

# Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of the declaration:	Officine Maccaferri S.p.A.
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Kiwa-EE-000382EN
Issue date:	22.05.2024
Valid to:	22.05.2029



## RENO MATTRESSES

PoliMac coated double twist wire meshes



**1. General information**

**Officine Maccaferri S.p.A.**

**Programme operator:**

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 Kiwa GmbH, Ecobility Experts  
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 13355 Berlin  
 Germany

**Registration number:**

EPD-Kiwa-EE-000382-EN

**This declaration is based on the Product Category Rules:**

PCR B – Product Category Rules for steel construction products, Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13

**Issue date:**

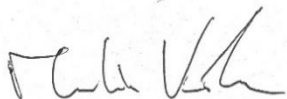
22.05.2024

**Valid to:**

22.05.2029



Raoul Mancke  
 (Head of programme operations, Kiwa-Ecobility Experts)



Martin Koehrer  
 (Verification body, Kiwa-Ecobility Experts)

**RENO MATTRESSES**

**Owner of the declaration:**

Officine Maccaferri S.p.A.  
 Via del Faggiolo, 1/12  
 40132 Bologna (BO)  
 Italy

**Declared product / declared unit:**

1 kg RENO MATTRESSES PoliMac coated double twist wire meshes including distribution packaging.

**Scope:**

The EPD is based on the composition product RENO MATTRESSES 5x3x0.3 6X8 D22 PMC. The LCA results are also representative of the others dimensions of RENO MATTRESSES PoliMac coated double twist wire meshes.

Kiwa-Ecobility Experts assumes no liability for manufacturer's information, LCA data and evidence.

**Verification**

The European standard EN 15804+A2:2019 serves as the core PCR.

Independent verification of the declaration and data according to ISO 14025: 2010.

internal

external



Dr.-Ing. Morteza Nikravan  
 (External verifier of Kiwa GmbH)

## 2. Product

### 2.1 Product description

RENO MATTRESSES and RENO MATTRESSES PLUS engineered steel wire baskets manufactured from hexagonal double twisted wire mesh, galvanised (Zinc Aluminium alloy in accordance with EN 10244-2 and ISO 7989-2 - Class A), and with an additional polymer (PoliMac) coating. Delivered flat-packed, the RENO MATTRESSES and RENO MATTRESSES PLUS are assembled and then filled with stones at the project site. The following products name are covered by the present EPD.

RENO MATTRESSES units are divided into uniformly partitioned cells by internal diaphragms. These partition diaphragms are made by pleating the base unit at given distance to form a double-mesh fold. This manufacturing procedure improves the diaphragm stability during filling operations. To reinforce the structure, all mesh panel edges are selvedged with a wire having a greater diameter.

RENO MATTRESS PLUS units are supplied together with vertical ties (X-Ties) connecting the base panel to the lid and to be installed on the site, to secure a tighter packing of the filling stones and improve their hydraulic performances.

RENOMAC and RENOMAC PLUS units are designed to be pre-filled with stones and ready to be installed on the project site.

RENO MATTRESSES comply with EN 10223-3:2013.



### 2.2 Application (Intended Use of the product)

RENO MATTRESSES are filled with stones at the project site to form flexible, permeable, monolithic structures such as riverbank protection and channel linings for erosion control projects.

Maccaferri RENO MATTRESSES are made from high quality steel wire, which is heavily galvanised. An additional protective polymeric coating “PoliMac” is also applied in order to be used in aggressive environments, or where a longer design life is required.

RENO MATTRESSES PoliMac coated are CE marked in compliance with Regulation (EU) 305/2011, according to EAD 200039 and EAD 200019.

### 2.3 Reference Service Life (RSL)

The typical service life is up to 120 years, according to related Declaration of Performance. Durability of the products are defined as per EN 10223-3 and tested accordingly.

### 2.4 Technical data

Characteristics (*)	Unit	Value
Double twist wire mesh tensile Strength (EN 10223-3:2013)	≥ 37	kN/m
Production route (EAF or BOF)	%	75.39 EAF – 24.61 BOF
Durability (EN 10223-3:2013)	120 years in environmental conditions C2, C3, C4 and C5 as per Annex A of EN 10223-3:2013	

(\*) Further Performances are detailed in Declaration of Performance according to Regulation (EU) 305/2011.

### 2.5 Substances of very high concern

RENO MATTRESSES PoliMac coated do not contain SVHC.

### 2.6 Base materials / Ancillary materials

The composition of the reference products is reported in Table below. The products are implemented with galvanized steel wire (for the mesh, for the edges and for vertical ties) PoliMac coated (coating thickness 0.5 mm).

PoliMac is an extruded polymer specifically developed by Maccaferri.

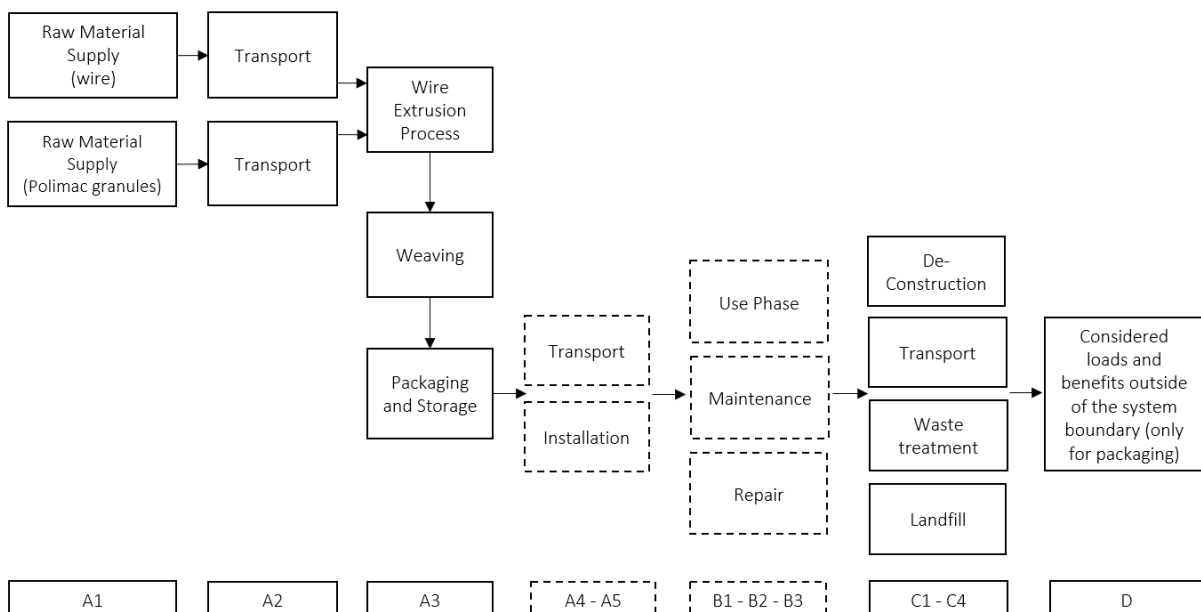
Raw material	Unit	Value
PoliMac	kg	0.113
Steel (galvanized steel)	kg	0.915

The reference CPC code is 412 “Products of iron or steel”.

### 2.7 Manufacturing

The manufacturing is managed in the Senica plant (Slovakia) by Maccaferri Manufacturing Europe s.r.o., in Shijak plant (Albania) by Maccaferri Balkans Sh.p.k., both subsidiaries of Officine Maccaferri S.p.A.

The production process includes the weaving of the double twist wire mesh, starting from steel wire, onto which the PoliMac coating can be applied at the plant through the extrusion process of the polymer.



## 2.8 Other Information

Further technical characteristics and information of the RENO MATTRESSES PoliMac are detailed and available on the Maccaferri website (<https://www.maccaferri.com/>).

According to Construction Product Regulation (EU) 305/2011 the essential technical characteristics, as per Harmonized Documents EAD 200039 and EAD 200019, are reported in the Declaration of Performances (DOP).

## 3. LCA: Calculation rules

### 3.1 Declared unit

In accordance with the PCR B, 1 kg of RENO MATTRESSES PoliMac coated double twist wire meshes is chosen as the declared unit.

Product	Unit weight (kg)
RENO MATTRESSES 5x3x0.3 6X8 D22 PMC	1

### 3.2 Scope of declaration and system boundaries

This a cradle to gate with modules C1-C4 and module D. More precisely, the following processes were accounted for each module:

A1 - Production of raw materials used in the products, as well as the production of energy carriers used in the production process.

A2 - Transport of raw materials to the manufacturing site and internal handling.

A3 - Manufacturing of the Officine Maccaferri RENO MATTRESSES which includes the manufacturing steps reported in section 2.7 as well as the production of the distribution packaging and of the ancillary material. In addition, the treatment of waste generated from the distribution packaging are accounted for.

C1 - Disassembly of the packaging was considered to be insignificant and equal to zero.

C2 - Transport from collection point to waste processing and disposal site.

C3 - Shredding and sorting of fractions for recycling.

C4 - Landfill of material fractions not recycled.

D - Benefit and load beyond the product system.

Description of the system boundary																
Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from manufacturer to place of use	Construction-installation process	Use	Mainnce	Repair	Replacement	Refurbishment	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

X=Module declared | MND=Module not declared

### 3.3 Geographical reference area

All process-specific data was collected for the operating year 2022-2023. Geographical reference area is global.

### 3.4 Cut-off Criteria

The cut-off applied are related to the packaging of chemicals products and lubricating oil used in the production process.

### 3.5 Allocation

A mass allocation based on the weight of the production volumes has been applied.

### 3.6 Data collection and reference time period

Specific data were collected at Senica plant (Slovakia) and at Shijak plant (Albania) considering an annual average referred to 2022, whereas the most updated selected generic datasets available in the LCI databases were used for the other modules. Thus, in line with PCR A requirements, manufacturer-specific data is not older than 5 years and generic data is not older than 10 years.

### 3.7 Estimates and assumptions

The main assumptions are related to distances of inbound and background transportations. It was also assumed that liquid and gas auxiliaries are unpacked and supplied in tanker trucks.

### 3.8 Comparability

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

**4. LCA: Scenarios and additional technical information**

As these products are used as structural components for retaining walls, channel linings, embankment protection, hydraulic control structures, erosion protection, drapery systems that control and prevent rock fall and the flow of loose debris, soil nailing systems and earth retaining structures: they are therefore intended never to be removed. For this reason, an end of life equal to zero was assumed.

Regarding the end of life of packaging components, the following scenarios were applied:

- The end-of-life plastic component was, conservatively, incinerated.
- The end of life of the wooden pallet was taken from the PEF Guidance.
- The end-of-life steel component was recycled.

Processes	Unit (expressed per FU or DU of components, products or materials and by type of material)	RENO MATTRESSES 5x3x0.3 6X8 D22 PMC
Collection process specified by type	Kg collected separately	Polymer: 5.14E-04 kg
		Wood: 3.29E-03 kg
		Steel: 6.17E-04 kg
Recovery system specified by type	Kg for reuse	Wood: 9.87E-04 kg
	Kg for recycling	Steel: 6.17E-04 kg
	Kg for energy recovery	Wood: 1.04E-03 kg
Polymer: 5.14E-04 kg		
Disposal specified by type	Kg product or material for final deposition	Landfill (Wood): 1.23E-03 kg

**5. LCA: Results**

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared average product.

**LCA results - Indicators describing environmental impacts based on the impact assessment (LCIA): 1 kg RENO MATTRESSES 5x3x0.3 6X8 D22 PMC (EN 15804+A2)**

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
<b>Core environmental impact indicators (EN 15804+A2)</b>							
GWP-total	kg CO2 eqv.	1.65E+00	0.00E+00	3.71E-05	1.68E-03	3.66E-03	-1.22E-03
GWP-f	kg CO2 eqv.	1.64E+00	0.00E+00	3.73E-05	2.85E-05	1.37E-03	-1.22E-03
GWP-b	kg CO2 eqv.	5.49E-03	0.00E+00	-5.51E-07	1.65E-03	2.29E-03	-3.95E-06
GWP-luluc	kg CO2 eqv.	1.23E-03	0.00E+00	3.45E-07	6.55E-09	9.11E-08	-1.68E-07
ODP	kg CFC 11 eqv.	9.98E-12	0.00E+00	3.26E-18	1.67E-16	3.94E-16	-6.67E-15
AP	mol H+ eqv.	5.15E-03	0.00E+00	1.96E-07	2.76E-07	6.95E-07	-1.77E-06
EPfr	kg P eqv.	3.57E-06	0.00E+00	1.36E-10	4.72E-11	3.79E-09	-1.55E-09
EPmar	kg N eqv.	1.59E-03	0.00E+00	9.46E-08	7.93E-08	8.58E-07	-4.89E-07
EPter	mol N eqv.	1.72E-02	0.00E+00	1.05E-06	1.14E-06	2.84E-06	-5.25E-06
POCP	kg NMVOC eqv.	5.04E-03	0.00E+00	1.85E-07	2.18E-07	1.47E-06	-1.44E-06
ADP-e	kg Sb-eqv.	3.64E-05	0.00E+00	2.42E-12	1.56E-12	4.47E-12	-7.06E-11
ADP-f	MJ	2.78E+01	0.00E+00	5.06E-04	4.22E-04	1.84E-03	-1.97E-02
WU	m3 world eqv.	1.48E-01	0.00E+00	4.29E-07	1.85E-04	1.32E-04	-9.29E-05
<b>Additional environmental impact indicators (EN 15804+A2)</b>							
PM	disease incidence	1.65E+00	0.00E+00	3.71E-05	1.68E-03	3.66E-03	-1.22E-03
IR	kBq U235 eqv.	1.64E+00	0.00E+00	3.73E-05	2.85E-05	1.37E-03	-1.22E-03
ETP-fw	CTUe	5.49E-03	0.00E+00	-5.51E-07	1.65E-03	2.29E-03	-3.95E-06
HTP-c	CTUh	1.23E-03	0.00E+00	3.45E-07	6.55E-09	9.11E-08	-1.68E-07
HTP-nc	CTUh	9.98E-12	0.00E+00	3.26E-18	1.67E-16	3.94E-16	-6.67E-15
SQP	Pt	5.15E-03	0.00E+00	1.96E-07	2.76E-07	6.95E-07	-1.77E-06
<p><b>ADP-e</b>= Abiotic depletion potential for non-fossil resources   <b>ADP-f</b>=Abiotic depletion for fossil resources potential   <b>AP</b>= Acidification potential, Accumulated Exceedance   <b>EPfr</b>= Eutrophication potential, fraction of nutrients reaching freshwater end compartment   <b>EPmar</b>= Eutrophication potential, fraction of nutrients reaching marine end compartment  <b>EPter</b>= Eutrophication potential, Accumulated Exceedance   <b>GWP-b</b>=Global Warming Potential biogenic   <b>GWP-f</b>=Global Warming Potential fossil fuels   <b>GWP-luc</b>=Global Warming Potential land use and land use change  <b>GWP-total</b>=Global Warming Potential total  <b>ODP</b>=Depletion potential of the stratospheric ozone layer  <b>POCP</b>=Formation potential of tropospheric ozone   <b>WU</b>=Water (user) deprivation potential, deprivation- weighted water consumption   <b>ETP-fw</b>=Potential Comparative Toxic Unit for ecosystems   <b>HTP-c</b>=Potential Toxic Unit for Humans toxicity, cancer   <b>HTP-nc</b>= Potential Toxic Unit for humans, non-cancer   <b>IRP</b>=Potential Human exposure efficiency relative to U235, human health   <b>PM</b>=Potential incidence of disease due to Particulate Matter emissions   <b>SQP</b>=Potential soil quality index</p>							

Disclaimer on ADP-e, ADP-f, WU, ETP-fr, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.



**LCA results - Indicators describing resource use and environmental information derived from life cycle inventory (LCI): 1 kg RENO MATTRESSES 5x3x0.3 6X8 D22 PMC (EN 15804+A2)**

Parameter	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	6.83E+00	0.00E+00	3.58E-05	1.05E-04	2.52E-04	-4.75E-03
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	6.83E+00	0.00E+00	3.58E-05	1.05E-04	2.52E-04	-4.75E-03
PENRE	MJ	2.79E+01	0.00E+00	5.08E-04	4.23E-04	1.84E-03	-1.97E-02
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.79E+01	0.00E+00	5.08E-04	4.23E-04	1.84E-03	-1.97E-02
SM	Kg	7.32E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	M3	7.00E-03	0.00E+00	3.95E-08	4.35E-06	3.17E-06	-4.26E-06
HWD	Kg	4.63E-07	0.00E+00	1.88E-15	9.55E-15	1.11E-13	-9.99E-13
NHWD	Kg	7.62E-02	0.00E+00	7.32E-08	3.31E-05	8.48E-04	-1.25E-05
RWD	Kg	1.26E-03	0.00E+00	6.56E-10	2.39E-08	3.55E-08	-1.31E-06
CRU	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	Kg	4.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.17E-04
MER	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E-03
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.17E-03

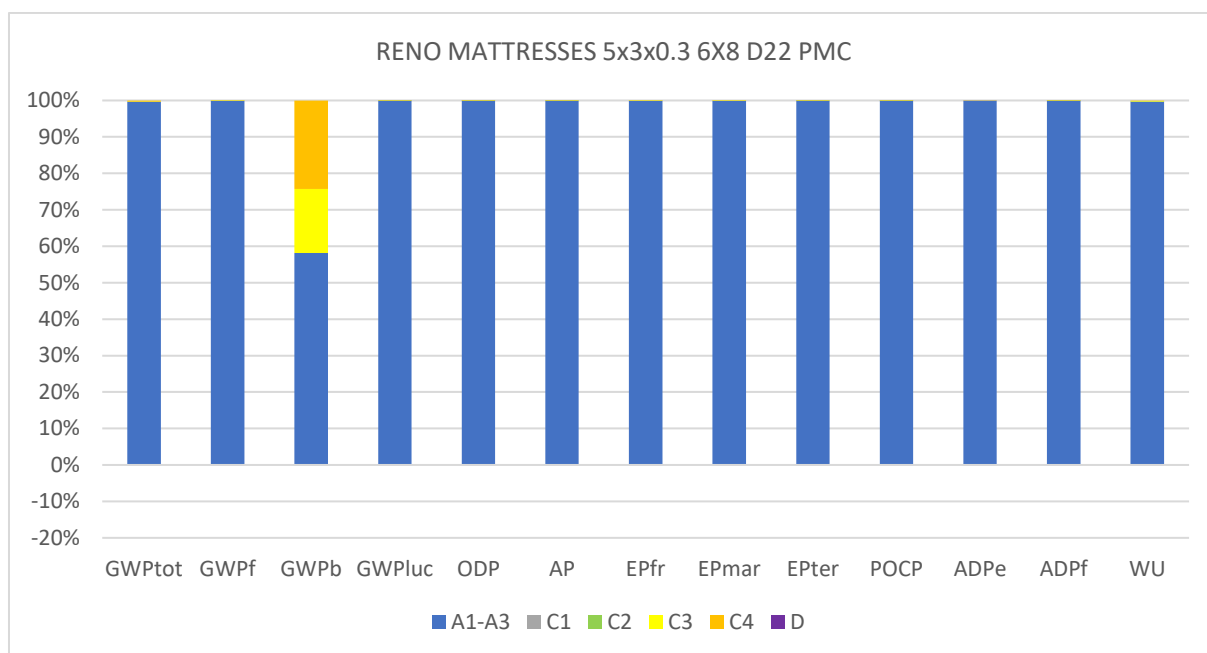
PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw materials | PERM= Use of renewable primary energy resources used as raw materials | PERT=Total use of renewable primary energy resources | PENRE= Use of non-renewable primary energy excluding non-renewable primary 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 fresh water | 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 | EET=Exported energy, thermal | EE=Exported energy, electrical

**LCA results - information on biogenic carbon content at the factory gate: 1 kg RENO MATTRESSES 5x3x0.3 6X8 D22 PMC (EN 15804+A2)**

Parameter	Unit	Value
biogenic carbon content in product	kg C	0
biogenic carbon content in accompanying packaging	kg C	1.31E-03
NOTE 1 kg biogenic carbon is equivalent to 44/12 kg CO <sub>2</sub>		

**6. LCA: Interpretation**

The analysis of the contribution of each module to the impacts of RENO MATTRESSES 5x3x0.3 6X8 D22 PMC is shown in the graph below. It can be observed that the impacts are driven by modules A1-A3, while the contribution of the other modules is about 1% for all impact categories analyzed, except for biogenic GWP, whose impacts are driven by the disposal of wood waste of distribution packaging. The contribution of module D is negligible (<1%) compared to modules A1-A3.



## 7. References

Ecoinnovazione; 2024. Technical report: LCA study of plastic-coated Double Twist Products for Geoen-gineering works.

ISO 14040:2006, Environmental management - Life cycle assessment - Principles and framework

ISO 14044:2006, Environmental management - Life cycle assessment - Requirements and guidelines

ISO 14025:2010: Environmental labels and declarations — Type III environmental declarations — Principles and procedures EN 13249

EN 15804:2012+A2:2019/AC:2021 Sustainability of construction works — Environmental Product Decla-rations — Core rules for the product category of construction products

PCR A: General Program Category Rules for Construction Products from the EPD program Kiwa-Ecobil-ity Experts, R.0\_2021-07-16

PCR B: Kiwa-Ecobility Experts, Berlin, 2020: PCR B – Product Category Rules for steel construction prod-ucts, Requirements on the Environmental Product Declarations for steel construction products; Ver-sion 2020-03-13 (draft)

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