



Environmental Product Declaration (EPD)  
**PARALINK**



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## PROGRAMME RELATED INFORMATION

This EPD is developed under The International EPD ® System Programme Operator, in compliance with the General Program Instruction version 2.5. for the EPD development and the Product Category Rules PCR CPC 54 “Construction products and Construction services” 2012:01 version 2.2. More information about the International EPD ® System is available on the website <https://www.environdec.com/>

Founded in 1879, Officine Maccaferri is specialised in the development of engineering solutions for the civil and environmental construction industry.

Its continued growth is based upon long-held values of innovation, integrity, excellent service and respect for the environment.

Our vision is to become a leading international provider of advanced solutions to the civil, geotechnical and environmental construction markets. We deliver solutions from retaining walls to hydraulic works and from rockfall mitigation systems to soil reinforcement.

By implementing a strategy of vertical integration, we research, manufacture materials, design, supply and build solutions within these fields. Our differentiating factor is our people and their knowledge capital, which we share with our clients to overcome their engineering challenges.

The manufacturing of ParaLink is managed by Linear Composites Ltd a subsidiary of the Officine Maccaferri Group.



**ParaLink geogrids** are planar structure consisting of a monoaxial array of composite geosynthetics strips.

Each single longitudinal strip has a core of high tenacity polyester yarns tendons encased in a polyethylene sheath; the single strips are connected by cross-laid polyethylene strips to form a grid configuration to the composite. ParaLink is CE certified for reinforcement applications and approved by the BBA (British Board of Agreement).

ParaLink is widely used in civil engineering for soil reinforcement application including reinforced soils walls and basal reinforcement applications. ParaLink provides the high performance and reassurance also in the most demanding applications such as embankment over piles or soils subjected to voids.



ParaLink for basal reinforced piled embankments

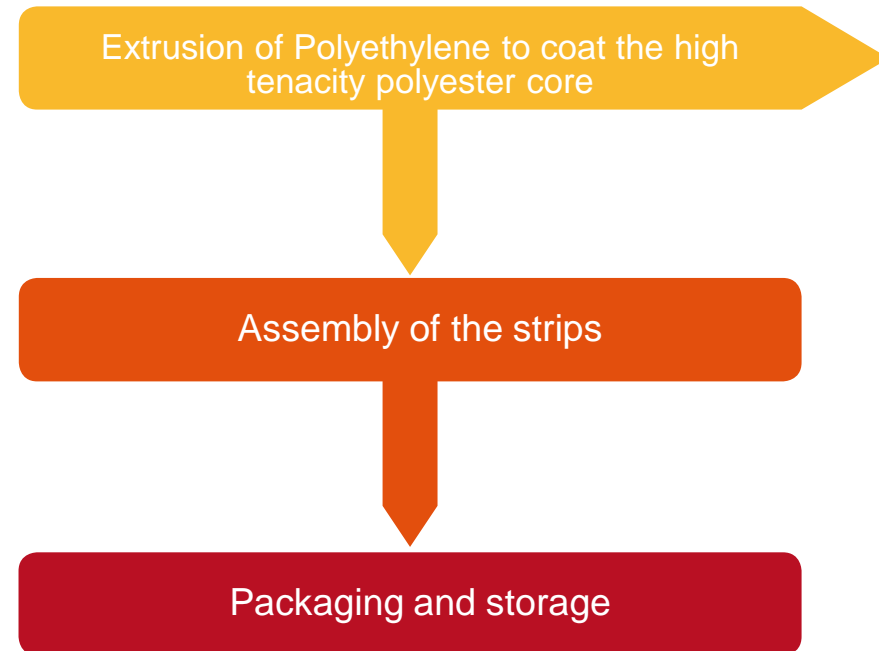
### 2.1 THE PRODUCTION PROCESS

The Production process includes the extrusion of the polyethylene to coat a core made in high tenacity polyester in order to obtain composite geosynthetic strips and the assembly through cross-laid polyethylene strips to form a grid configuration to the composite.

Technical Characteristics of the ParaLink range products are listed and detailed in the technical data sheet available on Maccaferri website (<https://www.maccaferri.com/>). According to Construction Product Regulation CEE 305/2011 the essential technical characteristics, as per Harmonized Documents: EN 13249, EN 13250, EN 13251, EN 13253, EN 13254, EN 13255, EN 13257 and EN 13265, are reported in the Declaration of Performances (DOP).

This EPD describes the impacts of the ParaLink produced in UK and India (Linear Composites Ltd), using as reference products the ParaLink variant most produced or sold in each plant for the reference year. The results reported in this EPD, through the selected reference product for UK and India, are representative of the product family in UK and India, respectively.

The reference CPC code of the products covered by the present EPD is 369 "Other plastic products".



### 2.2 PRODUCT COMPOSITION

The composition of the reference products for UK and India is reported in its weight in Table 1, whereas their main dimensional features are shown in Table 2.

The content of SVHC in the ParaLink does not exceed 0.1 % of its weight.

PRODUCT COMPOSITION OF THE PARALINK (REFERENCE PRODUCTS)		
	ParaLink 200 (UK)	ParaLink 300 kN (India)
<b>BoM - materials/components contribution (kg) for 1 m<sup>2</sup> of product</b>		
<b>Polyester fibers</b>	0.319	0.481
<b>Kevlar</b>	0.001	0.001
<b>Low-density polyethylene</b>	0.270	0.351
<b>Packaging (kg)</b>		
<b>Steel tube</b>	0.057	0.092
<b>PE film</b>	0.006	0.007
<b>Total weight (kg)</b>		
<b>Total weight</b>	0.590	0.833

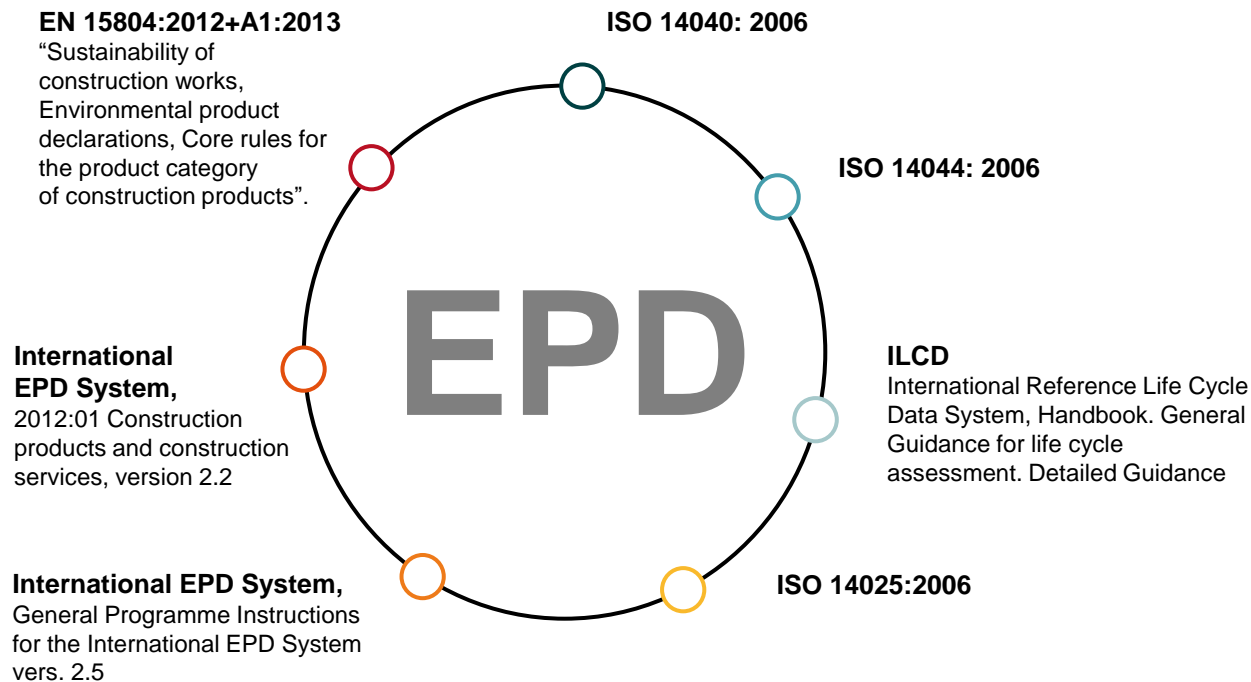
Table 1: BoM of the reference product for the two plants (UK and India)

DIMENSIONAL FEATURES OF THE SELECTED PARALINK VARIANTS		
	ParaLink 200 (UK)	ParaLink 300 kN (India)
<b>Single strip width</b>	85 mm	88 mm
<b>Pitch (weft x warp)</b>	100 cm × 18 cm	100 cm × 18 cm

Table 2: Dimensional features of the reference products

## 3.1 METHODOLOGY

The study behind the present EPD has been performed according to the state of art of the LCA methodology, with specific reference to the construction sector, in accordance to the following standard and guide lines:



The goal of the study is the evaluation of the potential environmental impacts of ParaLink.

The EPD is mainly addressed to the business-to-business communication. The data elaboration has been performed with the Gabi software, version 8.0.6.0.20. The database used are the most updated ones implemented in Gabi software. More in detail, main database used is thinkstep. The LCIA method used is CML 2001 version 4.2 (April 2013).






# 3. ENVIRONMENTAL PRODUCT DECLARATION

### 3.2 DECLARED UNIT

The declared unit is 1 m<sup>2</sup> of product, plus its packaging.

### 3.3 SYSTEM BOUNDARY

The EPD only covers the Cradle to Gate stage (as represented in Table 3 and showed in Figure 4) because other stages are very dependent on particular scenarios and are better developed for specific construction works.

 <b>PRODUCT STAGE</b>	A1	Raw Material Supply	X
	A2	Transport	X
	A3	Manufacturing	X
 <b>CONSTRUCTION PROCESS STAGE</b>	A4 to A5	Transport from the gate to the installation site, Construction/ Installation	Mnd*
 <b>USE STAGE</b>	B1 to B7	Use, Maintenance, Repair, Replacement, Refurbishment, Operational energy use, Operational water use	Mnd*
 <b>END-OF-LIFE STAGE</b>	C1 to C4	Deconstruction/Demolition, Transport, Waste processing, Disposal	Mnd*
 <b>BENEFITS and LOADS BEYOND SYSTEM BOUNDARY</b>	D	Reuse, Recycling potential	Mnd*

\* Module Not Declared

Table 3: Life cycle stages included in the study for Officine Maccaferri ParaLink (Linear Composite)



### 3. ENVIRONMENTAL PRODUCT DECLARATION

The following stages are included in the study:

**Raw Materials supply (A1).** Production of raw materials used in the products, of as well as the production of energy carriers used in the production process.

**Transport of raw materials to the factory (A2)**

**Manufacturing of the Officine Maccaferri (Linear Composite) ParaLink (A3).** It includes the following production phases:

- Extrusion for the Polyethylene to coat the high tenacity polyester core
- The assembly of the strips
- Final check on finished product and packaging and storage

Moreover, in module A3, the production of primary packaging and of the ancillary materials and the treatment of waste generated from the manufacturing processes are accounted for.

The electricity used in the manufacturing processes is from the national grid, for both the plants.

The reference year of the study is 2017.

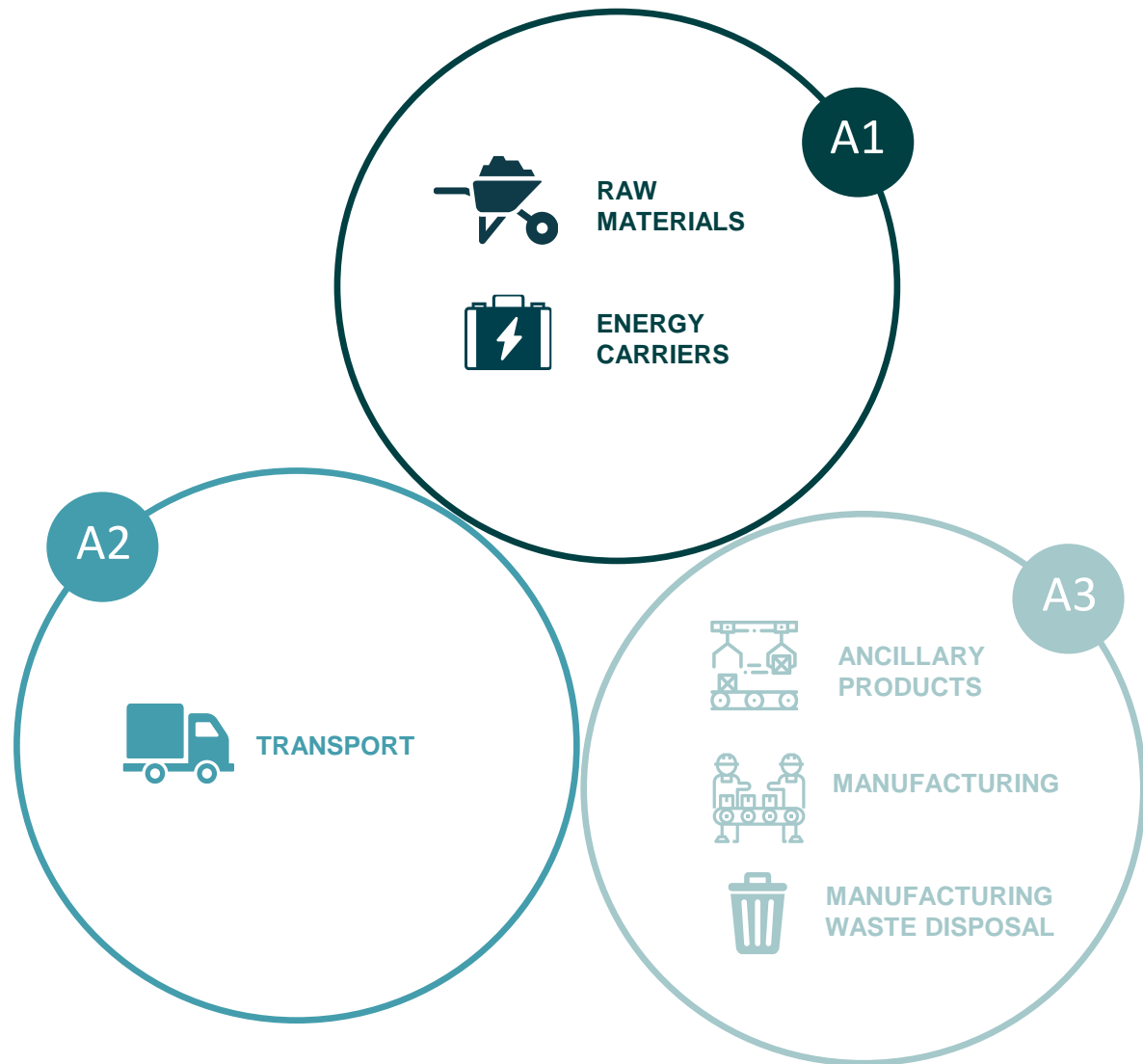


Figure 4: System boundaries for the Officine Maccaferri ParaLink (Linear Composite)

### 3.4 MAIN ASSUMPTIONS, CUT OFFS AND BACKGROUND DATA INFORMATION

Regarding the exclusion of product life cycle stages and processes, the capital goods have not been accounted for, as well as the use and the end of life phases.

The main assumptions applied in the study are reported below.

- For the majority of the raw materials as well as for the packaging for the finished products an European production is assumed.
- A default mean a transportation (truck Euro 4 > 32 t) with an utilisation ratio of 0.61 has been assumed when primary data on transport size were not available.
- For the energy consumption and the ancillary consumption in the manufacturing process, an allocation based on the mass of finished products from the plants has been applied.

Background data used in the study are from LCI database and are not older than 5 years.

### 3.5 PARAMETERS DESCRIBING THE ENVIRONMENTAL IMPACTS

IMPACT CATEGORY	ParaLink - UK
	ParaLink 200
Abiotic Depletion (ADP fossil) [MJ]	5.20E+01
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	3.73E-07
Acidification Potential (AP) [kg SO2-Equiv.]	3.87E-03
Eutrophication Potential (EP_ [kg Phosphate-Equiv.]	4.77E-04
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	2.09E+00
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	1.77E-10
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	5.48E-04

Table 4: Environmental profile for the representative variant of ParaLink manufactured in the UK plant by Officine Maccaferri (Linear Composite)

### 3. ENVIRONMENTAL PRODUCT DECLARATION

The validity of impact per variant is driven by the raw materials contribution, thus the potential environmental impacts proportionally increase with the weight of raw material per square meter. For this reason, in table 5 the environmental profile of the heaviest variant within the ParaLink family produced in UK is reported.

IMPACT CATEGORY	ParaLink - UK
	ParaLink 1350
Abiotic Depletion (ADP fossil) [MJ]	3.22E+02
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	2.32E-06
Acidification Potential (AP) [kg SO2-Equiv.]	2.39E-02
Eutrophication Potential (EP_ [kg Phosphate-Equiv.]	2.94E-03
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	1.3E+01
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	2.87E-10
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	3.40E-03

Table 5: Environmental profile for the heaviest variant of ParaLink manufactured in the UK plant by Officine Maccaferri (Linear Composite)

IMPACT CATEGORY	Paralink – India
	Paralink 300
Abiotic Depletion (ADP fossil) [MJ]	7.20E+01
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	4.80E-07
Acidification Potential (AP) [kg SO2-Equiv.]	9.67E-03
Eutrophication Potential (EP_ [kg Phosphate-Equiv.]	9.14E-04
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	2.97E+00
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	2.66E-10
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	1.10E-03

Table 6: Environmental profile for the representative variant of ParaLink manufactured in the Indian plant by Officine Maccaferri (Linear Composite)

### 3. ENVIRONMENTAL PRODUCT DECLARATION

The validity of impact per variant is driven by the raw materials contribution, thus the potential environmental impacts proportionally increase with the weight of raw material per square meter. For this reason, in table 5 the environmental profile of the heaviest variant within the ParaLink family produced in India is reported.

IMPACT CATEGORY	Paralink – India
	Paralink L 1000
Abiotic Depletion (ADP fossil) [MJ]	2.34E+02
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	1.55E-06
Acidification Potential (AP) [kg SO2-Equiv.]	3.10E-02
Eutrophication Potential (EP_ [kg Phosphate-Equiv.]	2.94E-03
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	9.62E+00
Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	5.10E-10
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	3.57E-03

Table 7: Environmental profile for the heaviest variant of ParaLink manufactured in the Indian plant by Officine Maccaferri (Linear Composite)

### 3. ENVIRONMENTAL PRODUCT DECLARATION

#### 3.6 INDICATORS OF RESOURCES USE

INDICATOR OF RESOURCES	ParaLink UK
	ParaLink 200
Use of renewable primary energy excluding renewable primary resources used as raw materials [MJ, net calorific value]	4.12E+00
Use of renewable primary energy resources used as raw materials [MJ, net calorific value]	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	4.12E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials [MJ, net calorific value]	5.62E+01
Use of non-renewable primary energy resources used as raw materials [MJ, net calorific value]	2.38E+01
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	8.00E+01
Use of secondary material [kg]	0.00E+00
Use of non renewable secondary fuels [MJ, net calorific value]	1.03E-10
Use of renewable secondary fuels [MJ, net calorific value]	8.74E-12
Use of net fresh water [ $m^3$ ]	2.72E-02

Table 8: Indicators of resources use for Officine Maccaferri (Linear Composite) ParaLink manufactured in UK

### 3. ENVIRONMENTAL PRODUCT DECLARATION

#### 3.6 INDICATORS OF RESOURCES USE

INDICATOR OF RESOURCES	ParaLink India
	ParaLink 300 kN
Use of renewable primary energy excluding renewable primary resources used as raw materials [MJ, net calorific value]	5.12E+00
Use of renewable primary energy resources used as raw materials [MJ, net calorific value]	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	5.12E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials [MJ, net calorific value]	7.67E+01
Use of non-renewable primary energy resources used as raw materials [MJ, net calorific value]	3.32E+01
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) [MJ, net calorific value]	1.10E+02
Use of secondary material [kg]	0.00E+00
Use of non renewable secondary fuels [MJ, net calorific value]	1.60E-10
Use of renewable secondary fuels [MJ, net calorific value]	1.37E-11
Use of net fresh water [ $m^3$ ]	3.44E-02

Table 9: Indicators of resources use for Officine Maccaferri (Linear Composite) ParaLink manufactured in India

### 3. ENVIRONMENTAL PRODUCT DECLARATION

#### 3.7 INDICATORS OF WASTE AND OUTPUT FLOWS

INDICATOR OF WASTE	PARALINK - UK
	ParaLink 200
Hazardous waste disposed [kg]	5.21E-08
Non-hazardous waste disposed [kg]	1.22E-02
Radioactive waste disposed [kg]	1.68E-03

Table 10: Indicators of waste for Officine Maccaferri (Linear Composite) ParaLink manufactured in UK

INDICATOR OF WASTE	PARALINK - INDIA
	Paralink 300 kN
Hazardous waste disposed [kg]	2.16E-08
Non-hazardous waste disposed [kg]	4.54E-02
Radioactive waste disposed [kg]	1.87E-03

Table 11: Indicators of waste for Officine Maccaferri (Linear Composite) ParaLink manufactured in India



### 3. ENVIRONMENTAL PRODUCT DECLARATION

OUTPUT FLOWS	PARALINK - UK
	ParaLink 200
Components for reuse [kg]	0.00E+00
Material for recycling [kg]	1.66E-02
Materials for energy recovery [kg]	5.91E-04
Exported energy, electricity [MJ]	0.00E+00
Exported energy, thermal [MJ]	0.00E+00

Table 10: Output flows for Officine Maccaferri (Linear Composite) ParaLink manufactured in UK

OUTPUT FLOWS	PARALINK - INDIA
	Paralink 300 kN
Components for reuse [kg]	0.00E+00
Material for recycling [kg]	1.34E-02
Materials for energy recovery [kg]	1.09E-04
Exported energy, electricity [MJ]	0.00E+00
Exported energy, thermal [MJ]	0.00E+00

Table 11: Output flows for Officine Maccaferri (Linear Composite) ParaLink manufactured in India

EC-JRC, 2010. International reference Life Cycle data System Handbook. General Guidance for life cycle assessment. Detailed Guidance

Ecoinnovazione. 2018. Technical report: LCA study of ParaProducts for Civil Engineering works. version 3

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

International EPD® System, 2017. General Programme Instructions for the International EPD System, vers. 2.5

International EPD® System, 2012. PCR 2012:01 Construction products and construction services, version 2.2

International Organisation for Standardization (ISO), 2006a Environmental management – Life Cycle assessment – Principles and framework. ISO 14040:2006, Geneva

International Organisation for Standardization (ISO), 2006b Environmental management – Life Cycle assessment – Requirements and guidelines. ISO 14044:2006, Geneva

International Organisation for Standardization (ISO), 2006c Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures. ISO 14025:2006, Geneva

**ENVIRONMENTAL IMPACT:** Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects [ISO 14001:2004].

**ENVIRONMENTAL DECLARATION:** Claim which indicates the environmental aspects of a product or service. An environmental label or declaration may take the form of a statement, symbol or graphic on a product or package label, in product literature, in technical bulletins, in advertising or in publicity, amongst other things. [ISO 14020:2000].

**HAZARDOUS WASTE:** Hazardous waste is waste that poses substantial or potential threats to public health or the environment [EPD, General Programme Instructions 2.5].

**IMPACT CATEGORY:** Class representing environmental issues of concern to which life cycle inventory analysis results may be assigned [ISO 14040:2006]

**LIFE CYCLE ASSESSMENT (LCA):** Compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle [ISO 14040:2006]

**PRODUCT CATEGORY RULES (PCR):** Set of specific rules, requirements and guidelines for developing Type III environmental declarations for one or more product categories [ISO 14025:2006].

**RAW MATERIAL:** Primary or secondary material that is used to produce a product. Secondary material includes recycled material. [ISO 14040:2006]

**RECOVERED MATERIAL (SECONDARY MATERIAL):** Material that would have otherwise been disposed of as waste or used for energy recovery, but has instead been collected and recovered as a material input, in lieu of new primary material, for a recycling or a manufacturing process. [ISO 14021:1999].

**SYSTEM BOUNDARY:** Set of criteria specifying which unit processes are part of a product system [ISO 14040:2006].

**SVHC:** Substances that may have serious and often irreversible effects on human health and the environment can be identified as substances of very high concern (SVHCs). If a substance is identified as an SVHC, it will be added to the Candidate List for eventual inclusion in the Authorization List of the REACH Regulation). The inclusion in this list implicates legal duties for manufacturers, importers or companies, which use those substances as such, in formulation or in their products.

### 6.1 ADDITIONAL INFORMATION CONCERNING THE PROGRAMME AND THE EPD

EPDs within the same product category but from different programme may not be comparable.

EPDs 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. This EPD and the PCR CPC 54 "Construction products and Construction services" are available on the website of The International EPD® System ([www.environdec.com](http://www.environdec.com)).

The verifier and the Programme Operator do not make any claim nor have any responsibility of the legality of the products included in the present EPD.

The LCA study and the present EPD have been issued with the technical scientific support of Ecoinnovazione S.r.l., spin-off ENEA (<http://ecoinnovazione.it/?lang=en>).

### 6.2 ADDITIONAL INFORMATION ON THE PRODUCTS AND ON THE COMPANY

Our factory in United Kingdom and India are certified according to ISO 9001.


For further information on product characteristics, typical applications, technical datasheets and case histories, please visit our website ([maccaferri.com](http://maccaferri.com)) or contact us [info@maccaferri.com](mailto:info@maccaferri.com).

### 6.3 DIFFERENCES VS PREVIOUS VERSION

Editorial changes occurred respect the previous version in order to delete the reference to Maccaferri Industrial Group in paragraph 1.

## 7. VERIFICATION AND REGISTRATION

### CEN standard EN 15804 served as core PCR

EPD Programme:	The International EPD® System. For more information - <a href="http://www.environdec.com">www.environdec.com</a>
PCR:	PCR 2012:01 Construction products and construction services version 2.2
PCR review was conducted by:	The Technical Committee of the International EPD® System. Contact via <a href="mailto:info@environdec.com">info@environdec.com</a>
EPD Registration no:	S-P-01463
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EPD valid within the following geographical area:	International
Technical support:	Ecoinnovazione S.r.l. – spin-off ENEA - Via d'Azeglio 51, 40123 Bologna  ecoinnovazione spin off ENEA <a href="http://www.ecoinnovazione.it">www.ecoinnovazione.it</a>
Independent verification of the declaration and data according to ISO 14025:	EPD verification (external)
Third party verifier:	SGS SGS Italia S.p.A. Via Caldera 21, 20153 Milano. <a href="http://www.it.sgs.com">www.it.sgs.com</a>
Accredited or approved by:	Accredia, certificate n.006H