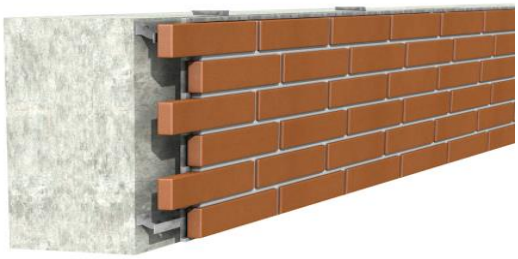
ENVIRONMENTAL PRODUCT DECLARATION No. 214 /2021

Issuance date: 10.05.2021
Validity date: 10.05.2026

The Stofix Brick Cladding System



EPD Program Operator:

Instytut Techniki Budowlanej[1]
Address: Filtrowa 1. 00-611 Warsaw, Poland
Website: www.itb.pl
Contact: Michał Piasecki. PhD D.Sc.eng
m.piasecki@itb.pl. energia@itb.pl

EPD Owner:

Stofix Poland Sp. z o.o.
Address ul. Krzysztofa Kolumba 8
Gorlice. Poland
Postcode: 62-052
Telephone number: +48 48 571 264 118
Internet address: www.stofix.com
E-mail address: poland@stofix.com

ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Environmental Product Declaration (EPD) based on ISO 14067:2018. Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification and verified according to ISO 14025 by an external auditor. It contains the information on the carbon impacts (as GWP indicator) of the declared construction materials on the environment. Their aspects were verified by the independent body according to ISO 14025. Basically. a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804 and ISO 14067:2018.

Life cycle analysis (LCA): A1-A4, C1-C4 and D in accordance with EN 15804
The year of preparing the EPD: 2021
Product standard: ETAG 034/ EAD 090062-00-0404:2018
Service Life: 150 years (value declared by the manufacturer)
Declared unit: 1 m^2 of the Stofix Brick Cladding System
Reasons for performing LCA: B2B
Representativeness: Polish production (2020)

[1] *ITB is an accredited and notified body for certification of products (ID number 1488) - conducts certification activities within the scope of certification of products and construction services and the factory production control by acting in accordance with the requirements of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products, the PN-EN ISO/IEC 17065 standard and having an accredited research laboratory in accordance with PN-EN ISO/IEC 17025 (accreditation number AB 023).*

ENVIRONMENTAL PRODUCT DECLARATION No. 214 /2021

PRODUCT DESCRIPTION

Stofix brick panel is manufactured in a factory located in Komorniki, Poland. Stofix prefabricated brick panels are delivered from the factory to the building site and are installed with a modulized mounting system. The Stofix brick panel is a combined structure of kiln-fired brick, polymer-modified mortar and a pressed metal frame. The Stofix Brick Cladding System is made of the following components: comprising brick slips, factory embedded to the backing steel sheet with mortar to form a panel (see Figure 1). The panels have a weight of 38 to 50 kg·m$^{-2,}$ depending on the brick type. The panel components have the following specifications:

- brick slips — clay kiln-fired bricks slips manufactured to EN 771-1 : 2012 and with standard dimensions of 65 mm (height) x 215 mm (length) with a nominal thickness of 20 mm
- steel sheet — the steel sheet is made from either galvanized steel with a hot-dip zinc coating (600 g·m^{-2}) of grade DX51D or S220GD Z600 manufactured acc. to EN 10346 : 2015 or stainless steel of grade 1.4521 in accordance with EN 10088-2 : 2014. The steel sheet contains holes and folds for keying into the mortar, and has a standard size of 1125 x 600 mm with a thickness of 0.7 mm
- factory-applied mortar — cement-based, polymer-modified mortar of class M20, manufactured to EN 998-2 : 2010, for embedding the brick slips to the backing steel sheet during panel assembly at the factory
- site-applied mortar — cement-based, polymer-modified site-applied mortar of class M10 for filling the joints of the cladding panels on site, manufactured to EN 998-2 : 2010
- self-drilling screws — the panels are secured together on site with zinc-plated 4.2 mm diameter self-drilling screws to DIN 7504, through the joints of the panels. The joints are then finished with the site-applied mortar
- SK wall bracket and JK extension bracket — 2.0 mm thick, made from either galvanized steel with 42 µm hot-dip zinc coating (600 g·m^{-2}) of grade DX51D or S220GD Z600 manufactured to EN 10346 : 2015, or stainless steel of grade 1.4521 according to EN 10088-2 : 2014
- J60 vertical rail and Z vertical rails — 1.25 mm thick, made from either galvanized steel with 42 µm hot-dip zinc coating (600 g·m^{-2}) of grade DX51D or S220GD Z600 manufactured to EN 10346 : 2015, or stainless steel of grade 1.4521 in accordance with BS EN 10088-2 : 2014. The J60 vertical rails have a weight of 0.8 kg·m^{-1} . The Z rails have a weight of 0.5 to 0.9 kg·m^{-1}
- AK horizontal rail 1.25 mm thick, made from either galvanized steel with 42 µm hot-dip zinc coating (600 g·m^{-2}) of grade DX51D S220GD Z600 manufactured to EN 10346 : 2015, or stainless steel of grade 1.4521 according to EN 10088-2 : 2014.
- M8 hexagon bolts and nuts — used to attach the horizontal rail to the vertical rail and the vertical rail to the bracket/extension bracket. The bolts have a diameter of 8 mm and length of 12 mm and are zinc plated to ISO 7380. The nuts are zinc plated to DIN 985.

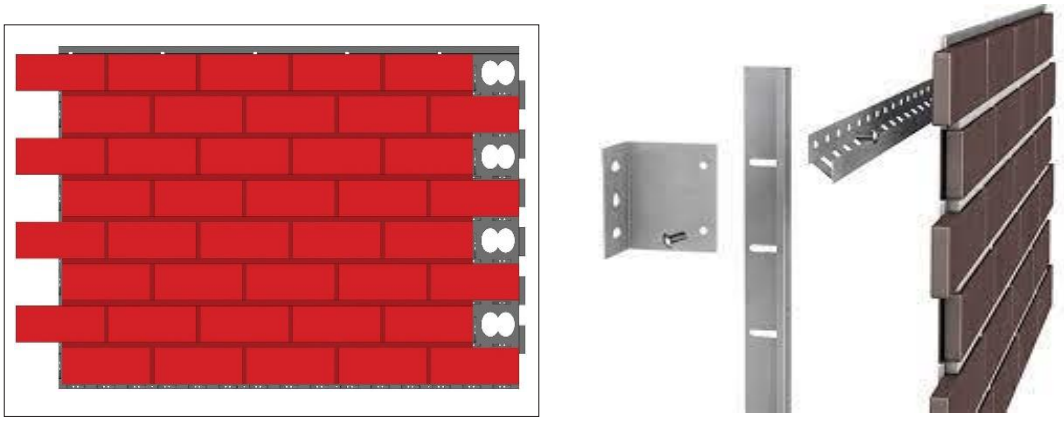


Figure 1 Typical Stofix Brick Cladding panel front view (a) and its mounting system (b).

ENVIRONMENTAL PRODUCT DECLARATION No. 214 /2021

APPLICATIONS

The Stofix Brick Cladding System is used to improve the weather resistance of a wall and provide a decorative finish. The system is installed with a ventilated cavity behind the cladding. It is suitable for several kinds of external wall structures as masonry, concrete, steel and timber frame substrates. Normally there is a min 35 or 38 mm air gap for ventilation behind the cladding. The system cannot be used to improve air tightness of the building to which it is installed.

CERTIFICATES

- ISO 9001:2015 AC090 100/2020/5151/2020; scope - manufacturing brick slip cladding facades, accreditation PCA
- ISO 14001:2015 AC090 104/2020/5151/2020; scope - manufacturing brick slip cladding facades, accreditation PCA

All necessary additional information about the technical properties of the product is presented on the manufacturer's website or at:

https://stofix.com/wp-content/uploads/2017/05/Stofix-Group-Brochure.pdf

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

The carbon footprint presented in this declaration is representative for a general The Stofix Brick Cladding Systems and as well for a specific Stofix projects such as the BORGEN project.

System limits

The declaration covers only one environmental indicator - the carbon footprint - expressed as Global Warming Gotential GWP according to the standards EN 15804 and is the type Carbon Footprint Declaration (EPD) based on ISO 14067:2018 *Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification* and verified according to ISO 14025. The life cycle analysis of the declared products covers “Product Stage”, A1-A4, “End of life stage” C1-C4 and D modules in accordance with EN 15804+A1 and ITB PCR A. The input materials and energy consumption inventoried in factory were included in calculation. In the assessment all significant parameters from gathered production data are considered i.e. all material used per production, utilized energy, internal fuel and electric power consumption. It is assumed that the total sum of omitted processes does not exceed 2% of all impact categories. In accordance with EN 15804 machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

Allocation

Production of the panels is a line process (see Figure 2). Allocation for a production (A1-A3 modules) is done on a mass basis. 100% of impacts from line production were inventoried and 100% were allocated to the panels production. Utilization of packaging material (PE, solid timber boxes, carboard, styrofoam) was taken into consideration. Module A2 includes transport of raw materials (steel, clay and other), additives and ancillary materials from their suppliers to manufacturing plant. Energy supply was inventoried for whole factory and 100% was allocated to panels production. Emissions in the factory (natural gas consumption) were estimated by using national conversion factors (KOBiZE- 2020) and were allocated to module A3.

A1 and A2 Modules: Raw materials supply and transport

All impacts from raw materials extraction and production including: burnt clay tiles, zinc coated metal backing sheet, bonding grout - polymer modified cement, colored mineral granules, adhesive, wall mounting and fixing system including horizontal rails, vertical rails, brackets, screws (zinc coated steel) are allocated in A1 module. The transport to the factory (A2 module) has been fully inventoried (LCI questionnaire) taking into account the number of deliveries: type of vehicles, the size of the delivery and the distance from the manufacturer to the factory for all input sources and raw materials.

A3: Production

Production process in a manufacturing plant in Komorniki can be divided into several stages (see Figure 2): frame and bricks cutting, brick cladding, frame bonding, drying, supplementation by mounting system, packing. Raw materials used in a production are: burnt clay tiles, zinc coated metal backing sheet, Stofix factory bonding grout - polymer modified cement, Stofix site bonding grout - polymer modified cement, coloured mineral granules, adhesive, wall mounting and fixing system including horizontal rails, vertical rails, brackets, screws (zinc coated metal). Packing materials used are: solid timber boxes or pallets, PE foil, cardboard, Styrofoam.

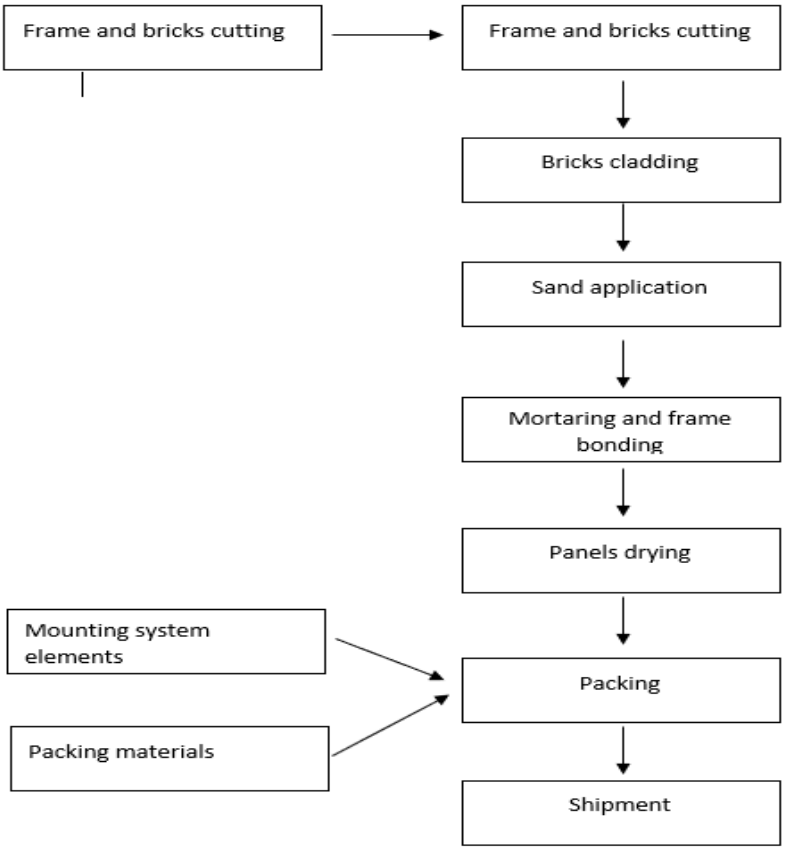


Figure 2. Production process of Stofix Brick Cladding panel with a mounting system.

A4: Transport to site

It was assumed that the final product is transported to a distance of 500 km. In the case of a different distance, we suggest using a simple proportion (for example 100 km give multiplication factor 0.2).

C1 – C4: End of life

The end-of-life scenario for all products has been generalized. Steel is considered as infinitely recyclable material. Typically is recovered by demolition contractors, who sell the recovered steel as ferrous scrap (material recovery rate in analyzed case is 95%). According to the scenario 0.5 MJ of the energy is set to recover the profile from the material derived from the demolition was assumed (electric equipment and jacks). It is assumed that at the end of life the transport distance from the product deconstruction place to waste processing (as module C2) is 50 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km. Materials recovered from dismantled products are recycled or/and landfilled according to the actual treatment practice of construction waste what is presented in Table 1.

Table 1. End-of-life scenario (C modules) for a Stofix Brick Cladding panel with a mounting system.

Parameter	Contribution
Collection rate	95%
Recycling of Steel	95%
Landfill of steel	5%
Recycling of clay tiles	90%
Landfilling of clay tiles	10%
Recycling of other materials	50%
Landfilling of other materials	50%

D: Re-use, recovery, recycling potential

The reuse, recovery and recycling potential for a new product system is considered beyond the system boundaries (module D) based on World Steel recommendations (net scrap approach) and typical practice (see references). The reuse of crushed clay (as new material in other system) tiles may replace the virgin aggregate and the steel is reused in its production (see LCI data for Steel products Report compiled by Brian Hughes and William Hare (2012 for World Steel Association).

Data collection period

The data for manufacture of the declared products refer to year 2020. The life cycle assessments were prepared for Poland as a place of product production.

Data input quality

The values determined to calculate the LCA originate from LCI verified inventory data provided by Stofix.

Assumptions and estimates

The impacts of the panels were aggregated using mass of production. Impacts were inventoried and calculated for all products. The impact on the panel's environmental performance from different type of brick profile was averaged for a product using the weighted average method.

Calculation rules

LCA was done in accordance with ITB PCR A document.

Databases

The carbon data for the processes come from the following databases: Ecoinvent v.3.7 (polymer modified cements, waste processing, packaging, water, timber), specific EPDs (clay tiles, zinc coated metal sheets, aggregates, Styrofoam, adhesive), foils (Plastic Europe), KOBiZE (energy carriers: electricity, ON, natural gas). Characterization factors are CML ver. 4.2 based on EN 15804:2012+A1:2013 version (PN-EN 15804+A1:2014-04).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared/functional unit

Table 2 Indicates which life cycle modules are included in the carbon footprint analysis.

Table 2. System boundaries (life's modules included) for the environmental characteristic of the Stofix system

Environmental assessment information (MNA – Module not assessed. MD – Module Declared. INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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
MD	MD	MD	MD	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MD	MD	MD	MD	MD

In the context of the analysis performed in accordance with EN 15804, all indicators except Global Warming Potential GWP (carbon footprint) have the status of INA - indicator not assessed. Biogenic carbon – estimated as less than 5% of total GWP is not declared.

The environmental impacts and aspects refers to declared unit (DU) – 1 m^2 of the system manufactured by Stofix (Table 3).

Table 3. Environmental product characteristic –1 m^2 of Stofix system.

Environmental impacts: (DU) 1 m^2										
Indicator	**Unit**	**A1**	**A2**	**A3**	**A4**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2 eq.	4.67E+01	1.04E+00	7.04E+00	2.02E+00	3.00E-02	2.02E-01	8.24E-02	2.29E-02	-2.05E+01

The carbon footprint of 1 m^2 of the Stofix system "production" (A1-A3) is 54.8 kg of CO_2 eq.

The carbon footprint of 1 m^2 of the Stofix system "end of life" (C1-C4) is 0.34 kg of CO_2 eq.

Results interpretation

The carbon impact of Stofix system is mainly dependent on production of raw/input materials (see Table 3, A1 module gives 77% of all life's carbon impacts) on which the manufacturer has only a little and indirect influence. The steel elements of the used sheets and profiled elements as well as the assembly system, made of quality galvanized European steel sheets, mostly produced in the BOF technology, have the greatest impact on the carbon footprint (51%). The manufacturing of burnt quality bricks (13%), modified cement (13%) and electricity consumption are in second place (8%) (see figure 3). Transport to construction site of 1 m^2 per distance of 500 km causes the emission of approx. 2 kg CO_2/m^2. The system recycling process is simple and does not significantly affect the environment (GWP- 0.34 kg CO_2/m^2). According to the adopted technology about 85% of the "waste" material can be recovered for recycling. The detailed impact on the carbon footprint of the system generated by the system components and the energy consumption is shown in the Figure 3.

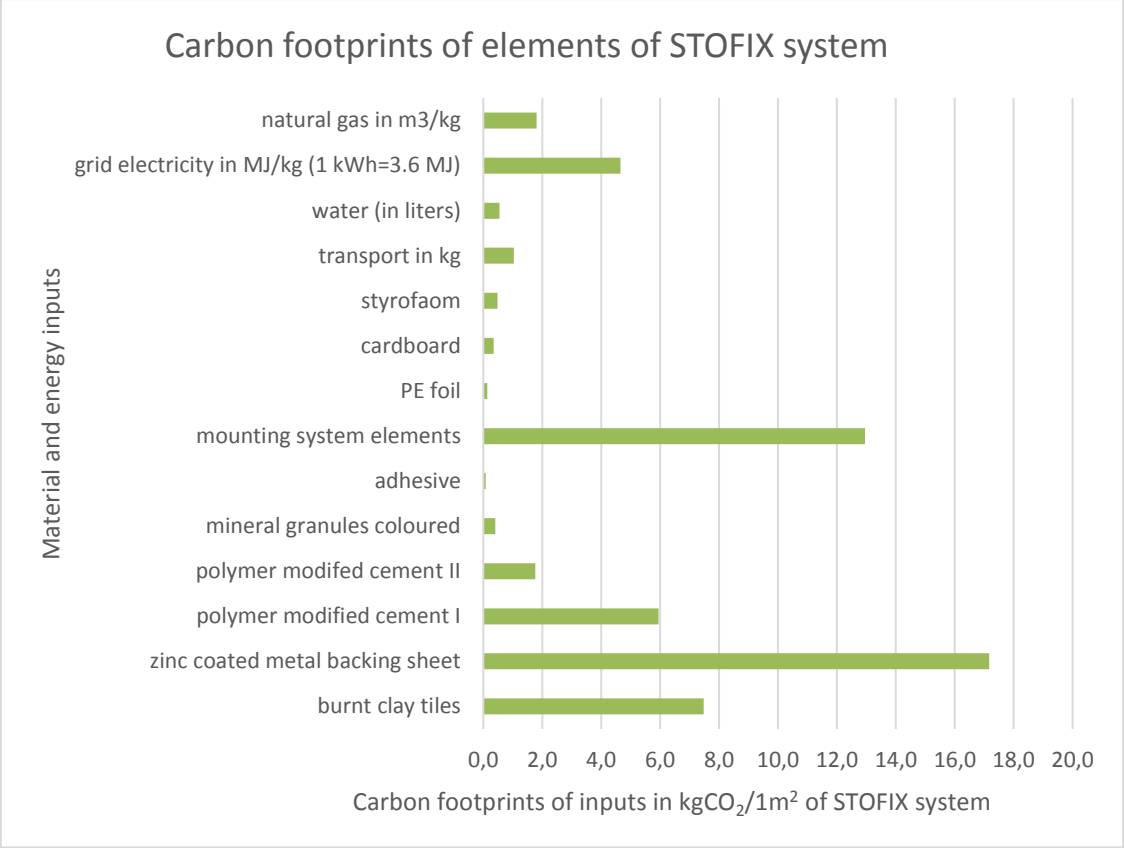


Figure 3. Key components impacting the carbon footprint of the Stofix system.

The panel products (at the end of life) due to the steel and clay brick content has some expected environmental (carbon minus) gains provided in module D (-20,5 kg CO_2/m^2, recycled steel may be used as an input for a steel production).

Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years. if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3.) [x] external [ ] internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA. LCI audit and input data verification: Ph.D. Eng. Michał Piasecki. m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska. j.tomaszewska@itb.pl

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and ISO 14067 and the building context, respectively the product-specific characteristics of performance are taken into account.

Normative references

- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NOx, CO i pyłu całkowitego dla energii elektrycznej. grudzień 2019
- EAD 090062-00-0404, „Kits for external wall claddings mechanically fixed”.
- LCI DATA FOR STEEL PRODUCTS. *Report* produced for: *Brian Hughes*. *William Hare* Ltd. Peter Hodgson. Tata Steel Group. 25th April 2012.

Instytut Techniki Budowlanej
00-611 Warsaw, Filtrowa 1

Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE № 214/2021
of TYPE III ENVIRONMENTAL DECLARATION

Products:

The Stofix Brick Cladding System

Manufacturer:

Stofix Poland Sp. z o.o.

ul. Krzysztofa Kolumba 8, 62-052 Komorniki, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

PN-EN 15804

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued for the first time on 1st May 2021 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Acting Head of the Thermal Physic, Acoustics and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director
for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, May 2021