 0.64	207-439-9	471-34-1	0	-
Organic Additives	0.01 ÷ 0.03	-	9004-65-3	0	-
Inorganic Additives	< 0.01	143-22-6	205-592-53	0	-

Table 7: Raw materials used in the family products of Calce Storica, Thermo M10 and Rebuild⁴⁰ R4.

Material	Hazard Phrase	Function
Hydrated Lime	H315; H318; H335	Natural and antibacterial binder
Hydraulic Lime	H315; H318; H335	Eco-sustainable binder
Organic Additives	No	Adhesion, working-ability and Flexibility
Inorganic Additives	H318	Aerating and anti-shrinkage
Perlite	No	Light Thermal and Acoustic Insulation
Expanded silica	N.D.	Light Thermal and Acoustic Insulation
Carbonates	H315; H320; H335	Multi-purpose
Concrete	H315; H317; H318; H335	Structural function

The product dealt with in this document are not classified as hazardous or dangerous for the environment in accordance with Directives 67/548/EEC and 1999/45/EC. There are no substances included in the Authorisation List (Attachment XIV) or the Candidate List of Substances of Very High Concern for Authorisation issued by the European Chemicals Agency, nor do they contain such substances.

Under normal storage and use conditions, these products can be handled with no particular precautions or special protective equipment. Detailed composition of products is DIASEN S.r.l. know-how and cannot be published.

LCA information

Product environmental performance was assessed using the Life Cycle Assessment (LCA) method, in accordance with the EN ISO 14044:2006 standard, and the Life Cycle Impact assessment (LCIA) method, in accordance with standard UNI EN 15804:2014, served as the core PCR. On this regards, Product Category Rules (PCR) – “Construction Products PCR 2019:14 - Version 1.1” was used as reference document.

Among the other reference standards, the following ones have been take into account for the development of the LCA and the LCIA other than to carry out this EPD:

- ISO 14025:2010 - Environmental labels and declarations - Type III environmental declarations – Principles and procedures;
- ISO 14067:2018 - Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification;
- ISO 15942:2011 - Sustainability of construction works — Environmental product declarations — Communication format business-to-business;

- ISO 21930:2017 - Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services;
- ISO 14020:2000 - Environmental labels and declarations — General principles;
- General Programme Instructions For The International Epd® System - Version 3.01 2019-09-18;

The results of the estimated environmental impacts are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

The field of application of the different products is quite the same, despite the related properties are different. Any products could perform several functionalities inside a building component (also different performances), thus the definition of a single and specific functionality for each products is quite difficult. For this reason a declared unit has been taken into account instead of a functional unit, as recommended by the used standardisation.

It can be introduced that for all products considered in the EPD, the “declared unit” is defined as 1.00kg of product, ready to be sold and transported towards the end user (builder), together with the related packaging (bag), already covered with related quote part of plastic film and laid out over the euro pallet on which it is transported on.

It has to be pointed out that the production of the investigated systems takes place inside the Diasen Manufacturing Plant in Sassoferrato (AN) – Italy.

More products can be included in the same EPD if the reference PCRs are the same and if they are made by the same company according to the same production process.

Declared unit and Reference service life :

1 kg of product as dry product mix is defined as Declared Unit (DU). The environmental impact of 1 kg of powder product (packaging included) for each products involved is described. According to the system boundary of this EPD, a Reference Service Life has not been provided.

Time representativeness: Data are referred to the production carried out in 2020 and have been provided by Diasen Srl. Also data regarding the geographic origin of any raw materials, packaging materials etc. have been provided, as well as the transportation media.

Database and LCA software used: Ecoinvent 3.6 used as a database and SimaPrò Version 9.1.1 as a software.

Description of system boundaries:

Cradle to gate (A1–A3).

All the energies and materials inputs and outputs of each phase (among the considered ones) have been included. No data regarding raw materials and components have been neglected, independently on the related contribution over the environmental impact or over any impact indicators.

Modules not accounted in the LCA since they are not assessed are marked as “ND” (Not Declared), as shown in table 7.

A low amount of emissions are produced, as the main amount of scraps (powders) are collected by specific filters and re-processed.

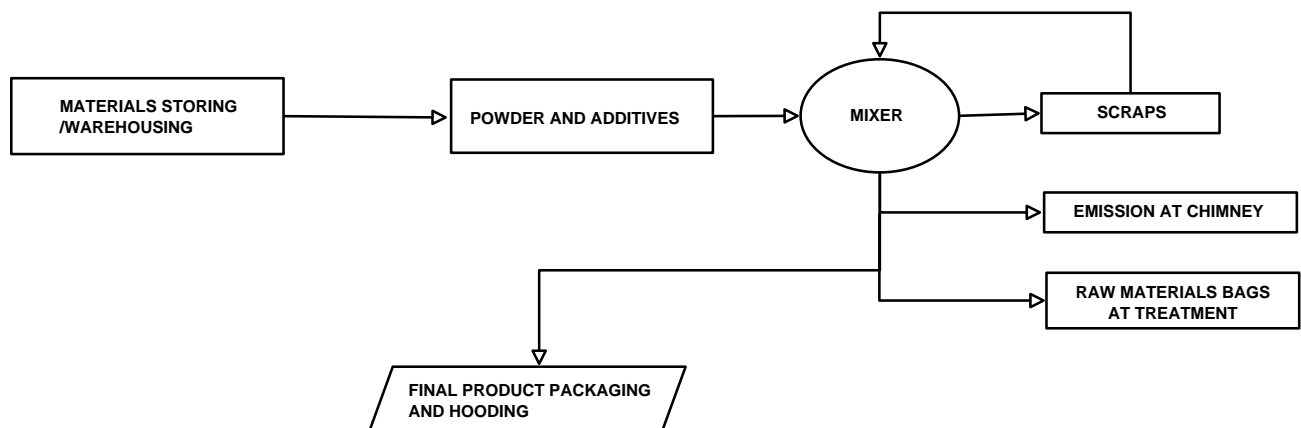
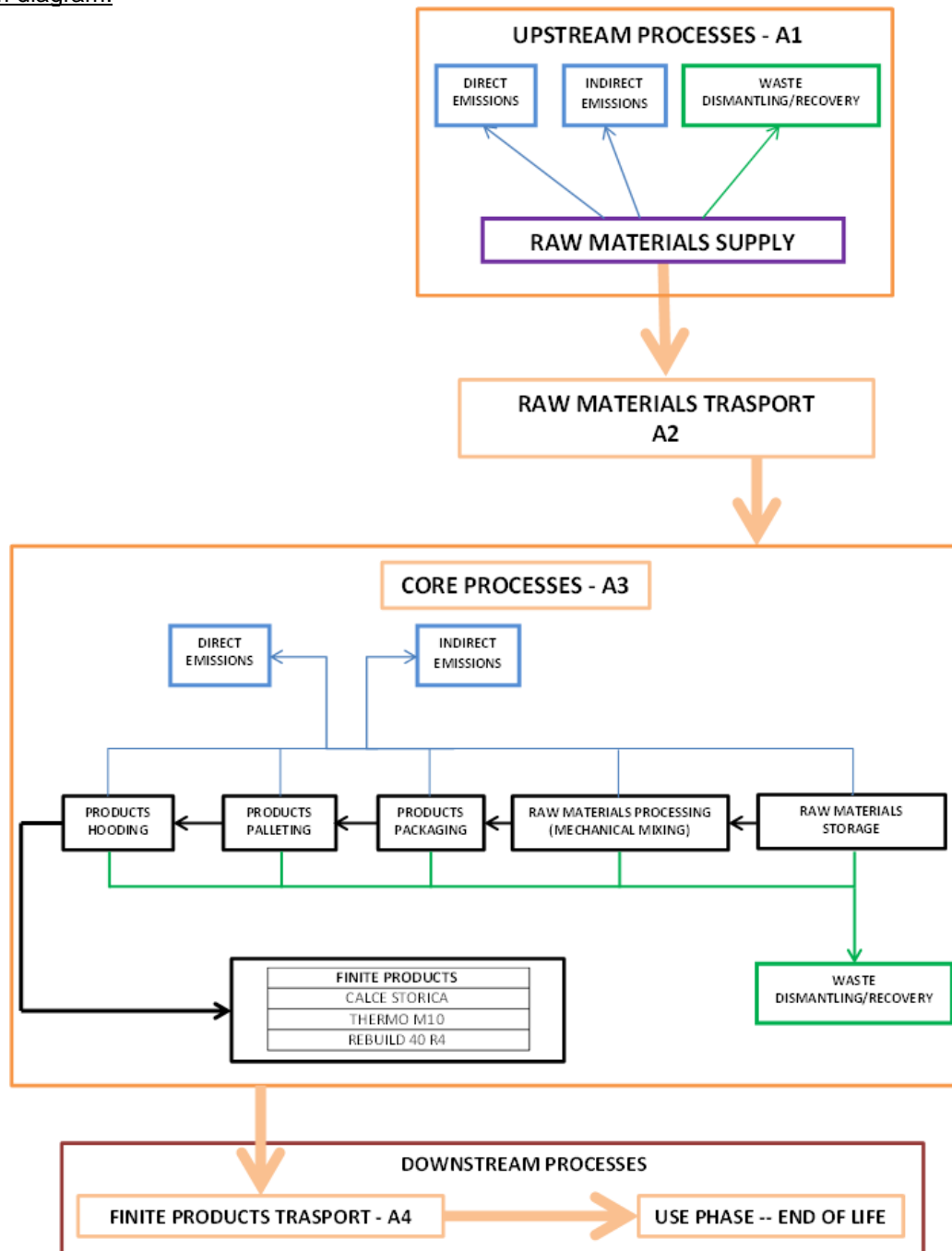


Figura 1: Pleiminary scheme of the Production phase for Calce Storica, Thermo M10 and Rebuild 40 R4.

System diagram:



The starting point regards the material arrive and storage. The widest part of the raw materials are provided without any packages (Hydrated and Hydraulic lime, Perlite and expanded glass), while additives arrive inside Kraft paper bags. The weight of the mentioned packages have been measured and included in the system boundaries together the raw materials. These packages are partially recycled (70% as reported in CONAI database) after the processing phase in a proper plant, as mixed packages.

Transport of raw materials and their related packages, as well as the transport stage of those packages used for the final product's storage have been included (Euro Pallet., PE film and Kraft paper). Moreover, these latter packages have also been included in the system boundaries.

Exactly the planned amount of each raw materials is processed inside the manufacturing facility (neither variability in each product composition nor averaged amounts have taken into account). At the end of the mixing time, each product is put inside the related bag, stacked inside the pallet and protected by mean of polyethylene film. The exact weight of each packaging media has been provided, as well as the energy consumption related to each manufacturing operations.

Table 7: Reporting table for Calce Storica, Thermo M10 and Rebuild⁴⁰ R4.

	Product stage		Construction process stage			Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	IT	IT	IT	-	-	-	-	-	-	-	-	-	-	-	-	-	-

More information:

Name and contact information of the organisation carrying out the underlying LCA study: University of Perugia – Strada di Pentima, 4 – 05100 –Terni (Italy)

Assumption and Estimation:

No Recycled materials are used.

About the used additives, both organic and inorganic counterpart, their composition has been modelled according to the information contained in the related technical and safety data sheet, provided by the specific provider.

Transports of both raw materials and packaging, from provider's sites to Diasen Processing plant, have been carried out by mean EURO4 lorries. This data represent the Italian road Transport system average framework.

According to Diasen, scraps have been labelled as powder collected by the suction systems (CER 08.02.01) and as chimney fine powder (E11). The former ones are recovered and introduced again in the processing cycle, while the latter ones are emitted as fine powder.

Data regarding the energy exploitation have been provided as an aggregate by the producer, and concern the whole processing cycle of any products dealt with in this document: (Italy Residual Mix).

As for the packaging, this is strongly dependant from the product. In fact, the envelopes are both used as "Distribution Packaging" (e.g.: euro-pallet and PE film are used for transport purposes, handling and protection) and also as "Consumer Packaging" (Kraft paper/plastic bags, with its content, constitutes a sales unit for the final user or consumer (ISO 21067-1:2016)).

Table 8: Packages for series Calce Storica, Thermo M10 and Rebuild⁴⁰ R4.

Product	Calce Storica	Thermo M10	Rebuild ⁴⁰ R4
Weight (kg/bag)	25.00	25.00	25.00
N° bag/Pallett	56	56	48
Paper/Plastic bag (kg/kg product)	$1.20 \cdot 10^{-3}$	$1.20 \cdot 10^{-3}$	$1.20 \cdot 10^{-3}$
Film PE (kg/kg product)	$2.90 \cdot 10^{-4}$	$2.90 \cdot 10^{-4}$	$3.30 \cdot 10^{-4}$
Europallet (unit/kg product)	$7.10 \cdot 10^{-4}$	$7.10 \cdot 10^{-4}$	$8.30 \cdot 10^{-4}$

The packaging used for transport, handling and containment, as well as those packaging used for some of the raw materials have been included. The related presence has been also taken into account in the transport phase (A2). Inorganic and organic additives (20 kg) are kept inside a Kraft paper bag (67 g). Table 9 contains the information about all the packages included in the final product.

Cut-off criteria:

The consumption of raw materials and energy related to ordinary and extraordinary maintenance operations was not included, as well as energy consumption associated to illumination and heating of personnel, since they were not considered relevant to environmental impact calculations.

No consumption of auxiliary materials and waste related to extraordinary activities (A3), having a periodicity exceeding 3 years, take place.

Allocation criteria:

The production process leads to the production of a single product as an output in any processing cycle. No co-products or by-products are obtained.

Moreover, the producer, as mentioned, has been able to provide the main part of the data and energy consumption, as well as scraps and wastes. Consequently no allocation procedures have been needed.

Any product is subjected to batch model production (not continuous production) also at regime, thus, at the end of each single production stage only one product is produced inside the manufacturing facility. After a simple cleaning stage, a completely different material can be processed in the same device.

Data quality:

As introduced, the background data used in this EPD were retrieved from the Ecoinvent 3.6 databank. For inventory modelling, SimaPro 9.1.1 software was used. The geographical reference was Italy, or, to the greatest extent, Central Europe, while the time period spanned the last 5 years.

Data collection included the analysis of internal production and environmental data from Diasen S.r.l. production site, the acquisition of relevant data (site specific data) for all the production processes included in the LCA and the disclosure of information about the energy sources used (Use of Italian Residual Mix¹⁰).

About the raw materials, the most relevant data are European or specific from supplier.

Finally, the reference time period for the LCA (product composition, transport, production rates, etc.) are referred to 2020.

Data comparability:

All the data and results related to this family of products were collected and obtained based on the EN 15804 standard, in the context of their final use in the building manufacturing system. Thus, the environmental impacts associated with the products Calce Storica, Thermo M10 and Rebuild⁴⁰ R4 are comparable with the environmental impacts of other similar products calculated according to the same UNI EN 15804 standard. EPDs of construction products may not be comparable if they do not comply with UNI EN 15804. Environmental product declaration within the same product category from different programs may not be comparable.

Environmental Information

Environmental profiles of the products covered by this EPD, using the LCA method, have been reported in this section.

As introduced, a “Cradle-to-gate” approach has been carried out, and phases A1-A3 have been included within the system boundaries. Different calculation tools have been used, as recommended by the EPD regulation.

Potential environmental impact – mandatory indicators according to EN 15804

- **Global Warming Potential (GWP):** It is directly linked to Climate Change, as a measure of greenhouse gas emissions, such as carbon dioxide and methane. These emissions increase absorption of radiation emitted by the earth, intensifying the natural greenhouse effect;
- **Abiotic Depletion Potential (ADP):** It directly regards the consumption of resources in relation to the corresponding source current availability. The exploitation of non-renewable resources leads to a decrease in the future availability of the related performed functions. This impact category can be shared in depletion of mineral resource elements (ADPE) and non-renewable fossil energy resources (ADPF). In the report these are reported separately;

- **Ozone Depletion Potential(ODP):** This indicator directly regards the increase in the tropospheric zone hole. It is another measure of the emissions of greenhouses gasses, as they increase the absorption of radiation emitted by the earth, which increases also the natural greenhouse effect;
- **Photochemical Ozone Creation Potential (POCP):** Photochemical Smog. It is a measure of precursors emissions contributing to ground level smog formation (mainly ozone O₃), produced by the reaction of volatile organic compounds (VOCs) and carbon monoxide in the presence of nitrogen oxides under the influence of UV light. Ground level ozone can be harmful for human and ecosystem health and may also damage agriculture;
- **Acidification Potential (AP):** It is related to the Acid Rains. It is a measure of emissions leading to acidifying effects on the environment. From a technical base point, the involved indicator is a measure of the capacity of a given molecule or chemical species to increase the hydrogen ion (H⁺) concentration in the water (lakes, rivers, etc.), thus decreasing the related pH value. Moreover, potential effects include forest and building materials deterioration;
- **Eutrophication Potential (EP):** It regards the Algal Blooms. It is a measure of nutrient enrichment that can lead to an undesirable shift in species composition and elevated biomass production in terrestrial and aquatic ecosystems. It includes potential impacts of excessively high levels of nitrogen and phosphorus macronutrients

Table 9: Impact indicators for the system Calce Storica.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. (A1-A3)
GWP-total	kg CO ₂ eq.	1.57	1.22*10 ⁻²	1.87*10 ⁻²	1.60
GWP-fossil	kg CO ₂ eq.	1.56	1.22*10 ⁻²	1.85*10 ⁻²	1.59
GWP-biogenic	kg CO ₂ eq.	1.27*10 ⁻³	3.67*10 ⁻⁶	7.60*10 ⁻⁵	1.35*10 ⁻³
GWP-luluc	kg CO ₂ eq.	3.56*10 ⁻⁴	4.38*10 ⁻⁶	7.09*10 ⁻⁵	4.31*10 ⁻⁴
ODP	kg CFC 11 eq.	1.70*10 ⁻⁷	2.24*10 ⁻⁹	1.39*10 ⁻⁹	1.74*10 ⁻⁷
AP	mol H ⁺ eq.	3.59*10 ⁻³	6.24*10 ⁻⁵	1.06*10 ⁻⁴	3.76*10 ⁻³
	kgSO ₂ _eq.	3.04*10 ⁻³	5.54*10 ⁻⁵	9.16*10 ⁻⁵	3.19*10 ⁻³
POCP	kg NMVOC eq.	2.15*10 ⁻³	6.68*10 ⁻⁵	9.70*10 ⁻⁵	2.31*10 ⁻³
Eutroph. Aq. Freshwater	kg PO ₄ ³ eq.	2.15*10 ⁻⁴	9.05*10 ⁻⁷	6.59*10 ⁻⁶	2.22*10 ⁻⁴
	kg_ P_eq.	6.60*10 ⁻⁴	2.78*10 ⁻⁶	2.02*10 ⁻⁵	6.83*10 ⁻⁴
Eutroph. Aq. Marine	kg_ N_eq.	2.53*10 ⁻⁵	7.78*10 ⁻⁸	7.91*10 ⁻⁷	2.62*10 ⁻⁵
Eutrophication Terrestrial	mole N_eq.	6.93*10 ⁻³	2.34*10 ⁻⁴	2.74*10 ⁻⁴	7.44*10 ⁻³
ADP-minerals& metals	kg Sb eq.	1.87*10 ⁻⁵	3.34*10 ⁻⁷	2.39*10 ⁻⁷	1.93*10 ⁻⁵
ADP-fossil*	MJ	10.50	0.182	0.331	11.01
Water Use	m ³ _world eq. depr	1.89*10 ⁻¹	5.26*10 ⁻⁴	1.62*10 ⁻²	0.206

Table 10: Impact indicators for the system Thermo M10.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. (A1-A3)
GWP-total	kg CO ₂ eq.	1.44	9.35*10 ⁻³	1.86*10 ⁻²	1.47
GWP-fossil	kg CO ₂ eq.	1.44	9.35*10 ⁻³	1.86*10 ⁻²	1.47
GWP-biogenic	kg CO ₂ eq.	1.22*10 ⁻³	2.82*10 ⁻⁶	7.60*10 ⁻⁵	1.30*10 ⁻³
GWP-luluc	kg CO ₂ eq.	3.08*10 ⁻⁴	3.37*10 ⁻³	7.09*10 ⁻⁵	3.82*10 ⁻⁴
ODP	kg CFC 11 eq.	1.61*10 ⁻⁷	1.72*10 ⁻⁹	1.38*10 ⁻⁹	1.64*10 ⁻⁷
AP	mol H ⁺ eq.	4.04*10 ⁻³	8.15*10 ⁻⁵	1.06*10 ⁻⁴	4.19*10 ⁻³
	kgSO ₂ _eq.	3.42*10 ⁻³	4.26*10 ⁻⁴	9.15*10 ⁻⁵	3.55*10 ⁻³
POCP	kg NMVOC eq.	2.16*10 ⁻³	5.14*10 ⁻⁴	1.23*10 ⁻⁴	2.14*10 ⁻³
Eutroph. Aq. Freshwater	kg PO ₄ ³ eq.	2.06*10 ⁻⁴	6.96*10 ⁻⁷	7.76*10 ⁻⁶	2.13*10 ⁻⁴
	kg_ P_eq.	6.32*10 ⁻⁴	2.14*10 ⁻⁶	2.02*10 ⁻⁵	6.55*10 ⁻⁴
Eutroph. Aq. Marine	kg_ N_eq.	2.17*10 ⁻⁵	5.98*10 ⁻⁸	8.94*10 ⁻⁷	2.26*10 ⁻⁵
Eutrophication Terrestrial	mole N_eq.	7.07*10 ⁻³	1.80*10 ⁻⁴	3.41*10 ⁻⁴	8.11*10 ⁻³
ADP-minerals& metals	kg Sb eq.	1.41*10 ⁻⁵	2.57*10 ⁻⁷	3.00*10 ⁻⁷	1.47*10 ⁻⁵
ADP-fossil*	MJ	9.44	0.14	0.399	10.11
Water Use	m ³ _world eq. depr	1.82*10 ⁻¹	4.05*10 ⁻⁴	1.74*10 ⁻²	0.199

Table 11: Impact indicators for the system Rebuild⁴⁰ R4.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. (A1-A3)
GWP-total	kg CO ₂ eq.	1.50	7.68*10 ⁻³	1.94*10 ⁻²	1.53
GWP-fossil	kg CO ₂ eq.	1.49	7.68*10 ⁻³	1.93*10 ⁻²	1.52
GWP-biogenic	kg CO ₂ eq.	1.17*10 ⁻³	2.32*10 ⁻⁶	7.99*10 ⁻⁵	1.25*10 ⁻³
GWP-luluc	kg CO ₂ eq.	3.56*10 ⁻⁴	2.77*10 ⁻⁶	7.42*10 ⁻⁵	3.98*10 ⁻⁴
ODP	kg CFC 11 eq.	1.60*10 ⁻⁷	1.41*10 ⁻⁹	1.46*10 ⁻⁹	1.63*10 ⁻⁷
AP	mol H ⁺ eq.	3.56*10 ⁻³	3.94*10 ⁻⁵	1.12*10 ⁻⁴	3.71*10 ⁻³
	kgSO ₂ eq.	3.03*10 ⁻³	3.50*10 ⁻⁵	9.67*10 ⁻⁵	3.16*10 ⁻³
POCP	kg NMVOC eq.	2.21*10 ⁻³	7.17*10 ⁻⁵	1.04*10 ⁻⁴	2.36*10 ⁻³
Eutroph. Aq. Freshwater	kg PO ₄ ³ eq.	2.06*10 ⁻⁴	5.72*10 ⁻⁷	6.89*10 ⁻⁶	2.13*10 ⁻⁴
	kg_ P_eq.	6.32*10 ⁻⁴	1.76*10 ⁻⁶	2.12*10 ⁻⁵	6.55*10 ⁻⁴
Eutroph. Aq. Marine	kg_ N_eq.	2.33*10 ⁻⁵	4.91*10 ⁻⁸	8.18*10 ⁻⁷	2.42*10 ⁻⁵
Eutrophication Terrestrial	mole N_eq.	7.47*10 ⁻³	1.48*10 ⁻⁴	2.92*10 ⁻⁴	7.91*10 ⁻³
ADP-minerals& metals	kg Sb eq.	1.67*10 ⁻⁵	2.11*10 ⁻⁷	2.57*10 ⁻⁷	1.72*10 ⁻⁵
ADP-fossil*	MJ	9.65	0.115	0.3481	10.11
Water Use	m ³ _world eq. depr	1.79*10 ⁻¹	3.32*10 ⁻⁴	1.65*10 ⁻²	0.196

Use of resources

Table 12: Use of resources for the system Calce Storica.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot. A1-A3
Use of renewable primary energy excluding resources used as a raw materials - PERE	MJ	1.18	1.04*10 ⁻²	0.621	1.81
Use of renewable primary energy resources used as raw materials - PERM	MJ	0	0	0	0
Total use of renewable primary energy resources - PERT	MJ	1.18	1.04*10⁻²	0.621	1.81
Use of non-renewable primary energy excluding resources used as a raw materials - PENRE	MJ	12.75	0.20	0.39	13.33
Use of non-renewable primary energy resources used as raw materials PENRM	MJ.	0	0	0	0
Total use of non-renewable primary energy resources - PENRT	MJ	12.75	0.20	0.39	13.33
Use of secondary materials - SM	kg	0	0	0	0
Use of non-renewable secondary fuels - NRSF	MJ	0	0	0	0
Use of renewable secondary fuels - RSF	MJ	0	0	0	0
Net Use of Fresh Water - FW	m ³	5.58*10 ⁻³	1.96*10 ⁻⁵	4.14*10 ⁻⁴	6.01*10 ⁻³

Table 13: Use of resources for the system Thermo M10.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Use of renewable primary energy excluding resources used as a raw materials - PERE	MJ	1.06	2.02*10 ⁻³	0.622	1.68
Use of renewable primary energy resources used as raw materials - PERM	MJ	0	0	0	0
Total use of renewable primary energy resources - PERT	MJ	1.06	2.02*10⁻³	0.622	1.68
Use of non-renewable primary energy excluding resources used as a raw materials - PENRE	MJ	11.47	0.15	0.39	12.01
Use of non-renewable primary energy resources used as raw materials PENRM	MJ.	0	0	0	0
Total use of non-renewable primary energy resources - PENRT	MJ	11.47	0.15	0.39	12.11
Use of secondary materials - SM	kg	0	0	0	0
Use of non-renewable secondary fuels - NRSF	MJ	0	0	0	0
Use of renewable secondary fuels - RSF	MJ	0	0	0	0
Net Use of Fresh Water - FW	m ³	5.22*10 ⁻³	1.51*10 ⁻⁵	4.14*10 ⁻⁴	5.65*10 ⁻³

Table 14: Use of resources for the system Rebuild⁴⁰ R4.

Results per declared unit – 1,00 kg					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Use of renewable primary energy excluding resources used as a raw materials - PERE	MJ	1.07	1.39*10 ⁻³	0.694	1.76
Use of renewable primary energy resources used as a raw materials - PERM	MJ	0	0	0	0
Total use of renewable primary energy resources - PERT	MJ	1.07	1.39*10⁻³	0.694	1.76
Use of non-renewable primary energy excluding resources used as a raw materials - PENRE	MJ	11.73	0.12	0.40	12.26
Use of non-renewable primary energy resources used as raw materials PENRM	MJ.	0	0	0	0
Total use of non-renewable primary energy resources - PENRT	MJ	11.73	0.12	0.40	12.26
Use of secondary materials - SM	kg	0	0	0	0
Use of non-renewable secondary fuels - NRSF	MJ	0	0	0	0
Use of renewable secondary fuels - RSF	MJ	0	0	0	0
Net Use of Fresh Water - FW	m ³	5.23*10 ⁻³	1.24*10 ⁻⁵	4.24*10 ⁻⁴	5.67*10 ⁻³

Additional Impact Indicators

Table 15: Additional Impact Indicators for the system Calce Storica.

Indicator	Unit	A1	A2	A3	Tot.A1-A3
Particulate matter emission	kg_PM2.5_eq.	3.42*10 ⁻⁴	5.40*10 ⁻⁶	9.39*10 ⁻⁴	1.29*10 ⁻³
Ionizing radiation, human health	kBq_U235_eq.	1.01*10 ⁻¹	9.60*10 ⁻⁴	1.86*10 ⁻³	1.04*10 ⁻¹
Eco-toxicity (freshwater)	CTUe	18.50	0.102	0.226	18.83
Human Toxicity, carcinogenic effects	CTUh	3.63*10 ⁻⁹	3.71*10 ⁻¹⁰	8.96*10 ⁻¹⁰	3.68*10 ⁻⁸
Human Toxicity, non-carcinogenic effects	CTUh	2.21*10 ⁻⁷	2.79*10 ⁻⁹	8.96*10 ⁻⁹	2.33*10 ⁻⁷
Land Use	Kg_C_Deficit	1.36	4.58*10 ⁻²	0.317	1.72

Table 16: Additional Impact Indicators for the system Thermo M10.

Indicator	Unit	A1	A2	A3	Tot.A1-A3
Particulate matter emission	kg_PM2.5_eq.	4.61*10 ⁻⁴	4.15*10 ⁻⁶	9.39*10 ⁻⁴	1.40*10 ⁻³
Ionizing radiation, human health	kBq_U235_eq.	8.06*10 ⁻²	7.38*10 ⁻⁴	1.85*10 ⁻³	8.32*10 ⁻²
Eco-toxicity (freshwater)	CTUe	14.50	0.079	0.226	14.80
Human Toxicity, carcinogenic effects	CTUh	3.21*10 ⁻⁸	2.86*10 ⁻¹⁰	1.26*10 ⁻⁹	3.36*10 ⁻⁸
Human Toxicity, non-carcinogenic effects	CTUh	2.00*10 ⁻⁷	2.15*10 ⁻⁹	8.96*10 ⁻⁹	2.11*10 ⁻⁷
Land Use	Kg_C_Deficit	1.16	3.52*10 ⁻²	0.317	1.51

Table 17: Additional Impact Indicators for the system Rebuild⁴⁰ R4.

Indicator	Unit	A1	A2	A3	Tot.A1-A3
Particulate matter emission	kg_PM2.5_eq.	3.26*10 ⁻⁴	3.41*10 ⁻⁶	9.41*10 ⁻⁴	1.27*10 ⁻³
Ionizing radiation, human health	kBq_U235_eq.	9.21*10 ⁻²	6.06*10 ⁻⁴	1.92*10 ⁻³	9.46*10 ⁻²
Eco-toxicity (freshwater)	CTUe	16.60	0.065	0.242	16.91
Human Toxicity, carcinogenic effects	CTUh	3.32*10 ⁻⁸	2.35*10 ⁻¹⁰	1.37*10 ⁻⁹	3.48*10 ⁻⁸
Human Toxicity, non-carcinogenic effects	CTUh	2.09*10 ⁻⁷	1.76*10 ⁻⁹	9.29*10 ⁻⁹	2.20*10 ⁻⁷
Land Use	Kg_C_Deficit	0.122	2.89*10 ⁻²	0.355	1.60

Waste production and output flows

Waste production

Table 18: Flows in final products for Calce Storica.

Results per declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Hazardous waste disposed	kg	0	0	0	0
Non-hazardous waste disposed	kg	0	0	2.01*10 ⁻⁵	2.01*10 ⁻⁵
Radioactive waste disposed	kg	0	0	0	0

Table 19: Flows in final products for Thermo M10.

Results per declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Hazardous waste disposed	kg	0	0	0	0
Non-hazardous waste disposed	kg	0	0	$2.01 \cdot 10^{-5}$	$2.01 \cdot 10^{-5}$
Radioactive waste disposed	kg	0	0	0	0

Table 20: Flows in final products for Rebuild⁴⁰ R4.

Results per declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Hazardous waste disposed	kg	0	0	0	0
Non-hazardous waste disposed	kg	0	0	$2.01 \cdot 10^{-5}$	$2.01 \cdot 10^{-5}$
Radioactive waste disposed	kg	0	0	0	0

Output flows

Table 22: Use of resources for the systems Calce Storica, Thermo M10 and Rebuild⁴⁰ R4.

Results per declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Components for re-use	kg	0	0	0	0
Material for recycling	kg	0	0	0	0
Materials for energy recovery	kg	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0

NOTE: It has to be specified that Diasen claimed: at the end of the service life of any product dealt with in this document, the products themselves can potentially recycled as inert materials;

Information on biogenic carbon content

According to the document “pcr2019-14 – PCR Construction Products v1.1”, EPDs of type “d” [approach “cradle to gate” (A1-A3)] and type “e” [approach “cradle to gate” (A1-A3) with options of additional modules (A4-A5)] are only possible if the following three conditions are valid:

- the product or material is physically integrated with other products during installation so they cannot be physically separated from them at end of life;
- the product or material is no longer identifiable at end of life as a result of a physical or chemical transformation process;
- the product or material does not contain biogenic carbon;

For this reason the content of “biogenic carbon” hasn’t been determined in the investigated Diasen products. In any case, it has been determined both for the products and the related packaging.

Table 23: Biogenic carbon content for the products Calce Storica, Thermo M10 and Rebuild⁴⁰ R4.

Biogenic Carbon	Unit	Calce Storica	Thermo M10	Rebuild ⁴⁰ R4
Biogenic carbon in the product	Kg C	$4.95 \cdot 10^{-3}$	$4.76 \cdot 10^{-3}$	$4.59 \cdot 10^{-3}$
Biogenic carbon in the packaging	Kg C	$2.79 \cdot 10^{-4}$	$2.79 \cdot 10^{-4}$	$2.93 \cdot 10^{-4}$

Additional information

- The company Diasen is certificated ISO 9001, ISO 14001. Moreover a wide amount of its product obtained other specific certification, as Avis Technique (French lab CSTB) and ITF for Sport Flooring system. It is associated to A.N.I.T (Associazione Nazionale Isolamento Termo-Acustico), to the Green Building Council Italia and N.R.C.A - National Roofing Contractors Association.

References

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- [6] ISO 15804:2019 - Sustainability of construction works – Environmental product declarations - Core rules for the product category of construction products;
- [7] ISO 15942:2011 - Sustainability of construction works — Environmental product declarations — Communication format business-to-business;
- [8] ISO 14020:2000 - Environmental labels and declarations — General principles;
- [9] Web site: <https://www.enel.it/content/dam/enel-it/documenti-supporto/mercato-libero-luce/Tabella%20Mix%20Energetico%20Enel%20Energia.pdf>;
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- [12] Ullmann's Encyclopaedia of Industrial Chemistry (2010). John Wiley & Sons, Inc., Hoboken, USA;

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

