ENVIRONMENTAL PRODUCT DECLARATION (EPD) FOR WOOD CEMENT BLOCKS

ISOTEX®
BLOCCHI E SOLAI IN LEGNO CEMENTO

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Programme operator: The International EPD ® System –
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SUMMARY

1 PROGRAMME RELATED INFORMATION

This EPD is developed under the program The International EPD ® System, 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 2.3.

More information about the International EPD ® System is available on the website:
https://www.environdec.com/

2 PRODUCT RELATED INFORMATION

2.1 THE COMPANY

ISOTEX is the first Italian company which manufacture wood cement blocks. This building system technique has been used in Germany since 1946.
So far, the ISOTEX® systems has been used in around 400,000 homes in Europe (of which approximately in Italy), due to the high reliability obtained by ISOTEX Company and its products in these years.

The manufacturing process is entirely performed in the company's site and make use of procedures and fully automatized machinery, which guarantees high quality and precise products.
More in detail, the company uses in its products just recycled wood (post-consumer) and as a such it performs accurate check on the quality of wood reaching the factory in order to validate the supply.
The company is equipped with machinery to check the specific characteristics of used raw materials, with special focus on the wood, and to adjust the mixture accordingly in order to keep constant and at the desired level the characteristics of the wood-cement produced.
ISOTEX owns a on site laboratory with equipment compliant to the requirements of the specific standard for checks and controls which are performed on each production lot are performed, including checks on specific weight (density) of the wood cement and mechanical tests.
Finally, the company is committed in the reduction and limitation of energy and resources from the environment. Indeed, the company re-uses in the production the wood cement products eventually not compliant and the scrap as well. In addition, the company has recently substituted part of the diesel forklift for the internal handling of the products with electric ones and has installed a Photovoltaic System for electricity generation.

Safety and living comfort represent the ISOTEX main goals for developing its building system. The technical performance of the products, in accordance with current Italian and European regulations, is guaranteed with tests in laboratories, university institutes and third party certification bodies.

The ISOTEX building system, with blocks and panels in wood cement, is the most widely used alternative to the traditional systems. Thanks to ease of use, remarkable technical characteristics, high-level living comfort and competitive costs, ISOTEX is the European leader company for the manufacturing of wood cement blocks and panels in wood-cement for over 30 years. Moreover, the company has become a reference point for technicians, builders and sellers.

The company has been implemented a quality management system according to the EN ISO 9001:2008 standard and it is certified by ANAB-ICEA (Italian National Association for Green Construction) for green construction material.

Figure 1: View of the ISOTEX site

2.2 THE PRODUCTS

The present EPD covers the family of products "wood-cement blocks for walls systems" produced by ISOTEX Srl in the production site of Poviglio (Reggio Emilia, Italy). The products are used for the construction of wall systems.

More in details, products included in the present EPD as single profile are listed below:

- HB 20
- HB 25/16
- HB 30/19
- HDIII 30/07 (NS)
- HDIII 33/10 (NS)
- HDIII 44/15-2
- HB 25/4

In addition, an average value for special blocks for pillar, corner and shoulder, calculated based on the respective production volume in 2017, is presented in this EPD. More precisely, the average profile of the special block has been calculated considering the following references:

- HDIII 30/07 (UNI)
- HDIII 33/10 (UNI and PILLAR)
- HDIII 38/14 - with insulation in EPS with graphite (UNI and PILLAR)
- HDIII 38/14 - with insulation in cork (UNI and PILLAR)
- HDIII 44/20 (UNI and PILLAR)

NS identify the Normal Standard block, UNI identifies the special block for corner and shoulder, PILLAR identifies the special block for pillar.

Lastly, the environmental profiles of the HDIII 38/14 (NS) with insulation layer in cork, HDIII 38/14 (NS) - with insulation in EPS with graphite and HDIII 44/20 (NS)- with insulation in EPS with graphite wood cement blocks are published in the INIES website.

Wood cement blocks are products used for the construction of load-bearing wall systems. Blocks are compliant with the standard UNI EN 15498 “Precast concrete products - Wood-chip concrete shuttering blocks - Product properties and performance”.

They are produced starting from fir wood grinded and refined, and bonded by cement Portland. The wood in input is recycled wood exclusively from pallets at end-of-life, selected and not treated. The thickness of the blocks under study varies between 20 and 44 cm. In the blocks an insulation layer of EPS with graphite or cork can be inserted for improving the thermal performance. A picture of block with and without insulation and special blocks is shown in Figure 2. The production process is represented in Figure 3., whereas the main characteristics of the blocks are summarised in Table 1.

Figure 2: ISOTEX® wood cement block without insulation (on the left), with insulation (on the centre) and special blocks (on the right)

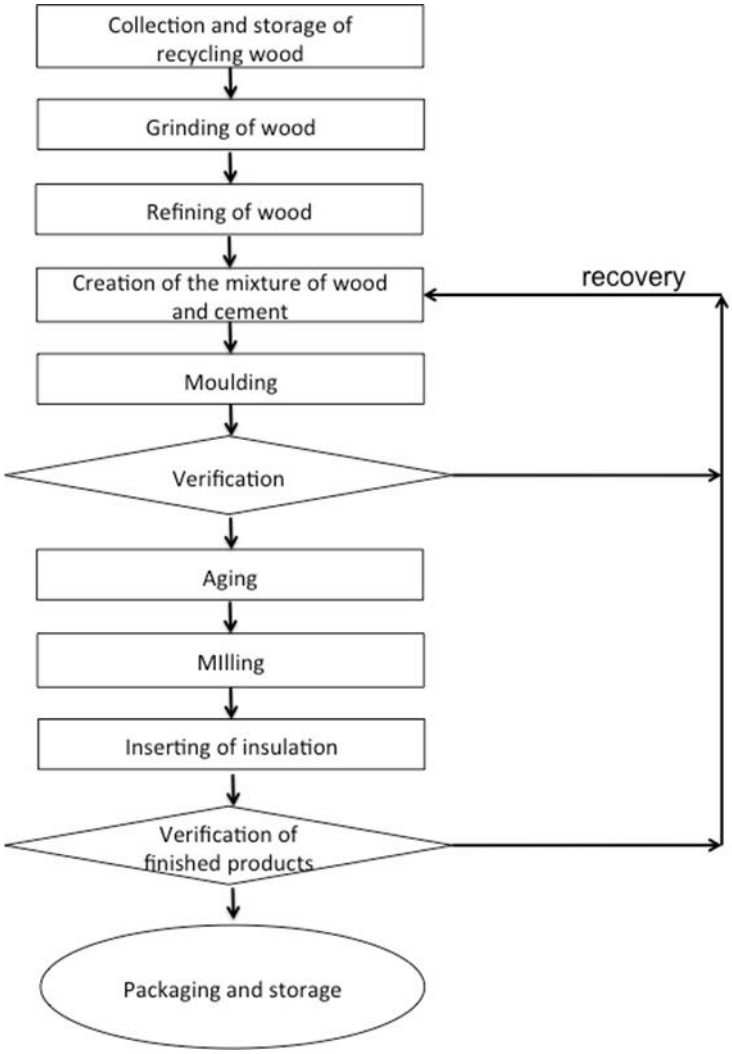


Figure 3: Production process of the wood cement blocks for wall systems

Table 1: main technical characteristics of the ISOTEX® wood cement blocks for wall system

Technical Characteristics	Reference						
	HB 20	HB 25/16	HB 30/19	HDIII 30/7 (EPS with graphite)[1]	HDIII 33/10 (EPS with graphite)[1]	HB 44/15-2[1]	HB 25/4
Maximum indicative load $R_{cK} \geq 30$ N/mm² **inter-floor h: 3,00 m [t/m]**	20	34	45	35	35	32+32	17
Thermal transmittance U of finished wall (with plaster), including surfaces resistances (Three-dimensional method) [W/m²K][2)]	-	0,79	0,68	0,34	0,27	0,56	-
Thermal transmittance U of finished wall (with plaster), including surfaces resistances (Two-dimensional method) [W/m²K][3)]	-	-	-	0,30	0,23	-	0,44
Periodic Thermal Transmittance Y_{IE} [W/m²K]	-	-	-	0,019	0,014	-	-
Summer phase shifts values	Not applicable	-	-	12H19’	12H43’	-	-
Acoustic insulation R_w [dB] of finished wall (with plaster)[4)]	-	56	55	54	54	60	-
Filling concrete [l/m²]	110	126	151	130	130	236	100

Thickness of shells [cm]	3	4,5	5,5	4	4	4,5	4,5
Thickness of concrete [cm]	14	16	19	15	15	15+15	12
Thickness of thermal insulation (EPS graphite or cork)	-	-	-	7	10	-	4
Fire resistance REI class for concrete filled wall (without plaster) [5]	-	120	120	120	120	120	-
Reaction to Fire	Euroclasse B-s1. d0						

1) the reported technical characteristics refer to the “NS” version of the reference;
2) reference standards UNI EN 10355 and UNI EN ISO 6946
3) reference standards UNI EN ISO 6946, UNI EN 13788, UNI 10355 and UNI EN 10351
4) from Laboratory test in compliance with UNI EN ISO 10140 and UNI EN ISO 717;
5) from Laboratory test in compliance with NF EN 1365-1 and NF EN 13501-2.

2.2.1 PRODUCT COMPOSITION

The content of SVHC does not exceed 0.1 % of the weight of the product. The products' composition together with the total weight referred to 1 m^2 of products are reported in Table 2.

Table 2: BoM of ISOTEX® wood cement blocks (referred to 1 m^2 of products)

Material and specification (in brackets)	UM	HB25/4	HB20	HB 25/16	HB 30/19	HDIII 30/7 NS	HDIII 33/10 NS	HDIII 44/15-2	Average special block[1]
Portland cement (Cement)	kg	39.35	27.49	39.34	47.44	38.81	43.12	65.76	48.18
Fir (Wood)	kg	27.02	18.87	27.02	32.57	26.65	29.61	45.15	33.08
Hydraulic lime, clinker based (Lime)	kg	4.03	2.82	4.03	4.86	3.97	4.42	6.74	4.94
Iron oxide (Pigment suspension)	kg	0.23	0.16	0.23	0.27	0.23	0.25	0.39	0.28
PSE with graphite (Insulation)	kg	0.6	-	-	-	1.04	1.5	-	1.81
Cork (insulation)	kg	-	-	-	-	-	-	-	-
PP strap (primary packaging)	kg	0.05	0.04	0.05	0.06	0.06	0.06	0.08	0.07

[1] It should be noted that the product composition reported in table 2 is referred to an average composition of the UNI and PILLAR wood-cement blocks, calculated based on the respective production volume in 2017.

3 ENVIRONMENTAL PRODUCT DECLARATION

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:

- ISO 14040: 2006;
- ISO 14044: 2006;
- ILCD, International Reference Life Cycle Data System, Handbook. General Guidance for life cycle assessment. Detailed Guidance;
- ISO 14025:2006,
- International EPD System, General Programme Instructions for the International EPD System vers. 2.5;
- International EPD System, 2012:01 Construction products and construction services, version 2.3;
- EN 15804:2012+A1:2013 "Sustainability of construction works, Environmental product declarations, Core rules for the product category of construction products".

The goal of the study is the evaluation of the potential environmental impacts of wood-cement blocks listed in section 2.2.

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 LCIA method used is CML 2001 version 4.2 (April 2013).

3.2 DECLARED UNIT

The declared unit is 1 m^2 of surface composed of ISOTEX® wood cement blocks.

3.3 SYSTEM BOUNDARY

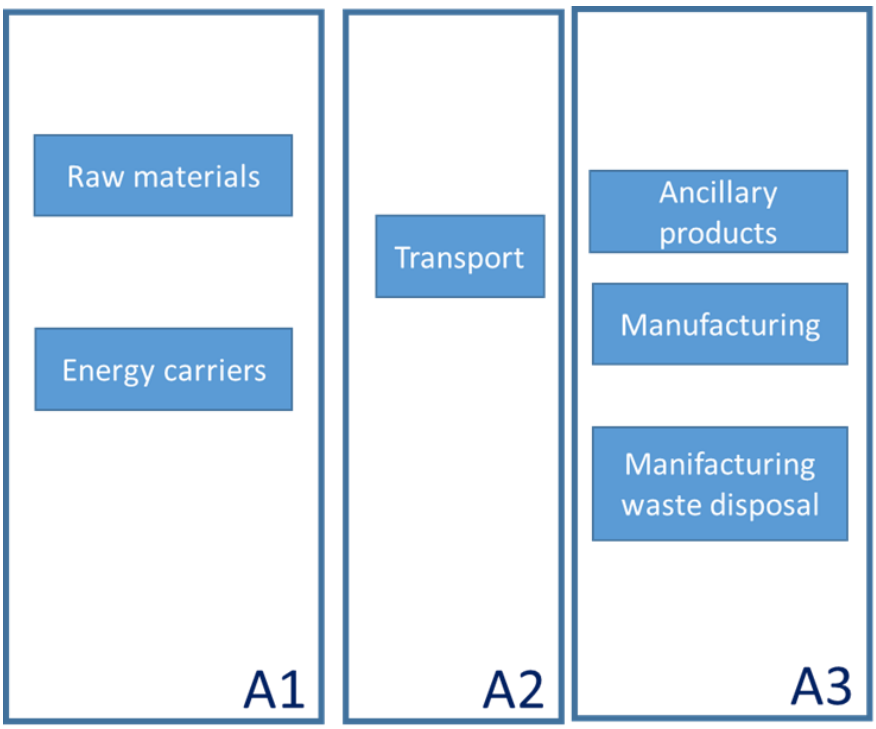
System boundaries are "from cradle to gate" as represented in Table 3 and in showed in Figure 4.

Table 3: Life cycle stages included in the study for ISOTEX® wood cement blocks

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE					END-OF-LIFE STAGE				BENEFITS and LOADS BEYOND SYSTEM BOUNDARY
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
Raw Material Supply	Transport	Manufacturing	Transport to the installation site	Construction, Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction, Demolition	Transport	Waste processing	Disposal	Reuse, Recycling potential
x	x	x	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*	Mnd*

* Module Not Declared

Figure 4: System boundaries for the ISOTEX® wood cement blocks



The following stages are included in the study:

Raw Material 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 and internal handling (A2)

Manufacturing of the ISOTEX® wood cement blocks (A3). It includes:

- Collection and storage of (recycled) wood
- Grinding and refining of wood
- Creation of the mixture of wood-cement
- Moulding of blocks and check on semi-finished products
- Aging of blocks
- Milling of blocks
- Inserting of insulation in PSE with graphite
- Final check on finished products and packaging.

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 purchased electricity used in the manufacturing processes is from a specific supplier from Italy.

The reference year of the study is 2017.

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 were not available.
- For the energy consumption and the ancillary consumption in the manufacturing process, an allocation based on the mass of wood-cement has been applied.
- All the impacts related to the on-site production of energy have been allocated to the manufacturing process as conservative approach.
- For modelling the specific electricity mix purchased by ISOTEX from an Italian electricity supplier, the Guarantee of Origin certificate was used as reference for the composition of the energy sources, more in detail the last GO available at the moment of the development of the present EPD, i.e. 2016.

The construction of the manufacturing site (capital goods) in not included in the LCA study.

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

3.5 PARAMETERS DESCRIBING THE ENVIRONMENTAL IMPACTS

Table 4: Environmental profile for the ISOTEX® wood cement blocks

Impact category	Module A1- A3							
	HB 20	HB 25/16	HB 30/19	HDIII 33/10 NS	HDIII 30/7 NS	HDIII 44/15-2	HB 25/4 graphite	average special block*
Abiotic Depletion (ADP elements) [kg Sb-Equiv.]	1,28E+02	1,83E+02	2,20E+02	3,29E+02	2,70E+02	3,05E+02	2,34E+02	3,79E+02
Abiotic Depletion (ADP fossil) [MJ]	7,59E-06	1,09E-05	1,31E-05	1,24E-05	1,10E-05	1,82E-05	1,10E-05	1,39E-05
Acidification Potential (AP) [kg SO2-Equiv.]	3,70E-02	5,29E-02	6,38E-02	6,47E-02	5,69E-02	8,84E-02	5,56E-02	7,29E-02
Eutrophication Potential (EP) [kg Phosphate-Equiv.]	5,54E-03	7,93E-03	9,56E-03	9,50E-03	8,39E-03	1,33E-02	8,26E-03	1,07E-02
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	2,64E+01	3,78E+01	4,55E+01	4,58E+01	4,03E+01	6,31E+01	3,95E+01	5,15E+01

Ozone Layer Depletion Potential (ODP, steady state) [kg R11-Equiv.]	**4,65E-10**	**6,68E-10**	**7,85E-10**	**7,58E-10**	**6,90E-10**	**1,13E-09**	**6,81E-10**	**8,52E-10**
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	**3,12E-03**	**4,46E-03**	**5,38E-03**	**2,80E-02**	**2,04E-02**	**7,45E-03**	**1,37E-02**	**3,34E-02**

* The variability of impacts for products included in the average special block sub-family is higher than 10%.

3.6 INDICATORS OF RESOURCES USE

Table 5: Indicators of resources use for the ISOTEX® wood cement blocks

Indicators of resources use	Modules A1-A3							
	HB 20	HB 25/16	HB 30/19	HDIII 33/10 NS	HDII 30/7 NS	HDIII 44/15-2	HB 25/4 graphite	average special block
PERE [MJ, net calorific value]	6,51E+01	9,31E+01	1,12E+02	1,04E+02	9,33E+01	1,56E+02	9,39E+01	1,17E+02
PERM [MJ, net calorific value]	2,31E+02	3,29E+02	3,98E+02	3,61E+02	3,26E+02	5,51E+02	3,29E+02	4,04E+02
PERT [MJ, net calorific value]	2,96E+02	4,22E+02	5,10E+02	4,65E+02	4,19E+02	7,07E+02	4,23E+02	5,20E+02
PENRE [MJ, net calorific value]	1,43E+02	2,04E+02	2,46E+02	3,55E+02	2,93E+02	3,41E+02	2,56E+02	4,08E+02
PENRM [MJ, net calorific value]	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT [MJ, net calorific value]	1,43E+02	2,04E+02	2,46E+02	3,55E+02	2,93E+02	3,41E+02	2,56E+02	4,08E+02
SM [kg]	1,89E+01	2,70E+01	3,26E+01	2,96E+01	2,67E+01	4,52E+01	2,70E+01	3,31E+01

NRSF [MJ, net calorific value]	2,49E+01	3,57E+01	4,30E+01	3,91E+01	3,52E+01	5,96E+01	3,57E+01	4,37E+01
RSF [MJ, net calorific value]	4,08E-15	5,43E-15	6,53E-15	6,24E-15	5,96E-15	8,87E-15	5,43E-15	7,14E-15
FW [m^3]	1,39E-01	1,99E-01	2,39E-01	2,45E-01	2,16E-01	3,33E-01	9,39E+01	2,77E-01

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; NRSF = Use of non-renewable secondary fuels; RSF = Use of renewable secondary fuels; FW = Net use of fresh water

3.7 INDICATORS OF WASTE

Table 6: Indicators of waste for the ISOTEX® wood cement blocks

	Modules A1-A3							
Indicators of waste	**HB 20**	**HB 25/16**	**HB 30/19**	**HDIII 33/10 NS**	**HDIII 30/7 NS**	**HDIII 44/15-2**	**HB 25/4 graphite**	**average special block**
Hazardous waste disposed [kg]	9,56E-07	1,37E-06	1,65E-06	1,54E-06	1,38E-06	2,29E-06	1,39E-06	1,72E-06
Non-hazardous waste disposed [kg]	1,93E-01	2,75E-01	3,32E-01	3,53E-01	3,08E-01	4,60E-01	2,96E-01	4,00E-01
Radioactive waste disposed [kg]	5,91E-03	8,44E-03	1,02E-02	9,99E-03	8,86E-03	1,41E-02	8,73E-03	1,12E-02

4 REFERENCE

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 wood cement products and components for wall and flooring systems and for acoustic barriers

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 2.3

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 Cyle 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

5 GLOSSARY

ENVIRONMENTAL IMPACT: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects [ISO 14001:2015].

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 (RECLAIMED) MATERIAL: Material that would have otherwise been disposed of as waste or used for energy recovery but has instead been collected and recovered (reclaimed) as a material input, in lieu of new primary material, for a recycling or a manufacturing process. [ISO 14021:2016].

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 o companies, which use those substances as such, in formulation or in their products.

6 ADDITIONAL INFORMATION

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).
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.
Additional information on the company and on the products covered by the present EPD are available at https://www.blocchiisotex.com/

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).

7 VERIFICATION AND REGISTRATION

CEN standard EN 15804 served as core PCR	
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Third party verifier:	Tecnalia R&I Certificación
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